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

August 12, 2016

Mr. Bruce Phillips
Interim Vice President, Columbia Fuel Operations
Westinghouse Electric Company
5801 Bluff Road
Hopkins, SC 29061

SUBJECT: WESTINGHOUSE ELECTRIC COMPANY – NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NO. 70-1151/2016-006

Dear Mr. Phillips:

The Nuclear Regulatory Commission (NRC) conducted an announced inspection during the week of July 11, 2016, at the Westinghouse Columbia Fuel Fabrication Facility in Hopkins, SC. The purpose of the inspection was to perform Temporary Instruction (TI) 2600/16, Inspection of Activities Associated with NRC Generic Letter 2015-01, Treatment of Natural Phenomena Hazards in Fuel Cycle Facilities. The enclosed report presents the results of the inspection. At the conclusion of this inspection, the results were discussed with you and members of your staff at an exit meeting on July 14, 2016.

During the inspection, NRC staff examined activities conducted under your license as they related to public health and safety, and to confirm compliance with the Commission's rules and regulations, and with the conditions of your license. Areas examined during the inspection are identified in the enclosed report. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel.

The inspection allowed the staff to independently verify compliance with regulatory requirements and applicable license conditions regarding the treatment of natural phenomena hazards (NPH) as described in your Integrated Safety Analysis (ISA). No findings of 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 call me at (404) 997-4703.

Sincerely,

/RA/

Omar Lopez-Santiago, Chief
Safety Branch
Division of Fuel Facility Inspection

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

Enclosure:
NRC Inspection Report 70-1151/2016-006
w/Supplemental Information

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Sincerely,

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U. S. NUCLEAR REGULATORY COMMISSION
REGION II

Docket No.:	70-1151
License No.:	SNM-1107
Report No.:	70-1151/2016-006
Licensee:	Westinghouse Electric Company
Facility:	Columbia Fuel Fabrication Facility
Location:	Hopkins, SC 29061
Dates:	July 11 through July 14, 2016
Inspectors:	B. Adkins, Senior Fuel Facility Inspector (Sections A.3, A.5, A.6, and B.1) T. Vukovinsky, Senior Fuel Facility Inspector (Section A.1) J. Munson, Fuel Facility Inspector (Sections A.4 and B.2) D. Anderson, Fuel Facility Inspector (Sections A.2, A.3, A.5, and A.6) J. Marcano, Structural Engineer (Sections A.1 and A.4)
Approved by:	O. López-Santiago, Chief Safety Branch Division of Fuel Facility Inspection

Enclosure

EXECUTIVE SUMMARY

Westinghouse Electric Company
Columbia Fuel Fabrication Facility
NRC Inspection Report 70-1151/2016-006
July 11 through July 14, 2016

The inspection implemented Temporary Instruction (TI) 2600/16, Inspection of Activities Associated with Nuclear Regulatory Commission (NRC) Generic Letter 2015-01, Treatment of Natural Phenomena Hazards in Fuel Cycle Facilities. The purpose of the inspection was to independently verify that licensees are in compliance with regulatory requirements and applicable license conditions regarding the treatment of natural phenomena hazards (NPH) events as described in the Integrated Safety Analysis (ISA). The inspection was conducted by NRC regional inspectors and headquarters (HQ) technical staff during normal shifts in areas of permanent plant modifications, chemical safety, nuclear criticality safety, fire protection, and emergency preparedness. 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. No findings of significance were identified.

Assessment of the Potential Accident Sequences, Consequences, and Prevention and/or Mitigation Strategies as a Result of Impacts to Facility Structures and Internal Components from NPH

The licensee's ISA adequately considered credible:

- NPH events with the potential for a release of uranium hexafluoride (UF_6) to the worker and/or public (Paragraph A.1);
- Seismic-induced fire/explosion resulting in a release of UF_6 to the worker and/or public (Paragraph A.2);
- Seismic-induced releases of hazardous chemicals to the worker and/or public (Paragraph A.3);
- NPH events that could result in a potential criticality and high consequence dose to the worker (Paragraph A.4);
- Flooding events (Paragraph A.5); and
- Events including the potential for high winds, tornadoes, or hurricanes. (Paragraph A.6.)

Special Topics

- Closure of Unresolved Item (URI) 2011-07-01, "Review Westinghouse's response to the failure that the risk of an earthquake was limited by applying sufficient engineering controls, administrative controls, or both, to the extent needed to so that, upon implementation of such controls, the event was highly unlikely." (Paragraph B.1)

- Closure of Unresolved Item URI 2011-07-02, “Review Westinghouse’s evaluation regarding whether all nuclear processes under an earthquake were subcritical.” (Paragraph B.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.

