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Subject: Westinghouse Written Statement to the Director, Office of Enforcement

- References:
1. U.S. Nuclear Regulatory Commission Confirmatory Order EA-16-173 (ML17221A122)
 2. U.S. Nuclear Regulatory Commission Inspection Report No. 70-1151/2017-007 (ML17058A448)
 3. Westinghouse Letter, LTR-RAC-16-49, "Commitments to Address the Columbia Fuel Fabrication Facility Scrubber Event" (ML16223A003)
 4. U.S. Nuclear Regulatory Commission Confirmatory Action Letter EA-16-173 (ML16224B082)
 5. Westinghouse Letter, LTR-RAC-16-63, "Confirmatory Action Letter – Columbia Fuel Fabrication Facility – Request for Restart Approval of S-1030 Scrubber System and Conversion Process Equipment" (ML16293A175)
 6. U.S. Nuclear Regulatory Commission Authorization to Restart EA-16-173 (ML16294A296)

Pursuant to Section V.1 of Reference (1), regarding the Westinghouse Electric Company LLC (Westinghouse), Columbia Fuel Fabrication Facility, Westinghouse hereby provides the attached written statements to the Director, Nuclear Regulatory Commission (NRC) Office of Enforcement, addressing the four violations described in References (1) and (2). Attachment 1 provides a summary of the corrective actions taken and Attachment 2 answers the questions specifically required by Reference (1).

Specifically, for each of the four violations identified in the References, Westinghouse describes: (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 repetition.

This letter and associated attachments contain no new commitments.

Should you have any questions or require additional information, please contact Nancy Parr of my staff at (803) 647-3338.

Sincerely,

A handwritten signature in black ink, appearing to read "Mike Annacone", with a long horizontal flourish extending to the right.

Mike Annacone, Vice President
Columbia Fuel Operations
Westinghouse Electric Company LLC
License SNM-1107 Docket 70-1151

cc: Regional Administrator, Region II

ATTACHMENT 1

I. SUMMARY OF WESTINGHOUSE ACTIONS TO ADDRESS THE COLUMBIA SCRUBBER EVENT

Westinghouse Electric Company LLC (Westinghouse) recognizes that the decision-making and performance that led to the accumulation of uranium in the Columbia Fuel Fabrication Facility (Columbia) S-1030 scrubber, as described in References (1) and (2), did not reflect Westinghouse's high standards for nuclear safety and excellence in operations.

Since the discovery of this uranium accumulation over one year ago, Westinghouse has taken and continues to take extensive and substantial corrective actions to address the lessons learned from this event. These actions are designed to maintain safety margin between normal operations and criticality safety limits, and more generally, designed to ensure sustainable, long-term improvements in the safety of operations at Columbia.

The following is a high-level summary of the most significant actions already taken to date, and the basis for those actions. The summary focuses first on immediate actions taken prior to restart of conversion operations at Columbia, and then on post-restart actions. The summary is followed by a list of the most significant corrective actions Westinghouse has taken in response to the S-1030 scrubber uranium accumulation condition.

I.A CORRECTIVE ACTIONS PRIOR TO RESTART

On July 28, 2016, once Westinghouse understood the significance of the uranium accumulation, Westinghouse shut down uranium conversion area operations at Columbia to evaluate the conditions found in the S-1030 scrubber, to understand the causes of those conditions, and to apply corrective actions. Westinghouse updated its NRC notification, and on August 9, 2016, submitted a list of actions to be taken before seeking approval to restart uranium conversion operations, and additional actions to be taken following restart. (Reference (3)) The pre-restart actions included:

1. Completing a Root Cause Analysis (RCA) investigation.
2. Completing restart corrective actions or compensatory actions.
3. Reviewing the existing safety basis for the S-1030 scrubber system and revising necessary areas.
4. Reviewing the Criticality Safety Evaluations (CSE) for non-favorable geometry (NFG) components and revising necessary areas.
5. Confirming isolation, inspecting, and cleaning NFG components that are permanently removed from service.
6. Performing a historical 10-year review of the corrective action program to identify recurring or longstanding issues and completing corrective actions.
7. Revising procedures for internal escalation and event response.
8. Retaining an external nuclear criticality safety expert.
9. Providing training on the lessons learned from the event.
10. Conducting a work environment assessment of the nuclear criticality safety (NCS) organization and developing corrective actions.

