



Westinghouse Electric Company LLC  
Columbia Fuel Site  
5801 Bluff Road  
Hopkins, South Carolina 29061-9121  
USA

Director, Office of Nuclear Material Safety and  
Safeguards  
U. S. Nuclear Regulatory Commission  
Document Control Desk  
11555 Rockville Pike  
Rockville, Maryland 20852-2738

Direct tel: 803-647-1957

e-mail: [donnelpb@westinghouse.com](mailto:donnelpb@westinghouse.com)

Your ref:

Our ref: LTR-RAC-22-19

March 15, 2022

SUBJECT: Response to NRC Request for Additional Information associated with the SNM-1107 License  
Renewal Environmental Impact Statement  
(License No. SNM-1107, Docket No. 70-115, EPID L-2017-RNW-0016)

REFERENCE: 1) LTR-RAC-21-57, "Westinghouse Revised SNM-1107 License Renewal Application,"  
(September 2021) (ML21263A217)  
2) NRC Letter to Westinghouse, "Request for Additional Information – Renewal of Special  
Nuclear Materials License SNM-1107" (February 2022) (ML22033A070)

Westinghouse Electric Company LLC ("Westinghouse"), the applicant for license renewal for the Columbia  
Fuel Fabrication Facility ("CFFF"), in Reference (1), reviewed the Request for Additional Information  
(RAI) provided in Reference (2). Westinghouse is pleased to provide responses to RAIs 4 through 9 for  
your review. The remainder will be provided at a later date.

Please contact me at 803-647-1957 should you have questions or need any additional information.

A handwritten signature in cursive script that reads "Patrick Donnelly".

Patrick Donnelly  
Regulatory Affairs Manager  
Westinghouse Columbia Fuel Fabrication Facility  
Docket 70-1151 License SNM-1107

Enclosure 1: Westinghouse Response to NRC Request for Additional Information (12 pages)

cc:

Mr. Thomas Vukovinsky

Ms. Jennifer Tobin

Enclosure 1

Westinghouse Response to NRC Request for Additional Information

**RAI-4 Sampling program**

**In the Environmental Report submitted as part of the LRA, the WEC states that “in-process sampling” was “conducted during the flood period” (in relation to the 2015 historic flooding event). Describe the in-process sampling that is conducted after such flooding events, and discuss whether any changes have been made to considering (i) the data and information gathered through the implementation of the Consent Agreement with the State and (ii) the information provided in response to RAI-3 above.**

Westinghouse Response:

CFFF follows its procedure associated with the site’s National Pollutant Discharge Elimination System (NPDES) permit for filling, sampling and discharging water from lagoons in the event of intense local rain that can cause flooding. This procedure includes lagoon level monitoring with action levels requiring notification of plant personnel and additional wastewater sampling.

Procedure RA-433, “Environmental Remediation” would be followed if an unplanned release were to occur. This procedure details the risk-based decision-making process, using EPA and NRC decommissioning screening levels, to assure a predictable response, to prevent migration of licensed material and/or contamination off-site and to minimize the impacts to decommissioning. This procedure contains requirements for reportability evaluation, documentation, initial response and event-based sampling that may be needed, characterization of the residual impact, implementation of remedial actions, risk and dose assessment as needed, and updates to the CSM and decommissioning records.

Additionally, in 2019, CFFF implemented new programmatic controls that would be followed to inform sampling activities. Procedure RA-434, “Environmental Data Management,” would be followed to assess and detect potential trends within the environmental monitoring program. This procedure outlines actions the site will take based on sample results for various environmental media and includes established action levels well below regulatory limits. Actions taken may include increased sampling frequency, new sampling locations near and around the abnormal result, new sampling locations downstream/downwind to evaluate the extent of the condition, review of manufacturing operations for potential causes and review of the new data within the Conceptual Site Model (CSM), procedure RA-435.

Data and information collected through the February 2019 Consent Agreement with SCDHEC, the information provided in response to RAI-3 and data collected through the routine environmental monitoring program have not resulted in the need to change the environmental monitoring program as defined in Chapter 10 of the current License Renewal Application (LRA).

**RAI-5 Changes to the environmental sampling and monitoring program**

- A. Explain the process and criteria Westinghouse uses to evaluate and implement changes to the environmental monitoring and sampling program to ensure its effectiveness does not decrease.**

Westinghouse Response:

Changes to the environmental monitoring and sampling program would be evaluated based on data collected and analyzed through its routine “Environmental Data Management” procedure, the Conceptual Site Model and data collected from the “Environmental Remediation” procedure. These procedures have been utilized to evaluate the data collected during the remedial investigation activities under the Consent Agreement with SCDHEC and have not resulted in subsequent changes to the environmental monitoring program as defined in Chapter 10 of the current LRA.