The inspection implemented Temporary Instruction (TI) 2600/16, Inspection of Activities Associated with Nuclear Regulatory Commission (NRC) Generic Letter 2015-01, Treatment of Natural Phenomena Hazards in Fuel Cycle Facilities. The purpose of the inspection was to independently verify that licensees are in compliance with regulatory requirements and applicable license conditions regarding the treatment of natural phenomena hazards (NPH) events as described in the Integrated Safety Analysis (ISA). The inspection was conducted by NRC regional inspectors and headquarters (HQ) technical staff during normal shifts in areas of permanent plant modifications, chemical safety, nuclear criticality safety, fire protection, and emergency preparedness. 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. No findings of significance were identified.

A. Assessment of NPH Accident Sequences, Consequences, and Mitigation/Prevention Strategies

1. Seismic-Induced UF_6 Release

a. Inspection Scope and Observations

The ammonium diuranate (ADU) Conversion area includes both steam chest vaporizers and autoclaves. The steam chest vaporizers and autoclaves are used to heat a UF_6 cylinder and convert the UF6 to the gas phase. The licensee determined that a seismic event could damage the vaporizers or attached piping and result in a UF_6 gas release. A leak of UF_6 out of a cylinder could result in UF_6 being released into the atmosphere or UF_6 bay trench. Modifications were made to the steam and UF_6 vapor piston actuated valves and their control solenoids, the emergency stop (E-STOP) pushbuttons, and the relays that trip direct current (DC) power to the valve solenoids. The modifications made included both passive and active engineering controls. Specifically, the inspectors reviewed items relied on for safety (IROFS) ADUVAP-945, -946, -947, -948, -949, and -950 and their corresponding accident sequences.

The inspectors conducted walk downs of the modifications, reviewed installation and procurement records, and post installation testing of the equipment. The UF_6 shutoff valves were installed on the outlet of each vaporizer. These shutoff valves (-10 valves) are designed to automatically fail closed upon loss of plant air and/or loss of power. Additionally, new steam shutoff valves were installed for each vaporizer to also shutoff the steam supply in the event of loss of air and/or power. The new UF_6 shutoff valve and steam supply valves were tied to the Line E-Stop and All Line E-Stop pushbuttons to stop UF_6 flow and remove the heating source to the vaporizers. The UF_6 shutoff valves were located on the side of the vaporizer such that there is no exposed UF_6 piping between the vaporizer and the associated UF_6 valves. The UF_6 shutoff valves also had

a steel enclosure installed around them to shield them from falling debris. New vaporizers lid assemblies were installed to preclude damage to the UF_6 cylinder valve operator and pigtail from falling debris.

Additionally, during some vaporization campaigns, it is necessary to remove a UF_6 cylinder from a steam chest before it is emptied to the point of becoming a heeled cylinder. During the time period that a cylinder is being disconnected, the cylinder valve could be impacted by falling debris during a seismic event. Controls credited to prevent this event include ADUVAP-951 and -952. These controls minimize the time that the steam chest lid is open, thus minimizing the exposure to any seismic induced debris. The inspectors reviewed these controls and verified that operators were using these controls as stated in their operating procedures and in the ISA.

The inspectors reviewed the above referenced controls and their associated accident sequences. The inspectors reviewed the configuration change packages, purchase and installation documents, and post installation testing for each of the above controls. Walk downs of the physical changes were conducted and the inspectors interviewed plant operators on the operation of the safety equipment and the use of the E-Stop pushbuttons. The inspectors verified that the All Line E-Stop pushbuttons were labeled in the control room, and that the licensee conducted training for all operators in the form of a Training Bulletin for Seismic Criticality Safety Evaluation (CSE).

The inspectors reviewed the technical documentation for the seismic qualification of equipment in the vaporization area. The internal components that were evaluated in the seismic qualification include the steam and UF_6 vapor piston actuated valves and their control solenoids, the E-STOP pushbuttons, and the relays that trip DC power to the valve solenoids. The valves used for the vaporization are pneumatic operated and will fail safe on a loss of power or air. The procedure for seismic qualification of these components was based on the Institute of Electrical and Electronics Engineers (IEEE)-344 (2004), IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations. The components were qualified based on seismic experience (Chapter 10 of IEE-344). The inspectors walked down a sample of the components that were seismically qualified to verify that the analysis adequately characterized the as-built conditions at the site. The inspectors also verified that sample components were adequately attached to the structure, when necessary, and that no signs of degradation existed that would hinder their performance under seismic loads.

While performing walk-downs of the internal components that were evaluated in the seismic qualification the inspectors noted that some of the relays were moved from the vaporization area due to a new project to relocate all safety components. The relays were moved to cabinets that were also analyzed in the seismic qualification or to sheet metal enclosures bolted to structural post which were connected to the floor and meet the inclusion criteria in the seismic qualification. The licensee demonstrated that with these controls in place, the performance requirements of 10 CFR 70.61 for high consequences events were satisfied.

b. Conclusion

No violations of NRC requirements were identified.