The NRC staff acknowledged Westinghouse's commitments in a Confirmatory Action Letter, dated August 11, 2016 (CAL). (Reference (4))

Over the following two months, Westinghouse completed its RCA investigation, which included an assessment of the nuclear safety culture (NSC) contributors to the event. The site implemented the corrective actions to prevent recurrence or compensatory actions, before it sought conversion area restart approval.

Consistent with the other CAL commitments, Westinghouse reviewed the design, operation, and maintenance history of the S-1030 scrubber and revised the safety basis accordingly. Westinghouse reviewed and revised procedures that implement items relied on for safety (IROFS), reviewed and corrected the management measures for the availability and reliability of the administrative IROFS, and completed physical modifications to support the revised safety basis. This review led Westinghouse to implement extensive physical modifications aimed at reducing the potential for material carryover to the S-1030 scrubber, improving ventilation system inspections, and reducing the ability for material to buildup in the scrubber itself.

Westinghouse reviewed the CSE accident sequences for wet scrubber ventilation systems with non-favorable geometry components, including the procedures and management measures for administrative IROFS. For CSEs with non-favorable geometry components that have mass limits, Westinghouse confirmed that IROFS had been flowed down to the Integrated Safety Analysis (ISA), sketches, and implementing documents.

Westinghouse confirmed that non-favorable geometry components that had been permanently removed from service were isolated such that additional special nuclear material (SNM) mass accumulation or moderator addition could not occur. Retired non-favorable geometry systems were inspected and cleaned.

For administrative IROFS satisfied by inspection, Westinghouse reviewed and revised procedures that implemented the inspections to ensure administrative limits were properly defined and were effectively implemented.

In the area of training, Westinghouse deployed a case study approach to train responsible personnel on lessons learned. The case studies included the 2016 S-1030 scrubber event, historical events at Columbia and at another fuel cycle facility. The training emphasized common nuclear safety culture themes and reinforced the need for fundamental, sustained change at Columbia, and the need to improve the site's ability to learn from events. Importantly, as part of this training, Westinghouse solicited worker feedback regarding the health of the site's nuclear safety culture. Following restart, the site used this feedback to inform the new Nuclear Safety Culture Monitoring Panel (NSCMP) and the facility's Excellence Plan.

Over two months later, on October 19, 2016, following the completion of its restart commitments, and after receiving internal Westinghouse approval, the site submitted a restart request to the NRC. (Reference (5)) Based on the NRC's inspection of Westinghouse's CAL commitments, the NRC authorized restart on October 20, 2016. (Reference (6))

I.B POST-RESTART CORRECTIVE ACTIONS

Following restart of conversion operations, Westinghouse has continued to implement a comprehensive set of corrective actions to ensure safe operations at Columbia, to address gaps in the implementation of its criticality safety program, and to apply the learning broadly across all safety disciplines and operations. These actions have been documented in a facility Excellence Plan intended to deliver long-term, safe, reliable, and excellent operations at Columbia. The Excellence Plan leverages Institute of Nuclear Power

Operations (INPO) 12-011 guidance, “An Implementation Framework to Significantly Improve Nuclear Plant Performance.” This guidance provides a time-tested, rigorous roadmap to improve facility performance. The site’s Excellence Plan also builds on the lessons learned identified in the site-specific reviews such as the RCA investigation, and a common cause analysis described below.

Among its most significant actions, Westinghouse has confirmed that the physical modifications to the S-1030 scrubber have been effective. Since initial restart in October 2016, the site has completed five full inspections of the S-1030 scrubber system with excellent results. Based on these five inspections, the current build up rates extrapolated over one year result in ~1.2 - 1.4 kilograms (kg) of uranium against a uranium limit of 85.7 kg. The site’s new inspection processes provide detailed steps to ensure repeatable outcomes, explicitly define acceptance criteria and effectively integrate reviews and approvals by criticality safety experts to ensure the safety basis is preserved during the activity.

