Enclosure 2

Consolidated June 23, 2016 RAI Responses for General Information and Organization & Administration (RAIs 1-12)

REQUEST FOR ADDITIONAL INFORMATION	REG BASIS	WESTINGHOUSE RESPONSE
RAI 1 Clarify the overview discussion of the CFFF site. Discuss main features of the site, such as buildings, and tanks. To the extent that engineering drawings are incorporated by reference. Section 1.1.2, page 3, gives an overview of the CFFF that uses phrases such as "primarily engaged in" and the "well-known ADU process". A reference is given to the ISA summary for details.	10 CFR 70.22(a)(2)	Section 1.1.2 of the License Application was revised to eliminate the ambiguous phrases. Facilities at the CFFF include the main manufacturing building; the administration building; visitor's center and guard station; the waste treatment building; the advanced liquid waste treatment building; the emergency response building; the respirator building; the paint booth; the sanitary waste lagoon; five process waste lagoons; a tank farm; ammonia recovery stills; the UF_6 cylinder storage pads; staging and storage areas for wastes, equipment, and shipping containers; site utilities; and parking lots. The CFFF manufactures fuel assemblies for commercial nuclear reactors. The manufacturing operations consist of receiving low-enriched (less than or equal to 5.0 wt.% U-235) uranium hexafluoride (UF_6) in cylinders; converting the UF_6 to produce uranium dioxide (UO_2) powder; and processing the UO_2 powder through pellet pressing and sintering, fuel rod loading and sealing, and fuel assembly fabrication. Uranyl nitrate may also be used as a feed material to produce UO_2 powder. These operations are supported by absorber addition, laboratory analysis, scrap recovery, and waste disposal systems. Most of the manufacturing operations are conducted in the main manufacturing building, which can be divided into two areas: the Chemical Area and the Mechanical Area. Uranium operations conducted in the Chemical Area include UF_6 conversion, powder blending, pellet manufacturing, fuel rod loading, and scrap processing. Uranium operations conducted in the Mechanical Area involve encapsulated and sealed material, such as rod certification, storage and final assembly. Manufacturing operations are governed by approved radiation and environmental protection, nuclear criticality safety, industrial safety and health, special nuclear material (SNM)

		safeguards, and product quality assurance controls. The CFFF uses a number of chemicals to support manufacturing operations. Chemicals and gases that are stored in bulk in tanks include: aqueous ammonia, fuel oil, hydrofluoric acid, nitric acid, calcium hydroxide, sodium hydroxide, sodium silicate, hydrogen, nitrogen, and argon. In addition, the CFFF has other activities, such as transport container refurbishment and non-fuel component manufacturing.
RAI 2 Discuss what is meant by "routine over-checks" in Section 1.1.2.1, Item (d). In Section 1.1.2.1, Westinghouse states that, for solid waste disposal, "Administrative controls are in effect to assure that only authorized materials are packaged for disposal. These [controls] include … routine over-checks to verify that the controls are effective."	10 CFR 70.22(a)(8)	No change made to the License Application. Routine over checks are performed in accordance with applicable operating procedures. Examples include: • Operators perform required calibrations of assay systems (ASSAY-103). • Operators perform required calibration checks or standards and replicates checks of assay systems (ASSAY-102) to prevent exceeding mass limits due to improper calibration. • An operator conducts daily functional checks for the wet trash collection scale. Any scale that fails this test shall not be used (WET-106).
RAI 3 Clarify the example for a design philosophy that includes instrumentation and control systems. Discuss the boundary of the Items Relied on for Safety (IROFS). Address the Safety Instrumented System (SIS). Discuss what is meant by "preferably" when referring to the SIS being safety integrity level (SIL) or TUV certified. Section 1.1.2.1(g) states that a design philosophy that includes instrumentation and control systems to monitor and control the behavior of active engineered control IROFS is	10 CFR 70.22(a)(8)	The design philosophy concerning instrumentation and control systems is a combination of industry best practices, practices and definitions from standards such as ANSI/ISA-S84.00.01(2004), Parts 1-3 (IEC 61511), and CFFF generated guidelines. The design for an active engineered IROFS is a Safety Instrumented System (SIS). This includes a set of sensors, logic solvers, actuators and final control elements designed to carry out one or more Safety Instrumented Functions (SIFs). The Safety Integrity Level (SIL) is an instrumentation design category that is based on the average Probability of Failure on Demand (PFDavg) for a particular SIF. The categories of SIL vary from 1 to 3. The Risk Reduction Factor along with the SIL category number sets the design criteria for the SIF to reduce the process risk to the plant's tolerable risk level.

implemented. This philosophy takes the form of a SIS.		It is preferable to use a SIS that is SIL or TUV certified, as it is based on a formal process of assigning the average Probability of Failure on Demand to reduce the process risk to the plant's tolerable risk level. The boundary for the active-engineered IROFS is noted in the SSC Sketches that identify the key components (input/outputs) or instrumentation for the safety function.
RAI 4 Discuss what is meant by "general operating philosophy". Discuss where the philosophy is documented. Explain the difference between "philosophy" and "procedures". Discuss why the operating philosophy is "general". Section 2.1.1.2, Positions and Activities within Organizational Operating Units, states, "Operations at the CFFF are in accordance with the general operating philosophy...."	10 CFR 70.23(a)(4)	The following changes have made to the License Application: For clarification, the following sentence was removed: "Operations at the CFFF are in accordance with the general operating philosophy and procedures that are employed in all Westinghouse plants and facilities. Basically, this philosophy provides that…" and replaced with: "Responsibility for all phases of operations, including safety, safeguards, and quality, follows the structured lines of organizational authority."
RAI 5 Discuss the work for other Westinghouse operations and customers. In Section 1.1.3, Scope of Licensed Activities, states that, "The CFFF may also perform work for other Westinghouse operations, or outside customers, which is within the authorized capabilities of the facility."	10 CFR 70.22(a)(2)	No change made to the License Application. Examples of activities that CFFF may perform for other Westinghouse operations or customers include: • receipt, handling, and storage of Natural Uranium, Depleted Uranium and Special Nuclear Material as uranium hexafluoride, uranium nitrates, uranium oxides; and/or contained in pellets, fuel rods, fuel assemblies, samples, scrap, and wastes; • Chemical Process Development operations; or • UF_6 cylinder washing and decontamination, hydrostatic testing, and recertification; and, re-work of returned fuel assemblies.
RAI 6 Discuss elements and attributes of the means by which the Safety Component or Regulatory Component determine that an alternate test,	10 CFR 70.22(a)(8)	The "alternative action" definition in the License Application has been deleted. Changes to the plant are reviewed and approved in accordance with the requirements of Section 3.1, "Configuration Management" and Section 3.4, "Procedures, Training