2. Seismic-Induced Fire/Explosion

a. Inspection Scope and Observations

The licensee evaluated the consequences from seismically induced fires and explosions and concluded that any potential failures of process equipment containing flammable gases or liquids such as hydrogen, natural gas, and hot oil were bounded by existing accident sequences analyzed in the ISA. The inspectors reviewed existing ISA accident sequences to determine if the sequences remained valid during a credible NPH event.

The inspectors reviewed in association with the Hot Oil Room, the accident sequences and associated IROFS ADUFIRE-901, ADUFIRE-902, which are administrative controls related to the fire protection program, and ADUHOS-907, which refers to the structural integrity of hot oil system components. The inspectors conducted walk downs of the Hot Oil Room and inspected hot oil safety shutoff valves between hot oil room and ADU dryers, which fail closed upon loss of power and require manual reset. The inspectors reviewed the Fire Barrier and Map line Rotation for the Hot Oil Room and Incinerator Room. The inspectors discussed fire mitigating practices with fire brigade personnel and the emergency director. The inspectors also reviewed the annual preventive maintenance procedure and completed work orders for the hot oil systems emergency shut down and hot oil isolation valves.

The inspectors performed walk-downs of the hot oil room. The seismic analysis of the facility does not specifically evaluate the performance of the hot oil room, however the walls are credited as fire walls with a 2 hour rating. The contractor who performed the seismic analysis of the facility provided a qualitative analysis to support the conclusion that the walls will not fail due to the configuration of the room. The walls are composed of concrete masonry unit (CMU) walls, with a roof attached to the top and thus providing an anchoring point for the CMU walls. Given that the room acts like a box with a lid the contractor qualitatively concluded the hot oil room will survive the evaluation basis earthquake.

The inspectors also conducted walk downs to verify the installation of manual isolation valves in the hydrogen and natural gas supply piping. The inspectors conducted interviews with operators regarding the hydrogen supply tank high level alarms and associated limits. The inspectors noted that operators were able to physically identify the location of the shut off valves in the case of an event.

The inspectors observed quarterly fire brigade training. This quarter one of the focus areas was the Site Emergency Procedure Sketch (SEPS)-009-14, Manual Valves to Isolate Seismic Induced Chemical Hazards, Revision 1. During this training the fire brigade toured the facility and physically identified each valve in the procedure and its purpose.

b. Conclusion

No violations of NRC requirements were identified.

3. Seismic-Induced Chemical Release (non-UF_6)

a. Inspection Scope and Observations

The inspectors evaluated credible NPH accident sequences involving the release of NRC-regulated bulk chemicals to determine if the sequences were properly indexed in accordance with the licensee's approved ISA methodology. The accident sequences of concern were determined to be a seismic event followed by structural failure of process equipment/tanks and a subsequent release of (1) dilute ammonia from the Q-tanks, (2) perchloroethylene from the solvent extraction system, and/or (3) hydrogen fluoride (HF) from the HF tank. These sequences had the potential to result in either high or intermediate consequences to the worker depending upon the chemical of concern; however, there were no sequences that resulted in either high or intermediate consequences to the public. The inspectors reviewed the basis for the initiating event frequency (IEF) to verify it was consistent with the evaluation basis earthquake (2% exceedance in 50 years) as described in the ISA. The inspectors noted that the IEF was conservatively reduced from -4 to -3 since equipment/piping that were determined to fail during the evaluation basis earthquake could also fail during a lower magnitude earthquake. The inspectors reviewed the licensee's chemical consequence analysis to determine if the modeling assumptions were conservative and the results were consistent with the information submitted in the ISA Summary.

The inspectors reviewed the IROFS selected for the seismic-induced chemical spill sequences which included PLANT-SEP-901 and 902. These controls include training and execution of the Site Emergency Plan to mitigate exposure to facility workers in the event of a seismic-induced chemical spill. Based on the NRC's review of the licensee's generic letter (GL) submittal, the NRC concluded that the licensee could not credit PLANT-SEP-902, training on the Site Emergency Plan, because it was considered to be a management measure for IROFS PLANT-SEP-901, execution of the Site Emergency Plan. This issue was documented in the staff's evaluation of the GL dated July 7, 2016. In a letter dated July 6, 2016, Westinghouse agreed to submit an updated ISA Summary by January 31, 2017, which will replace PLANT-SEP-902 with a new IROFS PLANT-SEP-903, See and Flee. At the time of the inspection, the licensee had not yet implemented PLANT-SEP-903; therefore, implementation of this IROFS will be verified during a future permanent plant modification inspection in calendar year 2017 following submittal of the revised ISA Summary in January 2017.