Westinghouse has continued to conduct independent reviews of the ongoing Columbia improvements. Recognizing that the effectiveness of our configuration control process in preserving safety margin was one of the root causes of the event, Westinghouse engaged personnel independent of the site organization, with design engineering and criticality safety expertise, to review work products and conduct challenge sessions to ensure the accuracy and rigor of the changes we made.

Westinghouse has focused on establishing a healthy nuclear safety culture at Columbia as the foundation of its improvement efforts. The RCA of the event identified gaps in this area, and beyond the corrective actions identified in the RCA, these findings have informed the scope of the site Excellence Plan.

Westinghouse has completed many actions to improve nuclear safety culture at the Columbia. For example, as previously noted, it has implemented a NSCMP, utilizing nuclear industry guidance, and shaped by benchmarking and feedback from consultants from our company’s external Nuclear Safety Review Board. Westinghouse is continuing independent oversight of panel meetings to ensure sufficient self-criticality.

Also in the area of nuclear safety culture, and consistent with one of the CAL commitments, Westinghouse completed an independent third party assessment of the current state of our nuclear safety culture using an experienced outside organization. Westinghouse is taking actions to address the gaps identified in this assessment. Significantly, the independent team noted in the executive summary of the report that our NSCMP had effectively self-identified most of the gaps noted by the team. The site’s ability to self-identify gaps is an important indicator of a first step in performance improvement.

Westinghouse is focusing on improving the management systems, processes, and programs at Columbia. The effectiveness of those systems can directly impact and shape nuclear safety culture. Completed actions in this area have focused on improving configuration control, self-identifying and correcting problems and strengthening internal and external challenges and reviews of performance. This has included two configuration control self-assessments using INPO guidance and other industry operating experience.

Westinghouse has improved corporate engagement and oversight of Columbia performance. Westinghouse has assigned a corporate radiation and criticality safety program manager to strengthen governance and oversight in these areas. It has upgraded its internal and corporate audit programs to facilitate more intrusive reviews. It has also established a corporate nuclear safety oversight committee to oversee nuclear safety culture improvement efforts company-wide. Additionally, to continue to foster

critical review and oversight, the Columbia management review meeting process requires participation by the responsible corporate functional area managers.

As part of the effort to sustain improvement at Columbia, Westinghouse conducted a common cause analysis of the scrubber event and other recent events to identify common underlying leadership, organizational, and programmatic drivers. This analysis was conducted by a combined team including Columbia staff and outside experts, and the site is implementing corrective actions identified through the common cause analysis.

In parallel with the development of the Excellence Plan, Westinghouse chose to engage in alternative dispute resolution (ADR), to resolve the Apparent Violations identified in the NRC's Augmented Inspection Team (AIT) Inspection Report, Reference (2). This ADR process resulted in a significant set of new and additional commitments from Westinghouse to the NRC, to address the scrubber condition and resolve the associated violations, as documented in the Confirmatory Order issued on August 9, 2017. (Reference (1)) This letter addresses one of those commitments.

With this background in mind, the following is a list of the most significant corrective steps taken to restore compliance following the scrubber event, and the additional corrective actions and enhancements taken to preclude repetition.

I.C SUMMARY OF WESTINGHOUSE SIGNIFICANT CORRECTIVE ACTIONS COMPLETED TO ADDRESS THE 2016 S-1030 SCRUBBER EVENT

1. Safety Culture and Employee Concerns Program (ECP):

- a. Enhanced the ECP at Columbia by establishing an ECP presence at the site. The ECP representative reports to the Westinghouse corporate ECP director and is independent of the site. ECP conducts a periodic meeting with the Vice President of Columbia Fuel Operations to review trends in ECP program inputs and status of open corrective actions and is an active participant in the Columbia Nuclear Safety Culture Monitoring Panel (NSCMP).
- b. Completed an independent third party NSC assessment. Results of the assessment have been reviewed by the Columbia NSCMP and have been entered into the corrective action program (CAP) for correction.
- c. Established a company-wide NSC Executive Committee to monitor and improve nuclear safety culture Westinghouse-wide.
- d. Established a NSCMP informed by the guidance of Nuclear Energy Institute (NEI) 09-07 and based upon lessons learned from WECTEC Global Project Services Inc. The Columbia NSCMP operates under the overarching governance of the Westinghouse NSC Executive Committee.
- e. Developed and initiated company-wide NSC training on the expected behaviors for leaders and for workers based on NRC and INPO standards.