procedure, or practice is deemed appropriate. Discuss what is meant by the proposed action being compared to this License Application. Section 1.1.6.3 states that alternate "[t]ests, procedures or other practices that may be substituted for prescribed activities deemed appropriate by the Safety and/or Regulatory Component. In such case, a detailed analysis is performed and documented by the cognizant engineer. The analysis includes a comparison of the proposed action with that specified in this License Application; and, a demonstration that action levels and limits are being met, and that health and safety of employees and the public, and quality of the environment is being protected."		and Qualification" in the License Application.
RAI 7 Discuss how an operator can promptly terminate a process when an imminent hazard develops, given that authority to prohibit the situation is through the cognizant first level manager. Section 2.1.1.2 (page 20) states that "members of the Safety and/or Regulatory Component have the responsibility and authority to prohibit, through the cognizant first level manager, any situation that is believed to involve undue imminent hazard. Such	10 CFR 70.22(a)(8)	No change made to the License Application. All employees have the authority to stop work that cannot be performed safely and correctly by using Human Performance tools and calling a Time Out. The activity or process is stopped, placed in a safe condition and then discussed with appropriate personnel, including management. The process is not resumed until any imminent hazard is corrected.

terminated operations remain in a safe shutdown state until the situation is reviewed with cognizant management, and there is a consensus resolution of the situation."		
RAI 8 Regarding Section 1.1.6.22, discuss the following: 8.1 How functions are staffed such that capabilities, responsibilities, and authority are continuously available. 8.2 How individuals are trained and qualified. 8.3 How experience is maintained as employees more to other positions, either within or outside the CFFF. Section 1.1.6.22 defines a "Function", when used in an administrative context, as an individual (or individuals), designated by a Component Manager having the capability, responsibility, and authority to make and implement decisions required to carry out assigned duties, such as environmental protection, radiation safety, nuclear criticality safety, and safeguards.	10 CFR 70.22(a)(6)	Based on revisions to the License Application, the definition of "function" is now Section 1.1.6.19. The definition has been revised to delete "when used in an administrative context." 8.1 The organizational responsibilities and authorities are discussed in Section 2.1.1, "Organizational Responsibilities and Authorities" of the License Application. It is management's responsibility to assure there is adequate staffing and capability within the function to execute the function's responsibilities in a safe and compliant manner. 8.2 The technical qualifications, including training and experience, are described in Section 2.1.1.3, "Position Accountability and Requirements" and Section 3.4, "Procedures, Training and Qualification" of the License Application. 8.3 The change control process described in Section 2.1.1.4, "Management of Organization Changes" of the License Application assures that organizational changes, including changes to personnel performing assignments of regulatory importance, are reviewed for impact on environmental and radiation protection, nuclear criticality safety, occupational safety and health, emergency preparedness, and other regulatory requirements. This process assures that necessary experience requirements are met when changes (such as an employee moving to a different position either within or outside of the CFFF) are made.

RAI 9 Discuss how cognizant staff groups are determined to ensure that all relevant technical disciplines are represented. Section 2.1.1.2 of the license application states that a first level manager cannot make unilateral changes in documents without review and approval by cognizant staff groups.	10 CFR 70.22(a)(8)	The license application was revised as follows: "Written procedures~~, manuals, postings or other documents~~ are prepared, which become the basis for performing specific operations. The first level manager cannot make unilateral changes in ~~such documents~~ these procedures without review and approval by cognizant staff groups." Changes to procedures are reviewed and approved in accordance with the requirements in Section 3.4.1, "Procedures" to assure that relevant technical and safety disciplines review and approve changes.
RAI 10 Section 2.1.1.2 of the license application states that first level managers are responsible for assuring that personnel under their jurisdiction receive adequate training. Discuss what is meant by adequate training. Discuss the scope of such training (e.g., reading procedures, practicing procedures, taking written test, taking practical test).	10 CFR 70.22(a)(8)	No change made to the License Application. Process operators who perform work involving licensed material and/or IROFS are properly trained and qualified to perform these activities in a safe and compliant manner. The training requirements are described in Section 3.4.2, "Training and Qualification" of the License Application.
RAI 11 Section 5.2.57 of the license application discusses the respirator protection policy, stating that the determination of fitness to use respiratory protection is performed by a physician prior to the initial fitting of respirators, and periodically at a frequency determined by a physician. By letter dated July 18, 2014, Westinghouse requested that the determination be done by a nurse practitioner under the supervision of a physician. The NRC staff approved the request... In the context of the renewal application, state whether or not	10 CFR 70.22(a)(8)	Westinghouse CFFF intends to continue using a nurse practitioner under the supervision of a physician to determine fitness to use respiratory protection. The License Application Section 5.2.57 has been revised to match the previously approved verbiage.