With respect to the implementation of PLANT-SEP-902, the inspectors conducted interviews with the emergency director, incident commanders, and emergency response personnel to assess their ability to invoke the Site Emergency Plan including a site evacuation following an NPH event. The inspector reviewed the corresponding emergency response procedure to determine if adequate procedural guidance was in-place to execute a site evacuation. Specifically SEP-005, Evacuation, Accountability and General Response, Rev. 6. In addition, the inspectors reviewed annual refresher training for the Site Emergency Plan and observed training of the fire brigade per SEPS-009-14, Manual Valves to Isolate Seismic Induced Chemical Hazards, Rev. 1 to ensure cognizant personnel were able to mitigate a chemical release resulting from a NPH event.

The inspectors also verified the completion of HAZCOM training for employees and inspected the designated HAZMAT vehicle. In addition inspectors confirmed that all active Hazmat team members were up to date with required training. The inspectors toured the on-site medical clinic and interviewed the attending nurse regarding protocol to handle HF exposures to ensure the on-site medical clinic was prepared to handle HF exposures.

The inspectors also reviewed controls credited as defense-in-depth in the licensee's ISA with respect to a seismic-induced chemical release. The inspectors conducted walk downs to verify the licensee's ability to isolate chemical supply sources (e.g., manual valves or excess flow valves) including argon, nitric acid, aqueous ammonia, uranyl nitrate (UN), and HF following a seismic event. The inspectors reviewed mechanical integrity (MI) reports including ultrasonic thickness measurements for the HF and aqueous ammonia storage tanks. The inspectors conducted interviews and reviewed procedures to confirm that perchloroethylene is a batch operation. The inspectors conducted walk downs in the solvent extraction area to confirm the presence of flange guards to control/limit leakage in the event of a pipe leak. The inspectors observed the presence of a berm around the Q-tanks and conducted operator interviews to verify that only one bank of Q-tanks is in-service at any one time. The inspectors reviewed electrical schematics to determine if the building ventilation shuts down on loss of offsite power and will not restart on backup power. The inspectors reviewed design drawings and performed walk downs to determine if the tanks were constructed of corrosion resistant materials such as polyethylene and stainless steel. The inspectors reviewed operating procedures and drawings, and conducted a walk down of the UN tanks to confirm the presence of a tank outlet isolation valve, computer assist interlock on tank high level, instrumentation to limit uranium concentration, and that the dike around the UN tank is constructed of a concrete pad to limit corrosion.

b. Conclusion

No violations of NRC requirements were identified.

4. Seismic Induced Criticality

a. Inspection Scope and Observations

The inspectors evaluated the adequacy of the licensee's nuclear criticality safety (NCS) program and analyses to assure the safety of fissile material operations and compliance with respect to NPH events. The inspectors reviewed select NCS documents (listed in Section 4.0 of the Attachment), including the newly developed NCS evaluation concerning NPH events (CSE-99-M). The inspectors verified the technical basis for NCS limits and assumptions, evaluated potential NPH-related criticality accident sequences, and verified that the licensee performed evaluations to assure sub-criticality of processes under all normal and credible abnormal conditions.

The inspectors reviewed NCS evaluations and analyses to determine whether the licensee evaluated normal and credible abnormal conditions for NCS, reviewed the associated criticality accident sequences, reviewed the purpose and technical basis for any controls implemented to prevent these criticality accident sequences, verified that controls identified to prevent these criticality accident sequences would be effective and

independent, verified that these controls were installed and/or implemented as intended, and evaluated whether the likelihood of these accident sequences was limited to regulatory limits.

The inspectors performed walk downs of the assembly wash pit, UF_6 area, bulk UN storage area, and general conversion areas. The inspectors interviewed Operations' staff and NCS engineers before and during walk downs. The inspectors visually verified that controls identified in the applicable NCS evaluations were installed and/or implemented as designed. The inspectors verified that certain management measures designed to maintain IROFS were being performed within their assigned frequency and in accordance with procedures. Specifically, the inspectors observed Operations' staff perform a surveillance to verify conversion area floor flatness.