2. Design, Equipment, and Maintenance

- a. Modified the Blue M oven design to reduce SNM influents into the S-1030 scrubber. These modifications included adding a filter to remove particulate from the hood and oven. Also, the Blue M oven sifter enclosure was re-configured such that the exhaust is routed to the dry ventilation system dust collector, instead of to the S-1030 scrubber.

- b. Implemented extensive modifications to the S-1030 scrubber to improve the reliability of supporting IROFS and implemented a conservative frequency of full cleaning and inspections. Physical modifications to the S-1030 scrubber system included a redesigned scrubber inlet transition; installation of a passive overflow system; modifications to the scrubber drain; installation of a basket system for packing media; elimination of the scrubber trough where material had been accumulating; installation of a liquid level alarm; and changes to the operation of the scrubber to include a blowdown system.
- c. Revised the S-1030 Inspection and Clean Out procedure and associated maintenance work instructions to clearly specify the recording of data needed to confirm the effectiveness of IROFS in maintaining uranium mass below the limits and to define the requirements for the engagement, review and approval of results by the criticality safety engineer prior to authorization of restart of the scrubber following the cleaning activity.
- d. Completed modifications to other scrubbers based on reviews conducted in connection with S-1030 event.
- e. Established a project to remove out-of-service components. Under this program, the NFG S-1056 scrubber and 2A-2B, 3A-3B, 7A and 4B filter systems have been removed.

3. Leadership and Oversight

- a. Assigned a new site Vice President and a Recovery Manager, both with significant external nuclear leadership experience.
- b. Established corporate oversight of the criticality safety function. This role provides routine governance and oversight of this function at Columbia.
- c. Implemented an administrative policy for the conduct of management review of criticality safety at least quarterly to include at a minimum review of issues reported in the Corrective Action Program, audit results, assessment results, and performance metrics. The meeting is led by the Vice President, Columbia Fuel Operations.
- d. Implemented an internal escalation protocol for IROFS violations, including situations involving uncertainty in compliance to limits.
- e. Revised event response guidelines to strengthen critical decision making based upon event significance by requiring independence of membership on the Safety Event Management Review Team.

4. Training

- a. Developed and conducted training for over 1000 leaders and workers involved in the control of IROFS and management measures on lessons learned from the Columbia scrubber event with emphasis on the NSC lessons learned from the RCA investigation.
- b. Developed and implemented training for individuals who perform tasks that could affect compliance with the CSEs for the S-1030 scrubber system to improve workforce understanding of the CSE and safety basis requirements for the tasks the individual is expected to perform.
- c. Conducted targeted nuclear NCS basis training for leaders with a more in-depth review of the safety basis.

5. Audits:

- a. Developed a more rigorous program for audits, by an independent qualified auditor with a background in criticality safety, of the NCS program to ensure the full NCS program is reviewed on a three-year cycle.
- b. Revised the triennial audit program required by the Columbia license (SNM-1107) to include an effectiveness review of periodic CSE technical reviews.
- c. Improved documentation and qualification requirements for external auditors used at Columbia.
- d. Based on lessons learned from the Columbia event, conducted an internal, independent criticality safety review at Westinghouse's other fuel fabrication facilities: the Springfields facility in the United Kingdom and at Västerås in Sweden.

6. Corrective Action Program

- a. Performed a historical review of CAP and Redbook/Greenbook entries for recurring or longstanding issues that could challenge the safety basis or CSE. Identified issues were entered into CAP and either corrected prior to restart or compensatory measures were put in place.
- b. Implemented a monthly Redbook review to identify trends and recurring issues. Items noted are entered into CAP for correction.
- c. Implemented a revision to the Redbook program to ensure entries are screened by the Issue Review Committee and investigations are assigned in the CAP based upon significance.
- d. Established a requirement for the Columbia Corrective Action Review Board (CARB) to review CAP initiation rate metrics and take appropriate actions based on review.