Westinghouse intends to continue to use a nurse practitioner as such.		
RAI 12 Explain what is meant by two statements in Section 2.1.1.4. The Section begins by stating, in part, that, "Approved procedures are in place to assure that relevant organizational changes… are reviewed for impact on environmental and radiation protection, nuclear criticality safety, occupational safety and health, emergency preparedness, and other regulatory activities." Item (h) states, "Organizational changes are reviewed prior to implementation, whenever practicable." (Emphasis added.)	10 CFR 70.22(a)(8)	Organizational changes are reviewed by the Regulatory Component through the Organizational Change Control Review process that is implemented through a CFFF procedure. Management is encouraged to provide notice to the Regulatory Component prior to implementation of organization changes to allow for review of potential impact to safety and security prior to implementation. If this is not feasible, then the organizational changes are reviewed after the change has occurred, and actions/training/mentoring is put into place, as determined necessary.

Consolidated June 2016 RAI Responses for ISA (RAIs 13-36)

REQUEST FOR ADDITIONAL INFORMATION	REG BASIS	WESTINGHOUSE RESPONSE
RAI 13 Remove the ambiguity in the definition of "incredible" in Section 1.1.6.23 by clarifying that "many unlikely upsets, including human actions" may not include failures of controls. The definition of incredible in Section 1.1.6.23 gives three criteria, one of which states, "A process deviation that consists of a sequence of many unlikely upsets, including human actions or errors for which there is no reason or motive. (In determining that there is no reason for such actions, a wide range of possible motives, short of intent to cause harm, must be considered. Necessarily, no such sequence of events can ever have actually happened in any fuel cycle facility)." This definition does explicitly state that the unlikely upsets should not include the failure of controls.	10 CFR 70.61(e), 10 CFR 70.65(b)(9)	Based on revisions to the License Application, the definition of "incredible" is now Section 1.1.6.20. The following paragraph was added to the License Application in Section 1.1.6.20: "Incredible scenarios may contain administrative SSCs. The ISA will classify these controls as SSCs unless the controls are also designated as IROFS in credible scenarios." An accidental criticality is not credible without designating the controls as SSCs, thus justifying there is no reason or motive for the errors. This definition was added to the license and approved by the NRC. Reference docket 70-1151 *Safety Evaluation Report: Submittal Dated December 15, 2010, Revision to an Integrated Safety Analysis Definition (TAC NUMBER L33069)*. As stated in the SER, the licensee gave the example of an accident sequence that contained many unlikely upsets. The upsets included multiple pellet trays being stacked and the addition of moderation; the stacking of pellets would be adverse to production and require approximately 10 human errors along with the introduction of moderation before a criticality would be possible. The human errors are an example of the "human actions for which there is no motive," while the addition of moderation is an example of an error. While the licensee believes that such a scenario is incredible without any administrative controls, the licensee places administrative SSCs on these types of scenarios to highlight to the operator the key important steps that need to be followed. In this case, the administrative SSC is to prevent the stacking of pellet trays. The staff also requested clarification with the use of controls on incredible scenarios. The licensee clarified that only administrative SSCs will be placed on administrative scenarios to provide defense-in-depth, as demonstrated with the example above. The SER goes on to state "The methodology presented by the licensee (all three

		bullets in section 1.1.6.23) was found to be consistent with the guidance in Reference 9 (Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility, Rev 1), including the definition of credible based off of identifying which items are not credible." Not only is the methodology consistent, the staff determined that based on the interpretations and examples that the licensee provided, there is reasonable assurance that Westinghouse will implement the methodology in a manner consistent with the expectations of Reference 9. The staff determined that the proposed amendment to SNM-1107 meets the requirements in 10 CFR 70.65. In addition, in Section 6.1.9 of the License Application, a commitment was made to include an effectiveness review of the CSE technical review process in the triennial NCS program audit.
RAI 14 Section 1.1.6.23 states three criteria for determining an event is "not credible", and thus, excluded from the ISA Summary. Discuss applying the criteria such that a determination of "not credible" avoids facility features that could fail to function or be rendered ineffective as the result of changes to the facility. For any feature used to make a determination of "not-credible," discuss performing and documenting an analysis that enumerates and evaluates failure modes whereby the safety function can be defeated, including, but not limited to, wearing, fatigue, degradation, and modifications. The analysis must demonstrate that the facility feature cannot credibly fail or be rendered ineffective as the result of a change. If a feature of the plant is used as a means of determining that an event is	10 CFR 70.4	No change made to the License Application. Based on revisions to the License Application, the definition of "incredible" is now Section 1.1.6.20. The third bullet of Section 1.1.6.20 includes the following statement: "(The validity of the argument must not depend on any feature of the design or materials controlled by the facility's system of Safety Significant Controls (SSC) or management measures)." Design features that could fail to function or be rendered ineffective apply only to the Criticality Safety Discipline and are analyzed in the Criticality Safety Evaluation (CSE) in the subcritical by geometry section. This section analyzes favorable geometry equipment that maintains subcriticality by geometry (i.e., dimensions and interaction). Failure mechanisms that could lead to criticality in situ (corrosion, bulging, etc.) are evaluated and justification is provided for dispensation. With the installed and analyzed configuration, there are no credible failure mechanisms that could alter the geometry of the equipment. These design features are designated as IROFS, and management measures, e.g., configuration management and maintenance, are applied to them.