The inspectors noted that for several accident sequences the licensee relied on the flatness of the floor to disperse any material that may be spilled from the process equipment following a seismic event. As such, the floor flatness is credited as an IROFS in certain areas of the facility, including the conversion area. The inspectors observed that the surveillance is mostly focused on identifying any holes or pits in the floor, but does not place emphasis on the wall-to-wall lateral floor flatness. The inspectors determined that, based on the large surface area of the conversion area floor and the associated predetermined safe slab height documented in the applicable NCSE, that a visual inspection would not be effective in identifying a slight slope in the floor capable of exceeding a safe slab height if large volumes of uranium-bearing solution were to be spilled such as in an NPH event. Based on this observation, the inspectors determined that this issue was a minor violation of 10 CFR 70.62(d) which states, in part, [e]ach applicant or licensee shall establish management measures to ensure compliance with the performance requirements of § 70.61…[t]he management measures shall ensure that engineered and administrative controls and control systems that are identified as [IROFS] pursuant to § 70.61(e) of this subpart are designed, implemented, and maintained, as necessary, to ensure they are available and reliable to perform their function when needed…." Specifically, the licensee failed to establish adequate management measures to ensure wall-to-wall lateral floor flatness of the conversion area would remain available and reliable during an NPH event. This violation was determined to be minor because it did not exceed any general or area specific screening criteria in MC 0616 Appendix B. This failure to comply with 10 CFR 70.62(d) constitutes a minor violation that is not subject to enforcement action in accordance with Section 2.3.1 of the NRC Enforcement Policy. This condition was entered into their corrective action program as CAPAL 100397271, Review of Chemical Area Spill during an Earthquake.

The inspectors reviewed a modification (PSEDoc-0001705) that the licensee completed in the wash pit area to provide an enclosure (fuel bundle enclosure) around the bottom of the fuel assembly to prevent it from sliding off the inspection stand during an earthquake, potentially violating NCS spacing requirements. The inspectors noted that the wash pit was not analyzed in the seismic analysis of the facility due to the deteriorated and corroded condition of the tanks, supports, and concrete pit and thus had a lack of defendable material properties to use in a seismic evaluation. The inspectors noted that visual inspections completed by Westinghouse Electric Corporation (WEC) personnel of the wash pit area in 2013 identified the deterioration of the structural elements supporting the inspection stands and wash tanks. The documentation of inspection surveillances indicated that the stainless steel tanks are

supported by carbon steel I beams that show signs of moderate to heavy surface corrosion. The 2013 inspection also indicated that the legs supporting the inspection stands did not appear to be secured or anchored to the floor of the pit.

The inspectors interviewed WEC personnel in charge of the design of the wash pit. WEC personnel clarified that the structural support system for the two tanks for final inspection of the assemblies are connected to each other by structural angles. WEC personnel pointed out that the top grating on the wash pit serves as a limiting factor for horizontal movement of the assemblies in the case of earthquake induced vibration.

The lack of a seismic analysis of the structural elements supporting the inspection stands and the reported potential degradation of the materials in the wash pit raised questions on the reliability of the fuel bundle enclose under seismic loads. The expected safety function of the fuel bundle enclosure is to maintain the fuel assemblies in place and prevent sliding under earthquake vibrations. The inspectors were not able to confirm that the enclosure will perform its intended safety function because (1) it is attached to a structural support systems that is not seismically qualified and (2) the structural support system shows signs of degradation. As such, the inspectors determined that the engineered spacing controls could not be assured to remain available and reliable during an NPH event.

Based on the observation noted above, the inspectors identified a second example of a minor violation of 10 CFR 70.62(d), which states, in part, [e]ach applicant or licensee shall establish management measures to ensure compliance with the performance requirements of 10 CFR 70.61…[t]he management measures shall ensure that engineered and administrative controls and control systems that are identified as [IROFS] pursuant to § 70.61(e) of this subpart are designed, implemented, and maintained, as necessary, to ensure they are available and reliable to perform their function when needed….” Specifically, the licensee failed to establish adequate management measures to ensure that engineered spacing controls in the wash pit would remain available and reliable during an NPH event. This violation was determined to be minor because the amount of time when this condition exists (only disconnected from seismically qualified crane 20 min per shift for 2 shifts per day) does not appreciably impact the overall risk of the accident sequence and did not exceed any general or area specific screening criteria in MC 0616 Appendix B. This failure to comply with 10 CFR 70.62(d) constitutes a minor violation that is not subject to enforcement action in accordance with Section 2.3.1 of the NRC Enforcement Policy. This condition was entered into their corrective action program as CAPAL 100397272, Review of Final Assembly Wash Pit during an Earthquake.

The inspectors also performed walk downs of the wash pit area to verify other conditions that may lead to accident sequences in the wash pit area. The inspectors walked-down the structural support system for the trolley that moves the assemblies into the wash pit. The inspectors verified that structure was adequately supported and connected to the structure. In addition the inspectors looked at the wash pit cleaning process, it was noted that the assemblies once they are removed from the trolley they are attached to an arm mechanism that hold the fuel bundles at the top. The mechanisms connect to the top of the assembly using a pin connection. The mechanism has a horizontal arm that is connected to a vertical post welded to the floor. This mechanism provides a layer of protection to support the assemblies and maintain spacing in the case of seismic induced failure of the legs.

The inspectors verified that the licensee evaluated the ability of the criticality accident alarm system (CAAS) to remain operational following a seismic event.