7. Configuration Control

- a. Revised the Configuration Control program to require a more robust safety review for physical modifications to the plant.
- b. Revised the Electronic Training and Procedure System (ETAPS) to implement a more robust safety review for operating procedure revisions.
- c. Conducted a self-assessment to evaluate necessary improvements. The results have been approved by the Columbia Vice President and entered into CAP:
 - i. Completed an assessment of the Columbia configuration management process using recommendations in INPO 10-005, "Principles for Maintaining an Effective Technical Conscience" and INPO IER L1-14-20, "Integrated Risk - Healthy Technical Conscience."
 - ii. Completed an assessment of the Columbia engineering design and calculation processes to ensure the proper designation of the use of independent verifications, disposition of assumptions, calculations and other typically accepted reviews/verifications to ensure technical rigor as specified in Westinghouse engineering procedures.

8. Completed a management measures self-assessment and entered results into CAP.

ATTACHMENT 2

I. VIOLATION 1

Failure to ensure criticality accident sequences remain highly unlikely, as required by Title 10 of the *Code of Federal Regulations* (10 CFR) 10 CFR 70.61(b).

I.A REASON FOR THE VIOLATION

The Westinghouse RCA determined that the programmatic controls for configuration management did not have the rigor to mitigate increased uranium accumulation in the S-1030 scrubber when design changes were made to the ventilation system and when operational requirements for the scrubber spray system were changed in the procedure.

Further, management did not adequately scrutinize the content of the CSE and as-found conditions in the S-1030 scrubber with a questioning attitude and conservative bias. Contributing to this, the management team did not ensure the organization had sufficient procedures and training to recognize and respond to deviations from the safety basis described in the CSE.

Operating experience and the corrective action processes were not effectively used to pursue the actions needed to detect, estimate, and mitigate deposited uranium in the S-1030 scrubber.

I.B CORRECTIVE STEPS THAT HAVE BEEN TAKEN TO RESTORE COMPLIANCE

Prior to restart of the S-1030 scrubber system and conversion process equipment on October 20, 2016, physical modifications were made to the S-1030 scrubber system (see Items 2a and 2b in Section I.C). These changes were incorporated into a revised CSE to ensure double contingency protection and a revised ISA to ensure the risk of an accidental criticality was highly unlikely. The revised safety basis was implemented in the plant including enhanced management measures to assure the reliability and availability of the IROFS. Procedures were revised and training was conducted on the revised CSE, ISA, IROFS and management measures and a post start-up monitoring plan was implemented to validate the effectiveness of the actions.

I.C ADDITIONAL CORRECTIVE ACTIONS AND ENHANCEMENTS TAKEN TO PRECLUDE REPETITION

As explained in Attachment 1, Westinghouse has completed an extensive set of corrective actions and enhancements to operations at Columbia, all designed to preclude repetition of the S-1030 scrubber condition. The following five corrective actions to prevent recurrence (CAPRs) have been implemented:

- (1) Procedures were revised to require an up-front planning meeting between multiple areas, including Criticality Safety for proposed plant equipment or safety changes. The purpose of the meeting is to evaluate proposed changes to plant equipment or systems and obtain consensus regarding potential impacts on the safety basis. These enhancements were applied to the design change process.
- (2) Procedures were revised to include a formal review for process changes with a potential impact to safety aspects. For changes other than administrative procedure changes, a procedure review

form has been implemented by the regulatory component to assess the potential impact of the change to the safety basis, including: CSEs, Safety Significant Controls (SSCs), IROFS, bounding assumptions, industrial safety, environmental permits and regulations, and general requirements. These enhancements were applied to the procedure change process.

- (3) Procedures were revised to require an independent technical review if a system or component described in a CSE is modified. The independent technical review checklist requires an evaluation on how the CSE is affected and the actions that must be taken to ensure the configuration management program is used to maintain the CSEs.
- (4) Westinghouse conducted a performance based self-assessment following applicable industry guidance on technical rigor. As a result, Westinghouse identified and implemented improvements in design calculations and design packages.
- (5) The S-1030 scrubber procedure was revised to clearly specify the recording of data needed to confirm the effectiveness of IROFS to maintain uranium mass below the safety limit. The procedure also provides clear instructions on timely review and evaluation of the data to ensure issues are promptly identified and reported to management.