Specifically, changes are evaluated on a case-by-case basis and the results of the evaluation are recorded in a letter to file that includes the data and technical justification for the change. The record is stored in the site’s electronic document control repository as described in section 3.9 of the LRA, and the NRC is provided any changes to the license application within 6 months of the change per section 12.1.1 of the LRA. As described in section 10.1.4(b) of the license application, the NRC has the opportunity to inspect the evaluation to determine its adequacy.

- B. Describe and explain how the management measures program is applied to the site’s environmental sampling and monitoring program.**

Westinghouse Response:

As defined in 10 CFR 70.4:

- Management measures mean the functions performed by the licensee, generally on a continuing basis, that are applied to items relied on for safety (IROFS), to ensure the items are available and reliable to perform their functions when needed.
- IROFS mean structures, systems, equipment, components, and activities of personnel that are relied on to prevent potential accidents at a facility that could exceed the performance requirements in § 70.61 or to mitigate their potential consequences.

The environmental sampling and monitoring program is not an IROFS. Nevertheless, the management measures described in Chapter 3.0 of the LRA are conservatively applied site-wide to assure compliance with applicable regulations, including 10 CFR Parts 20 and 70.

For example, the environmental sampling and monitoring program is implemented through written, approved and controlled plant procedures by trained and qualified personnel as described in Section 3.4. Data collection and analysis methods are also implemented through plant procedures, including action levels requiring investigation at low levels to prevent exceedances of regulatory limits. Incident investigations and the site’s Corrective Action Program as described in Sections 3.7 and 3.8 are used to address program deficiencies, abnormal conditions, trends, etc. As described in Section 3.1 – 3.3, configuration management, maintenance and quality assurance requirements apply to assure the availability and reliability of sampling and monitoring equipment and instrumentation. Personnel are

trained in Human Performance principles as described in Section 3.5. Audits of the environmental protection program, including implementation of the sampling and monitoring program, are performed at least every 3 years. Records of the activities described above are maintained in accordance with the records management requirements in Section 3.9.

**C. Explain the sufficiency of the current level of onsite and offsite sampling (e.g., sampling frequency, locations, and size) for fish considering the comments on the draft environmental impact statement from U.S. Department of Interior and South Carolina Department of Natural Resources.**

Westinghouse Response:

Pursuant to NRC Regulations (10 CFR 70.59) effluents released from plant operations are monitored to determine the quantities of radionuclides discharged into the environment. The cumulative radioactivity released is summarized both semi-annually, and annually, and input into models developed by the NRC and EPA to estimate the potential dose to the public. The CFFF discharges treated wastewater through an underground line to Congaree River.

The assessment of public dose due to liquid and gaseous effluents evaluates the potential exposure to a hypothetical member of the public from CFFF emissions via multiple pathways including direct inhalation, potable water, shoreline deposition, and aquatic foods (in this case fish). The assessment uses the actual measured concentration of liquid effluents released to the Congaree River to conservatively calculate potential exposure from fish consumption. This evaluation is performed in accordance with NRC prescribed methods and guidance (Reg Guide 1.109) and the results for all aquatic pathways (inclusive of fish consumption) are a fraction of the regulatory limit of 25 mrem whole body annual dose. The results of the last semi-annual effluent monitoring report (ADAMS Accession No. ML22059B021) are provided below as an example:

**Table 1.** 2021 Annual Dose to the Public from Liquid and Gaseous Effluents

	<b>Whole Body Dose (mrem)</b>	<b>Organ Dose - Bone (mrem)</b>	<b>Organ Dose - Lung (mrem)</b>
<b>Gaseous Effluents</b>			
Direct inhalation*	0.24	7.17E-03	1.89
<b>Liquid Effluents</b>			
Potable Water	7.33E-05	1.07E-03	-
Aquatic Food (Fish)	4.37E-06	6.18E-05	-
Shoreline Deposition	2.92E-09	-	-
<i>Total (mrem)</i>	<i>0.24</i>	<i>8.30E-03</i>	<i>1.89</i>

\* Assumes 80 % residence time

In addition to liquid effluent measurements and the resulting calculations, as part of the existing environmental surveillance program a fish sample is taken from the Congaree River annually and analyzed for uranium and gross beta (an indicator of Tc-99). While a single sample does not provide the ability to perform statistical analysis, Westinghouse does not believe statistical analysis for this type of

surveillance program is necessary given the level of control and monitoring prior to discharge. Fish sample results are merely used to confirm the results of the assessment of public dose discussed above.