The inspectors reviewed the Emergency Plan to ensure that mitigative actions with regard to an inadvertent criticality due to flooding and other natural phenomena were evaluated.

b. Conclusion

No violations of significance were identified. One minor violation of 10 CFR 70.62(d) with two examples was identified.

5. Flooding

a. Inspection Scope and Observations

The ISA Summary states that the facility is situated above the estimated 100 year and 500 year flood elevations. The licensee's analysis concluded that a large flood could impact the low-lying, undeveloped areas of the site, but concluded that is highly unlikely that a large flood would result in uranium releases or a nuclear criticality accident. Should a large rainfall event occur, sufficient time would be available to take appropriate preventive and emergency management measures, including evacuating employees and shutting down manufacturing operations.

The inspectors reviewed Site Emergency Procedure (SEP)-014, Response to Extreme Environmental Conditions, Rev. 3; SEP-005, Evacuation, Accountability, and General Response, Rev. 6; and the suite of area checklists related to severe weather preparation to ensure proper evacuation and shutdown of manufacturing operations. Inspectors conducted interviews with the emergency director and incident commanders regarding the aforementioned procedures to assess their ability to take appropriate preventative and emergency management measures.

b. Conclusion

No violations of NRC requirements were identified.

6. High Winds, Tornadoes, and Hurricanes

a. Inspection Scope and Observations

Based on the licensee's ISA Summary, the licensee stated that the main manufacturing building (and its additions) are designed for wind loading of 20 pounds per square foot, equivalent to 90 mph winds. Due to the design of the building, the licensee concluded that it is highly unlikely that high winds would result in failures of the building walls or other structural items, causing a release of uranium. Also, there were no accident scenarios identified resulting from a release of stored hazardous chemical due to high winds that would result in an accident involving licensed material with intermediate or high consequences as defined in 10 CFR 70.61.

With respect to tornadoes, the licensee used NUREG/CR-4461 Rev. 2 to obtain an estimate of the probability that the building is struck by a tornado as 4×10^{-4} per year to

an ISA frequency score of -4 which is considered to be highly unlikely. The licensee performed a qualitative analysis to compare the wind pressures associated with a tornado to the wind pressures used for the design of building structures. An estimate of the capacity of the exterior cladding to withstand impacts from defined tornado missiles was also performed.

Even though accident sequences associated with high winds, tornadoes, or hurricanes were determined to be highly unlikely, the licensee did state in their response to GL 2015-01 that appropriate emergency management measures would be activated by employees either sheltering in place or evacuating. The inspectors reviewed these emergency management measures to verify that procedures were in place to respond to potential high wind events outside of the analyzed event in the ISA.

Specifically, the inspectors reviewed procedure SEP-014, Response to Extreme Environmental Conditions, Rev. 3. This procedure is intended to assist the Emergency Response Organization (ERO) in preparing for and responding to an environmental or weather related threats such as tornados, hurricanes and earthquakes. The inspectors conducted interviews with the emergency director and incident commanders regarding the implementation of this procedure as well as the use of Site Emergency Procedure Form (SEPF)-009-13, Command Check Sheet – Tornado Response, Rev. 5. The inspectors also discussed the availability of fire brigade personnel and firefighting equipment after a tornado or hurricane event. The inspectors also verified the licensee had compensatory measures in case of loss of access to the fire water tanks. The emergency director identified the use of a turbo draft as an alternative water supply device that could allow them to tap into static sources such as lakes, ponds, and streams. The inspectors reviewed the procedure and test results from the most recent test of the turbo draft pump.

b. Conclusion

No violations of NRC requirements were identified.

B. Special Topics

1. Follow-up on Previously Identified Issues

a. (Closed) Unresolved Item (URI) 2011-07-01, Failure to ensure that the risk of an earthquake was limited by applying sufficient engineered controls, administrative controls, or both, to the extent needed so that, upon implementation of such controls, the event was highly unlikely

Following the earthquake at the Fukushima Dai-ichi nuclear power station in March 2011, the NRC conducted TI 2600/015, Evaluation of Licensee Strategies for the Prevention and/or Mitigation of Emergencies at Fuel Facilities, in December 2011 to confirm compliance with applicable regulatory requirements and license conditions; and to evaluate licensee's readiness to address NPH events and other licensing bases events related to NPH. The NRC was unable to verify that Westinghouse was in compliance with their licensing basis and regulatory requirements with respect to NPH. Specifically, the inspectors could not confirm that all credible external events (accident sequences) involving process deviations or other events internal to the facility (e.g., consequential explosions, spills, and fires resulting from NPH event) were properly considered in the ISA. The inspectors opened Unresolved Item (URI) 2011-07-01,

"Failure to ensure that the risk of an earthquake was limited by applying sufficient engineered controls, administrative controls, or both, to the extent needed so that, upon implementation of such controls, the event was highly unlikely," to track this potential noncompliance.