II. VIOLATION 2

Failure to assure that under normal and credible abnormal conditions, all nuclear processes were subcritical including use of an approved margin of subcriticality, as required by 10 CFR 70.61(d).

II.A REASON FOR THE VIOLATION

The reasons for this violation are substantially the same as the reasons for Violation 1.

II.B CORRECTIVE STEPS THAT HAVE BEEN TAKEN TO RESTORE COMPLIANCE

The corrective steps taken to restore compliance with 10 CFR 70.61(d) are substantially the same as the actions taken in response to Violation 1.

II.C ADDITIONAL CORRECTIVE ACTIONS AND ENHANCEMENTS TAKEN TO PRECLUDE REPETITION

The additional corrective actions and enhancements taken to preclude repetition of this violation are substantially the same as those taken in response to Violation 1. In addition, Westinghouse hired independent nuclear criticality experts to review the safety basis documentation, implementation, and management measures for wet scrubber ventilation systems with non-favorable geometry components. Also, Westinghouse assigned an independent nuclear criticality safety expert to provide oversight of the nuclear criticality safety function (see Item 3b in Section I.C).

III. VIOLATION 3

Failure to establish adequate management measures to ensure that items relied on for safety (IROFS) perform their function when needed, as required by 10 CFR 70.62(d).

III.A REASON FOR THE VIOLATION

The reasons for this violation are substantially the same as the reasons for Violation 1.

III.B CORRECTIVE STEPS THAT HAVE BEEN TAKEN TO RESTORE COMPLIANCE

Westinghouse revised the management measures for the S-1030 scrubber system IROFS to assure that the new controls were available and reliable. Additional rigor was applied to assure that the design, operation, training, maintenance and implementation of the new safety basis and IROFS were robust. Westinghouse revised the S-1030 procedures to confirm the effectiveness of IROFS (see Item 2c in Section I.C). A special focus was placed on procedure use and adherence for administrative IROFS. Training on lessons learned was delivered to the workforce. Training on compliance with CSEs was provided to impacted staff. (See Items 4a, 4b and 4c in Section I.C.) A 10 year historical review of potential challenges to the safety basis or CSEs was completed, and identified issues were entered into the CAP (see Item 6a in Section I.C). Westinghouse conducted a focused self-assessment of the management measures program and entered the results into the CAP for resolution. (See Item 8 in Section I.C.)

III.C ADDITIONAL CORRECTIVE ACTIONS AND ENHANCEMENTS TAKEN TO PRECLUDE REPETITION

Westinghouse implemented revisions to its design, configuration management and procedure programs to assure that the impact of changes to the safety basis are fully understood and the safety margin is maintained when changes are made. Revisions were made to the training program to improve knowledge related to the safety basis to enhance the ability to recognize latent conditions. Also, a revised procedure defining the internal escalation protocol for failed or degraded IROFS was implemented. The audit program was revised to ensure that the NCS program and the CSE reviews occur on a triennial frequency (see Items 5a and 5b in Section I.C). Monthly reviews of IROFS and management measures issues were instituted to identify trends and recurring issues (see Item 6b in Section I.C).

IV. VIOLATION 4

Failure to make a one hour report, as required by Appendix A(a)(4) of 10 CFR Part 70.

IV.A REASON FOR THE VIOLATION

The Westinghouse RCA determined that the management team did not ensure the organization had sufficient procedures and training to recognize and respond to deviations from the safety basis described in the CSE and ISA.

IV.B CORRECTIVE STEPS THAT HAVE BEEN TAKEN TO RESTORE COMPLIANCE

The required one hour report was made on July 31, 2016.

IV.C ADDITIONAL CORRECTIVE ACTIONS AND ENHANCEMENTS TAKEN TO PRECLUDE REPETITION

As described in Attachment 1, Westinghouse completed a RCA investigation, which included an assessment of the nuclear safety culture contributors to the event. Westinghouse revised procedures to strengthen critical decision making by requiring independence of membership on the safety event management review team. Additionally, training was provided to management to set expectations and strengthen nuclear safety culture decision making.