not credible, then the feature is being relied upon to meet the performance requirements. If the feature is relied upon, then by definition, it is an IROFS according to the definition in 10 CFR 70.4. Features can fail by wearing, fatiguing, and degrading. Furthermore, maintenance and modifications can have unintended consequences. The existence of any such failure pathways would make a seemingly not-credible event credible.		
RAI 15 Discuss the criteria used when an event frequency is close to the bound of a performance requirement. For example, if the calculated event frequency is $9x10^{-4}$/year, according to the note from Table 4.4, the sequence would be given an index of -4 even though the frequency is close to $1x10^{-3}$. In this case, ignoring the mantissa is equivalent to decreasing the sequence frequency by nearly an order of magnitude without a change in the IROFS reliability. Table 4.4 is a Risk Analysis Table, …A note from the table states, "When the overall likelihood is calculated quantitatively in units of "events per year," the exponent of the likelihood value is used. That is, for an event calculated to occur $4x10^{-5}$ / year, the overall likelihood index is -5."	10 CFR 70.65(b)(9), 10 CFR 70.62(c)(v)	The following change has been made to the License Application: In Table 4.1, Note 2 was added as follows: "When the overall likelihood is calculated quantitatively, conservative rounding is applied. For example, a calculated event frequency of $9x10^{-4}$/ year would be given an index of -3." An item was entered into the CFFF Correction Action Program (CAP) to review the existing fault tree calculations to confirm conservatism is correctly applied. A calculation note was performed and concluded that the application of conservative rounding to the final event probabilities of previous calculations resulted in no changes necessary to demonstrate compliance with the performance requirements.
RAI 16 Describe the process for	10 CFR	The ISA Handbook is a controlled document and is maintained current. The Licensing

maintaining the "Baseline Integrated Safety Analysis (ISA) and ISA Summary Handbook" and the qualifications of the Regulatory Component Manager and other ISA team members to perform the ISA and develop and maintain the ISA handbook.	70.62(c)(2), 10 CFR 70.22(a)(6)	Manager is responsible for maintenance of the Handbook. Revisions to the ISA Baseline and Summary are performed in accordance with the Handbook. The qualifications of Regulatory Component Management and ISA team members are provided in Sections 2.1.1.2, 2.1.1.3 and 3.4.2 of the License Application. The ISA team members are described in Section 4.1.1 of the License Application and in the ISA Summary.
RAI 17 Describe the process and criteria used to determine the appropriate hazards analysis method. Provide an example of implementing this process. Section 4.1 states, "What-if/checklist analysis, Failure Modes and Effects Analysis Fault Tree/Event Tree, Loss of Protection Analysis, or other generally recognized process hazards analysis methods may also be used, as applicable."	10 CFR 70.62(c)(1)	No change made to the License Application. Process Hazard Analysis (PHA) is performed in accordance with written procedures. The PHA methodology used at the CFFF is based on the *American Institute of Chemical Engineers, Guidelines for Hazard Evaluation Procedures*, 2nd edition with worked examples and NUREG-1513, *Integrated Safety Analysis Guidance Document*. Section 4.1.1 of the License Application states: "The choice of a particular method or combination of methods will depend on a number of factors including the reason for conducting the analysis, the results needed from the analysis, the information available, the complexity of the process being analyzed, the personnel and experience available to conduct the analysis, and the perceived risk of the process." Guidelines are provided in plant procedures to determine the type of PHA methodology to be used for the conduct of the Process Hazards Analysis. Examples of current guidance: • HAZOP analysis is well suited for chemical and/or mechanical processes with Piping & Instrumentation Diagram (P&ID) drawings. It can also be used as a tool while conducting Design Reviews. • FMEA is well suited for analyzing instrumentation/control systems and/or mechanical equipment systems that have some combination of the following characteristics: – systems that are relatively complex such as systems with multiple sensors and specific sequencing actions; – systems that are dependent upon the communication between a logic solver and an item control computer system; or

		– systems whose components have a high frequency of use and thus a high potential for failure. • What-If/Checklists are well suited for chemical and mechanical processes where accurate P&ID drawings necessary for a HAZOP are not available. They are also used when brain storming is needed to determine all of the hazards, and they can be used as a tool while conducting Design Reviews. • Layers of Protection Analysis (LOPA) methodology is used when potential high risk scenarios need further analysis and/or quantification for non-criticality safety scenarios. • Quantified Fault Trees are used for criticality safety scenarios. • Other approved industry standard PHA methodologies such as event trees, fault trees, etc. are also allowed for use.
RAI 18 Describe the criteria used to determine the details required and the process to provide reasonable assurance that the appropriate summary details are included in the Configuration Change Control Form. Describe the process for documenting and maintaining evaluations for those changes that do not require prior Commission approval. Section 4.1.2.2 states, "Summary details of the change, including required approvals, are documented on a Configuration Change Control Form."	10 CFR 70.62(c)(1), 10 CFR 70.72(f)	No change made to the License Application. A formal configuration management process, governed by written and approved procedures, has been established to ensure that plant design changes do not adversely impact safety or safeguards at the CFFF. This process is used to analyze new structures, systems, and components, or modifications to existing structures, systems, and components. The Engineering Component is responsible for establishing and maintaining this CM program to provide oversight and control of design and safety information and records of modifications that might impact the ability of IROFS to perform their safety function when needed. The Regulatory Component establishes the requirements for nuclear criticality safety, radiation and environmental protection, industrial, fire and chemical safety, emergency planning and other related Licensed programs. When configuration changes are made, the Regulatory Component reviews the change to assure continued compliance with these licensed programs. Prior to implementing a change, the following items are addressed and documented:

		• The technical basis for the change; • Impact of the change on safety and health or control of licensed material; • Modifications to existing drawings, procedures and training; • Authorization requirements for the change; • For temporary changes, the approved duration (e.g., expiration date) of the change; and • The impacts or modifications to the ISA, ISA Summary, or other safety program information, developed in accordance with 10 CFR 70.62. Changes that require NRC prior approval per 10 CFR 70.72(c) are submitted with ISA Summary Revisions, but are not implemented until NRC approval is obtained. An annual update to the ISA Summary is also submitted for implemented changes that do not require pre-approval by the NRC. Changes that do not require NRC approval, but which may affect the ISA, require formal evaluation to determine the effects to ISA documentation. ISA methods are utilized to evaluate the adequacy of existing IROFS and associated management measures, and to designate new or additional IROFS and appropriate management measures as required. Changes are evaluated to ensure they do not remove, without at least an equivalent replacement of safety function, an IROFS listed in the ISA Summary that is necessary for compliance with performance requirements.
RAI 19 Resolve the apparent discrepancy among the items from Section 4.1 ….[and] address Items specifically, and throughout the ISA Summary, in general…. During a review of the ISA submitted in January 2015 and January 2016, the NRC staff identified items.	10 CFR 70.62(c)(1), 10 CFR 70.65(b)	Integrated Safety Analysis (ISA) is performed at the CFFF in accordance with the *Integrated Safety Analysis Handbook.* The following paragraph has been added to Section 4.1 of License Application: "The *Integrated Safety Analysis Handbook* provides details describing the key features and practices for (1) conduct of a baseline ISA of the plant site and structures, (2) baseline system ISAs of plant operations, and (3) preparation of ISA Summaries. It defines team organization and skills, analytical rules and assumptions, techniques, and deliverables required to enable an analysis to be performed. The document embraces all aspects of the CFFF ISA Plan and Schedule submitted to, and approved by, NRC staff in accordance with 10CFR70.62(c)(3)(i). The original Handbook and subsequent revisions are approved by the Regulatory Component Senior Manager."

		Use of the *Handbook* assures the reliability and consistency of the methodologies used in performing ISAs as well as the rigor applied to reviewing changes. The reliability and availability of IROFS established through the ISA process is assured via the application of Management Measures in accordance with Chapter 3.0 of the License Application. Based on discussions with the NRC while onsite at the CFFF, the following clarification of the methodology application to administrative IROFS was provided. In the existing SNM-1107 License Application and the SNM-1107 License Renewal Application, there is a table that qualitatively describes the failure probability and associated index score that may be applied to IROFS (see Table 4.4 in the SNM-1107 License Renewal Application). The performance of IROFS at the CFFF is assessed on an annual basis to validate that assigned index scores are appropriate. If needed, updates to the Integrated Safety Analysis and Summary documents are completed. A CAP was written and completed, which validated the correct application of index scores for administrative IROFS. 19.1 Prob/freq means probability or frequency. In our case it is a frequency value. The ISAs were revised in the January 2017 update to reflect this. 19.5 The safety basis calculation note for CSE-1-K was revised to address this comment. There was no change to the overall likelihood (changed from 1e-2 to 2E-2). Since the process is based on exponents these both are -2. In CSE-7-A, if the failure to operate the system properly was modeled into the fault tree, the initiating event frequency would be reduced below 1, and the corresponding frequency would actually be reduced. The fault trees diagrams serve a dual purpose for CSEs to show compliance with 10CFR70.61 performance requirements and to clearly show double contingency protection. Initiating events are rarely modeled because of this. Based on discussions with the NRC and the CAP generated, the remaining RAI questions 19.2 through 19.4 and 19.6 through 19.9 were resolved.

RAI 20 Describe how the ISA program takes into consideration the potential effects of generic communications such as IN-15-18, "Criticality and Chemical Safety Events Involving Unanalyzed Conditions and Unanticipated Unavailability of IROFS at Fuel Cycle Facilities."	10 CFR 70.62(c)(1)	The following statement has been added to Chapter 4.0, Section 4.1.1 in the License Application: "Operational Experience (OE) from other facilities, generic communications from NRC, and other sources are reviewed for applicability to the ISA, and the ISA may be revised based on insights learned from the OE. OE is entered into the CAP described in Chapter 3.0 of this License Application."
RAI 21 Describe how the ISA program uses 10 CFR Part 20 limits to evaluate radiological consequences. Clarify the definition of the qualifying term "substantially" as described in Table 4.3. In Table 4.3, under the column, "Radiological Consequence," for a consequence score of "4," the licensee states, "Exposure of worker or member of the public substantially in excess of 10 CFR 20 limits."	10 CFR 70.62(c)(1)	The table was revised to eliminate the qualitative explanations which could cause confusion. The revised table (now Table 4.2) has been incorporated into the License Application.
RAI 22 In Table 4.3, under the column, "Chemical Consequence", for a consequence score of "3," the table states, "Chemical accident that could result in exceeding radiological criteria." Clarify the meaning of this statement considering the column is referring to chemical consequences. Describe how the ISA program uses this table and supplemental information to provide reasonable assurance that risk evaluation scores, depending on the chemical consequence, are reasonable and appropriate for a given hazard or	10 CFR 70.62(c)(1)	The License Application has been revised as described in the response to RAI 21.

accident sequence.		
RAI 23 In Table 4.3, under the column, "Criticality Consequence" for a consequence score of "3," the table states, "Loss of double contingency protection." Describe the elements of the ISA program that provide justification to conclude this score should not be "4" or higher, i.e. intermediate or high consequence.	10 CFR 70.62(c)(1)	The License Application has been revised as described in the response to RAI 21.
RAI 24 Describe the elements of the ISA program and the criteria used that justify Footnote 1 in Table 4.3, considering the performance requirements include consequences involving the worker. Footnote 1 states, "Does not include plant conditions that result in an occupational risk, but do not affect the safety of licensed radioactive materials."	10 CFR 70.62(c)(1), 10 CFR 70.61	The License Application has been revised to remove the Footnote.
RAI 25 Describe how maintenance activities are evaluated as part of the ISA process. Clarify what components of the "Maintenance Work Control System," as documented, provides reasonable assurance that, prior to the performance of maintenance activities, the licensee performs an analysis that identifies all relevant IROFS then determines and implements a plan for continued compliance with the performance requirements during maintenance. Identify where, in the CFFF organization, these responsibilities reside.	10 CFR 70.62(c)(1), 10 CFR 62(d)	No change made to the License Application. Maintenance activities are governed by the management measures described in Chapter 3.0 of the License Application. Changes to maintenance activities are reviewed by the Regulatory Component as described in Section 3.4.1 of the License Application to assure the activities safe and compliant. The Regulatory Component interdisciplinary review of maintenance activities includes consideration of any impacted IROFS and/or safety measures as part of the initial assessment and any associated revisions.