Following the completion of TI 2600/015, the NRC concluded that this was a generic issue and subsequently issued NRC Generic Letter (GL) 2015-01, "Treatment of Natural Phenomena Hazards in Fuel Cycle Facilities," in June 2015. The GL requested licensees to provide additional information to support a determination with regard to proper evaluation of NPH impacts at fuel cycle facilities. Westinghouse submitted a response to the GL in June 2016 and the response was accepted by the NRC in July 2016.

The NRC reviewed this open URI to verify that the licensee had complied with regulatory requirements and applicable license conditions regarding the treatment of NPH events in the ISA. The results of the inspection are documented in Section A of this inspection report. Based on the inspections performed, the NRC has concluded that Westinghouse is in compliance with regards to the regulatory requirements specified in 10 CFR Part 70.61, Subpart H, with respect to the assessment of NPH hazards in the ISA. This URI is considered closed.

b. (Closed) URI 2011-07-02, Review Westinghouse's evaluation regarding whether all nuclear processes under an earthquake were subcritical

During a post-Fukushima-Dai-ichi NPH inspection in December 2011, the inspectors opened URI 2011-07-02 to document that Westinghouse had an incomplete evaluation regarding whether all nuclear processes under an earthquake were subcritical. The NRC reviewed this open URI to determine if the ISA adequately addresses the potential for nuclear criticality following a seismic event.

The inspectors evaluated the adequacy of the licensee's NCS program and analyses to assure the safety of fissile material operations and compliance with respect to natural phenomena events. The inspectors verified the technical basis for NCS limits and assumptions, evaluated potential NPH-related criticality accident sequences, and verified that the licensee performed evaluations to assure sub-criticality of processes under all normal and credible abnormal conditions. The inspectors reviewed NCS evaluations and analyses to determine whether the licensee evaluated normal and credible abnormal conditions for NCS, reviewed the associated criticality accident sequences, reviewed the purpose and technical basis for any controls implemented to prevent these criticality accident sequences, verified that controls identified to prevent these criticality accident sequences would be effective and independent, verified that these controls were installed and/or implemented as intended, and evaluated whether the likelihood of these accident sequences met regulatory limits.

Based on the inspections performed, the inspectors determined that Westinghouse adequately evaluated that all nuclear processes under an earthquake were subcritical. The NRC identified one minor violation with two examples for failure to meet 10 CFR 70.62(d). Specifically, the licensee failed to establish adequate management measures to ensure the availability and reliability of the IROFS designed to control floor flatness and engineered NCS spacing in the assembly wash pit. This violation with two examples

was determined to be of minor significance and is discussed in detail in Section A.4.a of this report. No other violations of significance were identified. This URI is considered closed.

C. Exit Meeting

The inspection scope and results were summarized on July 14, 2016, to Bruce Phillips and staff. The inspectors received no dissenting comments from the licensee. Proprietary and security-related information were discussed but not included in the report.

SUPPLEMENTAL INFORMATION

1. KEY POINTS OF CONTACT

Name	Title
G. Byrd	Licensing Engineer
S. Carver	Emergency Preparedness Manager
T. Graves	Conversion Engineer
J. Howell	Environmental, Health and Safety (EH&S) Manager
C. Kneece	Industrial Health & Safety Manager
N. Parr	Licensing Manager
B. Phillips	Interim Vice President, Columbia Fuel Operations
D. Wilkerson	Team Manager, Conversion

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

2. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Closed

70-1151/2011-07-01	URI	Failure to ensure that the risk of an earthquake was limited by applying sufficient engineered controls, administrative controls, or both, to the extent needed so that, upon implementation of such controls, the event was highly unlikely
70-1151/2011-07-02	URI	Review Westinghouse's evaluation regarding whether all nuclear processes under an earthquake were subcritical

3. INSPECTION PROCEDURE USED

TI 2600/16, Inspection of Activities Associated with NRC Generic Letter 2015-01
IP 88015, Nuclear Criticality Safety
IP 88020, Operational Safety
IP 88050, Emergency Preparedness
IP 88055, Fire Protection
IP 88070, Permanent Plant Modifications

4. DOCUMENTS REVIEWED

Records:
CCF 13630, "Seismic Restraining Device Wash Pit Inspection Stands," Nov 2013
OM81088 - Hot Oil Isolation Valves – Annual OM
PM 73061, "SI-Safety, Inspection Stand Seismic Restraint Inspection 3 Year PM"
PM 81109 – Function Test – All Stop
PM81016 - SI – Safety – Hot Oil Systems Emergency Shut-down – Annual PM
WO 673554
WO 705647