The environmental surveillance program also includes surface water monitoring, which is performed at a greater frequency at six on-site locations in upstream waterways to identify any impacts to surface water prior to reaching a fish population where bioaccumulation could occur. These upstream waterways generally are not conducive to significant populations of harvestable fish and include locations such as Upper Sunset Lake and Mill Creek.

Measurements of liquid effluents performed prior to planned discharges will identify process upsets which can be corrected prior to introduction into the environment where fish could be impacted. Any discharge to Sunset Lake and/or Mill Creek would be reported as an abnormal release and additional sampling would be performed to assess the impact.

Additionally, SCDHEC performed a fish tissue study in May 2020 and concluded there were no impacts from Westinghouse operations regarding water quality or public health protection as described in Technical Report No. 007-2020. Specifically, SCDHEC noted the following:

- Based on the whole fish dataset as an environmental monitoring sentinel, neither uranium nor fluoride was indicated to be contaminants of concern for ambient water quality.
- Based on the filet dataset as a public health monitoring sentinel, neither uranium nor fluoride was indicated to be contaminants of concern for human consumption of bluegill sunfish.

The complete report is publicly available on SCDHEC's website: ([https://scdhec.gov/sites/default/files/media/document/Westinghouse\\_FishTissueStudy.pdf](https://scdhec.gov/sites/default/files/media/document/Westinghouse_FishTissueStudy.pdf)). Since that study, there have been no spills or unusual releases from the CFFF facility that would impact the fish population prompting an increase in fish sampling.

**RAI-6 Conceptual Site Model**

- A. Explain how the current CSM and environmental data management process are sufficient to be used as a decision-making tool and to inform the CFFF's sampling and monitoring program.**

Westinghouse Response:

Procedure RA-434, "Environmental Data Management," provides the decision making process used to assess and detect potential trends within the environmental monitoring program; outlines actions that the site will take based on sample results for various environmental media; defines how environmental data is managed and controlled at the site, including receipt of field data, laboratory analytical results, and outputs of the site's CSM; and defines a standard method for documenting and recording the results of the data evaluation. If defined investigation levels are exceeded, actions that may be taken include increased sampling frequency, additional sampling near and around the abnormal environmental result, additional sampling downstream/downwind of the abnormal result, causal analysis, and review of the new data within the CSM.

As described by the United States Environmental Protection Agency (EPA), a CSM uses site-specific data to illustrate the big picture by graphically depicting the sources, exposure pathways, and receptors (EPA, 2008). The CSM is dynamic and can be used in the characterization (investigation), remedy, and closure phases to illustrate site conditions, data gaps, and treatment strategies. CSMs are particularly useful in explaining site conditions to audiences of all knowledge ranges. The CSM can be developed in any illustration platform; however, 3D CSMs using geographic information systems (GIS) or similar software can be strategically helpful in organizing and managing spatial data quickly and allow for faster updates to the CSM over time. A 3D, GIS-driven CSM allows for data to be displayed to scale in appropriate relationships to each other. Also, during the characterization phase, data gaps are more readily visible in a scaled 3D CSM because viewers can examine the site at different angles and evaluate whether additional investigation may be warranted.

The CFFF CSM is within the characterization phase, where new data continues to be added in order to support remedy decision making (EPA, 2016). Historical assessments, such as the Preliminary Baseline Risk Assessment (February 2014) and Preliminary Human Health Risk Assessment (March 2019), will be evaluated for relevance and supporting information. Upon completion of the characterization phase, CFFF will enter a remedy phase that will incorporate recommendations from the final Human Health and Ecological Risk Assessment into design for the final remedy, and into the CSM. After a remedial design is implemented, data will continue to be incorporated into the CSM as part of the closure phase, as needed.

Other complimentary decision-making tools such as plume analytics and fate and transport modeling may also be used in conjunction with the CSM, as outlined in the site's Environmental Data Management procedure, RA-434.

- B. Describe Westinghouse's training and qualifications in support of the CSM's function and environmental data management process.**

Westinghouse Response:

The environmental data management process and CSM procedures are controlled by the Regulatory Component of the site. Training and qualification requirements of Regulatory Component managers and engineers are described in Section 2.1.1.4(d) and 3.4.2.2 of the LRA and implemented through site procedures. Management control procedures are described in Section 3.4.1 of the LRA. Due to the specific skill and technical knowledge needed for execution of the CSM and the data management processes, CFFF uses an approved contractor under Regulatory Component supervision.