Section 3.2 describes the elements of the maintenance program, stating, "IROFS shall not be disconnected or removed from service (while the process continues to operate) during calibration or functional testing, unless authorized in a written procedure specifically approved in advance by EH&S."		
RAI 26 Describe how the ISA program documents accident sequences that are screened out based on the criterion stated in Section 4.1.1.12 and how these evaluations are maintained. Section 4.1.1.12 states, "Accident sequences having unmitigated consequences that will not exceed the performance requirements, once identified as such, are not reported in the ISA Summary."	10 CFR 70.62(c)(1)	No change made to the License Application. The PHA methodology is used to identify ISA accident sequences. Following completion of a PHA, accident sequences are documented in a fault tree or accident flow diagram format. A bounding consequence analysis is then used to screen out accident sequences that do not meet the 10 CFR 70 high or intermediate consequence performance requirements. Only accident sequences that exceed performance requirements are carried forward from the ISA Baseline document into the ISA Summary. The ISA baseline document is updated and revised annually in conjunction with the ISA Summary.
RAI 27 Discuss the human performance program as it applies to the ISA process. Discuss the organization within the CFFF that is responsible for the program. In the context of the ISA and the administration and operation of IROFS, discuss how human performance issues are identified, disseminated, and resolved. The identification and adequate resolution of human performance issues within the team, as well as among the operators who administer and operate IROFS, is	10 CFR 70.62(c)(2)	No change made to the License Application. The CFFF has implemented a Human Performance Program (HuP) based on the Institute of Nuclear Power Operation (INPO) concepts to support safe and reliable nuclear operations. HuP was added as a management measure described in Chapter 3.0 of the License Application because HuP tools are used to recognize error likely situations and to minimize the frequency and severity of events. Employees use HuP tools when performing activities at the CFFF, including the application of the other management measures described in Chapter 3.0. HuP issues are identified, disseminated and resolved, as appropriate, through the CAP.

fundamental to demonstrating compliance with 10 CFR 70.62(c)(2) and 10 CFR 70.22(a)(6).		
RAI 28 Describe the process and any applicable criteria for the retention and disposal of documents related to the ISA process.	10 CFR 70.72(a)	Records are discussed in Section 3.9 of the License Application. Section 3.9 as revised states: "Records associated with ISAs are included in the general category for licenses/permits. Records pertaining to IROFS and associated with Configuration Management document control, Maintenance, and other quality assurance elements are also included in this category and are retained for three years. Records associated with the *IROFS and management measures failures* required by 10CFR70.62(a)(3) and with *abnormal occurrences involving IROFS* are retained for a minimum of 3 years or as otherwise required by federal regulation."
RAI 29 Discuss the criteria or requirements that engineers must meet before performing analyses that determine if changes may affect IROFS. Explain the process engineers follow to become qualified to make configuration control changes as defined in the CFFF configuration management program. Section 3.1 describes the elements and implementation of configuration management at the CFFF. For change control, the licensee states engineers "are not authorized to make configuration control changes until they are appropriately qualified in EH&S [Environmental Health & Safety] requirements."	10 CFR 70.72(a)	No change made to the License Application. Section 3.4 describes the Procedures, Training and Qualification process at CFFF. Training requirements associated with the configuration management program are specified in written procedures. Engineers have to complete an EH&S Qualification Training Program, be qualified for their area of responsibility (including familiarization with the Criticality Safety Evaluations, ISA, IROFS, management measures and other safety requirements), be trained on configuration management procedures, and be mentored for a minimum of three configuration control changes.
RAI 30 Discuss the training Westinghouse personnel at the CFFF receive in ISA methods that provide the qualifications to update and maintain the ISA and ISA Summary.	10 CFR 70.22(a)(6)	No change made to the License Application. ISA activities are performed by qualified Westinghouse personnel. Procedures, training and qualification is performed in accordance with written procedures, as described in Section 3.4 of the License Application.

Training Westinghouse personnel, instead of contractors, provides reasonable assurance that personnel are both knowledgeable of the CFFF and applicable ISA methods.		Regarding ISA methods, training requirements are designated (through the Environment, Health and Safety Integrated Safety Analysis Training Checklist) and require the trainee to become knowledgeable and/or proficient in the following: 10CFR70; existing ISAs; NUREG 1520, "*Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility*"; site procedures. (e.g., *ISA Handbook*; Process Hazard Analysis; Regulatory Policies; Regulatory Significant Calculation Note Generation, Format, and Content Requirements; and Implementation of ISA.).
RAI 31 Describe the elements of the ISA Program providing reasonable assurance of consistency and repeatability when determining the appropriate analysis methods, demonstrating the performance requirements are met, and designating IROFS and management measures.	10 CFR 62(d)	No change made to the License Application. PHAs are performed in accordance with written procedures to ensure consistency and repeatability of application. The PHA methodology used at the CFFF is based on the *American Institute of Chemical Engineers, Guidelines for Hazard Evaluation Procedures*, 2nd edition with worked examples and NUREG-1513, *Integrated Safety Analysis Guidance Document*. Integrated Safety Analysis (ISA) is performed in accordance with the *ISA Handbook.*
RAI 32 Describe the program, system, or process for documenting and maintaining programmatic and individual training records related to the training and qualification of personnel that implement the ISA.	10 CFR 70.22(a)	As stated in Section 3.9 of the revised License Application: "Individual records for training, qualification and requalification are typically maintained and controlled in an electronic training and procedure system. Some training records, such as job specific training and qualification of Regulatory Component personnel, are retained as paper copies and are stored for the qualification period.
RAI 33 Discuss how the potential for red oil reactions was considered in, or excluded from, the ISA. ISA 07 which discusses the solvent extraction system, states that the uranium products from the solvent extraction systems use steam-heated, forced-circulation reboiler type evaporators. If there is organic entrainment or carryover into this system, the system has the constituents	10 CFR 70.62(c)(ii), 10 CFR 70.4	No change made to the License Application. Section 4.1.1 of ISA 7 Summary states the following: The hazards associated with red oil provide an example of one of the events considered, and a red oil explosion was determined to be highly unlikely. The conditions required for generation of red oil are not present in the solvent extraction process. The concentration of free nitric acid is maintained at 15 to 20 percent, and the temperature is maintained at 100 degrees Centigrade. In addition, the system is vented. These conditions are significantly below the concentration and temperature required for a red oil ignition. To form red oil, the TBP organic phase must be in contact with boiling nitric acid at a concentration of greater than 10 molar (> 48