WO 635032
WO 693494
WO 656899
WO 716732

Change Control Forms (CCF):
13475
13630
Procedures:
COP-810099, UF6 Vaporizor, Revision (Rev. 25
COP-814532, General Safety Requirements – Conversion, Rev. 24
MOP-730503, Fuel Assembly Vacuuming, Rev. 38
SEPF-009-01, Command Checksheet – Uranyl Nitrate (UNH) Solution Release Westinghouse Nuclear Fuel Columbia, SC, Rev. 1
SEPF-009-13 Tornado Response, Rev. 5
SEPS-009-14 Manual Valves to Isolate Seismic Induced Chemical Hazards, Rev. 1

Condition Reports Review:

CAPAL 100360284

Condition Reports Written as a Result of this Inspection:

CAPAL 100397271, Review of Chemical Area Spill during an Earthquake, dated July 11, 2016
CAPAL 100397272, Review of Final Assembly Wash Pit during an Earthquake, dated July 11, 1016
CAPAL 100397295, Seismic Induced Fire for Hot Oil System, dated July 11, 2016

Other Documents:
ABCO MTR Package
CF-83-056, Uranyl Nitrate Daily Operation Sample Log Sheet, Rev. 18
CN-CRI-06-35, Rev 5, April 2013
CN-CRI-07-2, Rev 4, April 2013
CN-CRI-07-2, Rev 2, Sept 2008
CN-SB-10-07, Rev 0, Sept 2010
CSE-99-M, Rev 0, Dec 2013, “CSE for the Columbia Fuel Fabrication Facility Design Basis Seismic Event”
CSE-17-B, Rev 4, April 2013, “CSE for Final Assembly Wash Pit”
Drawing 335F01Pl01
Drawing 335F11EL01
Drawing 335F05EL01
Drawing 335A01LS01
Drawing 622F01CC01, Uranyl Nitrate/Storage System UN Concrete Assessment & Details, Rev. 2
Drawing 622F01P101, Outdoor Uranyl Nitrate Storage Tanks, Rev. 4
Drawing 622F01EQ01, Uranyl Nitrate/Storage System 7500 gal Storage Tank (T-1040), Rev. 15
Drawing 448F07EQ03, Wash Pit No. 1 Inspection Stands Seismic Restraining Device, Rev. 1
No. 448F07AR01 Rev 2 “Cleaning Pit Trap Door Arrangement”

FCSS-018 Seismic Design Specifications, Rev 0
NSA-TR-COL-13-53, Seismic Evaluation of Equipment and Tanks at the Columbia Fuel Fabrication Facility (CFFF), Rev. 0.
NSA-TR-COL-13-59, UF6 -10 Valve Guard and Steam Chest Lid Evaluation, Rev. 0
NSA-TR-COL-13-60, Seismic Qualification of Components Required for Isolation of UF_6 Vapor from Evaporators at the CFFF, Rev. 0
PSEDoc-0001544, Internal Inspection of the FA Washpit #1, Rev. 0, dated October 7, 2013
PSEDoc-000175, Inspection stands in final assembly wash pit had restraining devices added per CCF 13630, Rev. 0
SYF-219-6, Inspection of a weld that was made to repair a crack in the wash tank shell, dated April 6, 2010
RA-108-04, General-Entire Chemical Area
RAF-314-1, Rev 13, Nov 2013
Roberts Company Document Package - Vaporizer Lids
Sketch 836038-1, Chemical Operating Procedure Sketch URRS Area, Rev. 96
SYF-219-6, Visual Inspection of the Wash Tanks and the piping on the lower end of the tanks to determine the overall external condition of the system, dated April 30, 2010
Training Bulletin for Conversions, dated July 13, 2016
4500615760 Lids PO CN1 The Roberts Co., dated October 1, 2013

<u>NRC/Westinghouse Generic Letter Communications</u>:

NRC Generic Letter 2015-01, Treatment of Natural Phenomena Hazards in Fuel Cycle Facilities, dated June 22, 2015, ADAMS ML14328A029
LTR-RAC-15-43, Subject: Westinghouse Response to NRC Generic Letter 2015-01 Treatment of Natural Phenomena Hazards in Fuel Cycle Facilities (Docket 70-1151), dated August 26, 2015, ADAMS ML15238B643
NRC Request for Supplemental Information, 02/22/16, ADAMS ML16005A112
LTR-RAC-16-22, Subject: Westinghouse Response to NRC Request for Additional Information (Cost Accounting Code Number L33337), dated June 21, 2016, ADAMS ML16173A375
Staff Evaluation of Westinghouse Columbia Fuel Fabrication Facility Response to Generic Letter 2015-01, “Treatment of Natural Phenomena Hazards in Fuel Cycle Facilities (Cost Accounting Code Number: L33337), dated July 7, 2016, ADAMS ML16182A314 & ML16180A423
LTR-RAC-16-39, Subject: Westinghouse Natural Phenomena Hazard (NPH) Generic Letter 2015-01 Follow-up, dated July 6, 2016