**RAI-7 Inadvertent releases, spills, and leaks of radioactive materials****A. Describe WEC's plans to minimize contamination, including the subsurface, and reduce exposures as part of the radiation protection program established under 10 CFR Part 20.**

Westinghouse Response:

To minimize radioactive contamination at the CFFF, processes and equipment are designed, operated and maintained using defense-in-depth principles to minimize leaks and spills and control the spread of contamination. Containment systems are also used as a secondary defense. Design specifications are established in accordance with industry codes and standards. An example of the defense in depth design philosophy is provided in Section 1.1.2.1(f) of the LRA. Similarly, CFFF maintenance program requirements are described in Section 3.2 of the LRA. Examples of maintenance practices used to minimize inadvertent releases include the integrity inspections of equipment, piping and containment systems and predictive/preventative maintenance procedures for pumps and other equipment. Additionally, CFFF follows As Low As Reasonably Achievable (ALARA) principles in the design, operation, and maintenance of the facility, with goals that drive continuous improvement. Areas of the facility designated as a contamination control area require entry training, protective clothing, and exit monitoring to protect personnel and minimize the spread of contamination. Additionally, routine surveys of contamination control areas, entry/exit points, and radiologically clean areas are performed to ensure contamination is confined to the designated contamination control area and levels are maintained ALARA. Any area with contamination levels above action levels are decontaminated within prescribed time limits as described in Chapter 5 of the LRA.

The CFFF environmental monitoring and surveillance program enables early detection of issues as described in CFFF procedure RA-434 "Environmental Data Management." The site also maintains a CSM as described in CFFF procedure RA-435 "Conceptual Site Model Development." The CSM is a useful tool that aids in the understanding of the site and assessing the environmental monitoring program. If a release were to occur, CFFF follows its procedure RA-433 "Environmental Remediation" to prevent migration of licensed material and/or contamination off-site and to minimize the impacts to decommissioning. Decommissioning plans are updated every 3 years, in accordance with NRC regulations, as described in Chapter 11 of the LRA.

Lastly, inadvertent releases of radioactive materials are reported to the onsite Incident Commander (IC) who determines if the event requires emergency response as described in Chapter 9 of the LRA.

**B. Describe WEC's plan to minimize waste in accordance with 10 CFR 20.1406, "Minimization of contamination."**

Westinghouse Response:

Plant processes, equipment and operations are reviewed by radiation safety and environmental protection engineers to assure that ALARA considerations, including waste minimization, are incorporated into facility changes. Materials and equipment are not taken into a contamination control area unless essential. When equipment reaches its end-of-life, decontamination practices are used to clean equipment for unrestricted release, if practical. Compaction, incineration, and solvent extraction are also implemented to reduce waste volume and to recover/recycle uranium from waste materials generated at the CFFF. Where

applicable, hazardous chemicals are replaced with non-hazardous materials to minimize mixed waste generation.

**C. Explain whether and how impacts to surface water and groundwater from inadvertent releases was considered in the site emergency plan.**

Westinghouse Response:

CFFF procedures require reporting of inadvertent releases to the IC who assesses the situation. The IC will determine if emergency response is required and initiates emergency response when needed. Also, depending on the event, the Emergency Operations Center (EOC) may be activated. Major releases would be evaluated by appropriate EH&S and Licensing personnel to determine if the release requires reporting to regulatory agencies. An example of a major release would be a Reportable Quantity (RQ) of a hazardous substance (e.g., per 40 CFR Part 302 or 40 CFR Part 68).

The Site Emergency Plan and implementing procedures are designed to prevent and/or mitigate potential impacts to surface water and groundwater from inadvertent release. These include emergency equipment and supplies; trained hazardous materials responders; closing or covering stormwater drains; control of 5 stormwater management sluice valves to contain releases as close as possible to the source; spill kits strategically placed around the facility; IC checklists describing the proper response to inadvertent releases, etc.

If a release may have entered into the stormwater system where it could travel to surface water, CFFF emergency response personnel contact EH&S Environmental personnel and other subject matter experts for guidance on actions that need to be taken, such as checking pH and/or analyzing samples from storm drains, ditches, surface water bodies, groundwater and other environmental media.

Following termination of the emergency event, procedure RA-433 "Environmental Remediation", RA-434 "Environmental Data Management" and RA-435 "Conceptual Site Model Development will be followed.