(i.e., organic compounds, nitric acid, and heat) for the red oil reaction.		weight percent), and the temperature must be at or above 130 degrees Centigrade. Therefore, no formal accident sequence was developed.
RAI 34 Clarify whether the subcritical nature of the scenario on page 70 of ISA 01 would be affected if the upstream knock-out pots leak. If so, justify the exclusion of sequences involving leaks in the knock-out pots. Page 70 of ISA 01 includes a new scenario, CSE-1-K Scenario 6, "Failure of the Design of the Vacuum Pump Silencers." The description of the scenario includes the statement, "unless the upstream knock-out pots leak, the bulk of any material collected will not reach the silencer." The description further states that the scenario "is subcritical by geometry."	10 CFR 70.62(c)(1), 10 CFR 70.65(b)(3)	No change made to the License Application. The CSE evaluates whether a scenario/geometry can be defeated. The analysis of this scenario demonstrates that it is subcritical by geometry, eliminating the requirement to perform cut sets or fault trees. See the response to RAI 14 for further explanation of subcritical by geometry. The additional description in the ISA, cited in the RAI, is unnecessary and has been removed.
RAI 35 In the following scenarios, discuss the IROFS that will replace ADUVAP-945, 946, and 950 to demonstrate compliance with 10 CFR 70.61. Page 214 of ISA 03 shows the criticality likelihood for the process stages of ADU conversion. For stage (l), a seismic event (CSE-99-M), the likelihood is 6.0 x10-5. Several cutsets of scenario #5 for CSE-99-M, however, rely on IROFS ADUVAP-945, 946 and 950 which are meant to protect against falling debris from a nearby masonry wall. Scenario # 5,	10 CFR 70.65(b)(4)	No change made to the License Application. As stated in Westinghouse's response to the NPH Generic Letter RAIs, this accident sequence was revised to address the question as well as to eliminate AIR-NOT-LOST. The performance requirements remain satisfied with this revision. This revision was incorporated in the January 2017 ISA annual update.

however, describes an event where the UF6 line ruptures as a result of seismic displacement such that ADUVAP-945, 946, and 950 should no longer be credited. Removal of those IROFS from Scenario 5 increases the likelihood O(1E-3) which is unlikely.		
RAI 36 As indicated, justify and clarify the scenarios on pages 25 through 28 of ISA 11. Pages 25 through 28 of ISA 11 describe a loss of protection analysis whereby a pump explodes as a result of ammonium nitrate detonation. The analysis concludes that no SIF is required because the risk integral of fatalities is approximately 2.0E-5. Furthermore, no IROFS are designated to prevent or mitigate pump explosions. The risk integral was estimated using an occupancy frequency, the frequency of a fatality and assuming that the explosions are random events, as opposed to being caused by particular chemical conditions. And although no IROFS are designated, page 22 of ISA 11 credits three preventative controls, ADUSCRP-401, 402, and 403 which provide high temperature and low/no flow interlocks for two of 15 pumps, pumps P-707A and B, which could experience an ammonium nitrate detonation. ISA 03 indicates that 12 of those 15 pumps, denoted by P-x06 A and B, also have	10 CFR 70.61(e), 10 CFR 70.62(c)(v), 10 CFR 70.62(c)(1), 10 CFR 70.65(b)(4),	No change made to the License Application. A PHA was completed and identified this accident sequence. An accident sequence flow diagram was generated, and a bounding consequence analysis was performed. Based on the consequence analysis, this accident sequence does not meet the 10 CFR 70 performance criteria for a high or intermediate consequence event. Therefore, as described in the response to RAI 26 and in the ISA Handbook, the accident sequence evaluation should be included in the Baseline ISA, but not incorporated into the ISA Summary. The ISA Summary was revised in January 2018 to remove the accident sequences which do not result in a high or intermediate consequence event. Based on this statement, no response is required for RAI questions 36.1 through 36.6. Additionally, the pump in this specific scenario is no longer in service.

tank level and flow interlocks to prevent detonation. However, again, those interlocks are not designated as IROFS. The remaining pump, P-702, does not appear to be addressed in the ISA Summary. 36.1. Justify not designating the preventative controls for P-707 A and B as IROFS, considering they were used to reduce the overall likelihood index (OLI) of the accident sequence. 36.2. Justify not designating the other interlocks for P-x06 A and B as controls, considering they are used to prevent an accident sequence with the potential for high consequences. 36.3. Justify not designating the occupancy of the room as an IROFS, considering it was used to reduce the risk integral within the tolerable risk frequency rate. 36.4. Justify an initiating event estimate on the order of 1 in 1000 years when two pump explosions happened within nine years at this facility, and Information Notice 90-70, "PUMP EXPLOSIONS INVOLVING AMMONIUM NITRATE" describes two events at two different facilities within two years. 36.5. Justify the estimation for the		

initiating event frequency under the supposition that pump explosions are random events, as opposed to analyzing the process mechanisms that could lead to a pump explosion. Clarify how the results of the loss protection analysis demonstrate compliance with 10 CFR 70.61 considering only fatalities were considered in the risk integral. Discuss the apparent exclusion of the possibilities of intermediate or high consequences other than death.		