**D. Explain whether and how inadvertent releases, leaks, and spills over the last 10 years have been considered under "Risk Zone 2 (Meets performance criteria but unacceptable risk for long-term operation)" as described in Table 4.1, "Risk Analysis Table," (page 46) of the LRA.**

Westinghouse Response:

As described in NRC memo, "Regulatory Authority Over Chemical Hazards at Fuel Cycle Facilities," (ADAMS Accession No. ML030700317), NRC regulation for chemical safety, as provided in 10 CFR 70.62(c), focuses on the following items: (1) radiological hazards related to the processing of licensed material; (2) chemical hazards of licensed material and hazardous chemicals produced from licensed material; and (3) facility hazards that could affect the safety of licensed materials and thus present an increased radiological risk as they pertain to the performance requirements of 10 CFR 70.61. There have been no inadvertent releases involving or containing SNM at CFFF over the timeframe specified that when mitigated using existing IROFS exceeded high or intermediate consequences as defined by LRA Table 4.2 and 10 CFR 70.61. Prior inadvertent releases, leaks, and spills were low severity events in context of the performance requirements specified 10 CFR 70.61 and LRA Table 4.1 Note 3.

Chemicals not containing SNM are covered by other programs (e.g., 40 CFR Part 68 EPA Risk Management Program). All hazardous chemicals are controlled to prevent spills and reduce or eliminate hazards. Safety Significant Controls, which include IROFS, are generated in response to recognized risks as defined through process reviews such as Process Hazard Analysis or Layer of Protection Analysis. In conclusion, LRA Table 4.1 is a forward-looking tool used to categorize risk of plant operations and define when controls are needed to prevent high and intermediate consequences as defined in 10 CFR 70.61 performance requirements. Past releases, leaks and spills are evaluated as described in LRA Chapter 10 and remediated as described in LRA Chapter 11.

**RAI-8 Tc-99 Contamination**

- A. Explain whether and how the results of the Tc-99 investigation were considered in determining whether changes to the radiation safety program are necessary.**

Westinghouse Response:

Commercial Uranium Hexafluoride (UF<sub>6</sub>) feed material is known to contain residual quantities of Tc-99, and the quantities of Tc-99 identified during the Tc-99 investigation were expected. All feed material is sampled for Tc-99 content and feed material that does not meet the ASTM specification for Tc-99 would be sent back to the supplier.

External exposure risks from Tc-99 are low because Tc-99 is a weak beta emitter. The internal exposure risk to an individual is through ingestion of process material. Since it is very unlikely for an individual to ingest a quantity of process material which could incur a measurable internal dose, the internal exposure risk is also considered to be low. With respect to the quantities of Uranium, Tc-99 results in an insignificant portion of the total effective dose equivalent received by a radiation worker. The dosimetry and survey instrumentation used at CFFF is capable of detecting beta radiation so a significant deviation from the expected quantities would be detected. Consequently, the existing radiation safety program is sufficient for identifying excursions of Tc-99 and for the protection of personnel.

- B. Explain whether and how the results of the Tc-99 investigation were considered in determining whether changes to the management measures are necessary.**

Westinghouse Response:

As described in RAI 5 above, management measures apply to IROFS. No changes to management measures were necessary because there are no accident scenarios involving a release or radiation exposure from Tc-99 exceeding the 10 CFR 70.61 performance requirements. The highest concentration of Tc-99 measured in CFFF's process is orders of magnitude less than the quantity which would require an IROFS. However, internal administrative changes were made to provide detection of Tc-99 excursions. Tc-99 analysis (as opposed to gross beta and contingent analyses) has been implemented for all environmental surveillance samples to support the license renewal. Gross beta investigation limits were also added to existing sample locations within the liquid effluent stream to provide an early indicator of deviations in the quantity of Tc-99 present in the process.

**RAI-9 WEC's human performance program**

**Describe the process for evaluating the effectiveness of WEC's human performance program.**

Westinghouse Response:

Evaluation of the Human Performance (HU) program at the CFFF is achieved through a variety of activities. Specifically, self-assessments are performed on aspects of HU as defined in procedure CA-218, "Human Performance and Observation Program." In 2021, CFFF completed a self-assessment on the Prompt HU Process and three other Procedure Use and Adherence (PU&A) workgroup assessments. Aspects of HU are included in the Nuclear Safety Culture Surveys including Questioning Attitude/Stop When Unsure, PU&A, Use of HU tools, Pre-Job Briefs, etc. The CFFF Nuclear Safety Culture Monitoring Panel convenes quarterly to self-assess the traits as described in INPO 12-012, "Traits of a Healthy Nuclear Safety Culture" (ADAMS Accession No. ML13031A707), which includes Human Performance. Site HU events are also tracked as part of the site monthly key performance indicators which will recognize negative HU trends and generate a submittal to the Corrective Action Program.