Consolidated June 2016 RAI Responses for Radiation Safety (RAIs 37-51)

REQUEST FOR ADDITIONAL INFORMATION	REG BASIS	WESTINGHOUSE RESPONSE
RAI 37 Explain the bases for determining when to issue dosimetry for a CFFF employee. Section 5.2.4.2 states that dosimetry is provided to adults likely to receive greater than 0.5 rem in a year. Discuss how Westinghouse makes a determination on those who might receive greater than 0.5 rem per year.	10 CFR 20.1502(a)(1)	No change made to the License Application. A prospective analysis is performed to determine the monitoring requirements for each department. The analysis is based on a review of historical exposure data and any process/facility changes that may increase personnel exposure. The analysis determines individuals required to be monitored for occupational radiation exposure and those to be included in the external and internal exposure monitoring programs. A copy of the report is distributed to all Team Managers and Department Managers who have monitored/trained individuals.
RAI 38 Identify criteria to determine when dosimetry is to be provided to employees or contractors, such as declared pregnant women, minors, or any other administrative limits the CFFF employs. Section 5.2.42 states that dosimetry is provide for adults likely to receive greater than 0.5 rem in a year. Other criteria, if any, are not stated.	10 CFR 20.1502(a)(1)	No change made to the License Application. All minors and declared pregnant women likely to exceed the following limits are monitored for radiation exposure: • 0.100 rem DDE; • 0.100 rem CEDE; • 0.500 rem SDE (skin or extremities); or • 0.150 rem LDE.
RAI 39 Describe how occupational internal and external doses are reported to employees. Section 5.2.52 states that internal and external occupational doses are combined in accordance with criteria in 10CFR20, and in applicable guidance contained in both Regulatory Guide 8.7,	10 CFR 19.13(b)	No change made to the License Application. Occupational radiation exposure is reported to employees via NRC Form 5, which is distributed annually. Personnel may request their current occupational exposure at any time.

"Instructions to Exposure Data", and in Regulatory Guide 8.34, "Monitoring Criteria and methods to Calculate Occupational Radiation Doses."		
RAI 40 State the duration to calibrate radiation protection instrumentation. Section 5.2.59 of the license application states, in part, that radiation protection instruments are calibrated on a routine schedule established by the Radiation Safety Function. The schedule requires calibration … at least semiannually. By letter dated July 8, 2014, Westinghouse requested that calibration be done at least annually. The NRC staff approved the request...	10 CFR 70.22(a)(8)	The License Application Section 5.2.59 has been revised to match the previously approved verbiage.
RAI 41 Discuss how procedures of activities involving licensed material and IROFS are prepared, authorized, and approved for distribution, when multiple disciplines are involved. Section 3.4.1 states that activities involving licensed material and IROFS are conducted in accordance with properly issued and approved procedures.	10 CFR 20.1101(b)	No change made to the License Application. When a modification is designed per the CFFF Configuration Management Program, the "change" is reviewed by the various safety disciplines to assure that 10CFR70.72 requirements are met. When a "change" potentially has an impact on existing IROFS or requires new IROFS, the procedures for those IROFS must be approved and issued prior to implementation and start-up of the "change." The CFFF Configuration Management Program assures that the CFFF maintains control of changes to procedures and requires multi-disciplinary review and approval to ensure procedures continue to meet their specification requirements and comply with all applicable regulations. Procedures are prepared, authorized, and approved in accordance with established guidelines for the Electronic Training and Procedure System (ETAPS), as noted in CFFF procedure CA-002.
RAI 42 Provide the minimum training requirements for the Radiation Safety	10 CFR 70(a)(6)	No change made to the License Application.

Function Manager. Provide the training requirements for Regulatory Function Engineers working in the Radiation Safety Function. Section 2.1.1.3 describes minimum requirements for a Safety or Regulatory Component Manager as well as Regulatory Function Engineers.		Chapter 2.0 of the License Application describes the Management Organization, including specification of structure, responsibilities and authorities. Section 2.1.1.3(d) covers the details specific to Regulatory Component Managers and Engineering Qualifications. Additional information is detailed in Section 3.4.2.2. At the CFFF, there is a training and qualification program for EH&S personnel. Training records are maintained and are available onsite for NRC review and inspection.
RAI 43 Identify refresher training or requalification requirement for engineers, operating technicians, and process operators, above the annual refresher training requirement for radiation workers. Section 3.4.2.2 through Section 3.3.2.4 describe additional training and qualification requirements for engineers, operating technicians, and process operators.	10 CFR 19.12	No change made to the License Application. Refresher training varies between departments and functions. Refresher and requalification training is determined using a systematic approach. Examples are: Periodic refresher training for personnel performing administrative IROFS is performed. This periodic review and refresher training assures the availability and reliability of administrative IROFS and is considered part of the "procedure" management measure described in Section 3.4 of the License Application. Also, any time changes are made to processes/procedures, training is required for those processes/procedures. Periodic requalification for operators performing activities relied on for safety requires that an On the Job Trainer (OJT) determines if a re-qualifying person can continue to successfully and safely perform the process per the procedure(s). In the License Application, the use of Electronic Training Check Lists (ECL) is required for operator training. Where process operation qualification interlocks are in use, an operator cannot perform a task until he/she is current on procedure, training and qualification requirements. Nuclear Safety Qualification Training (NSQT) is an example of this. Procedures, training and qualification requirements assure that activities related to IROFS and management measures are performed properly in accordance with CFFF specifications.

		In addition, if disqualified, a worker must be re-qualified for the procedure/process by training on the processes/procedures again.
RAI 44 Describe survey requirements, procedures or surveys performed, for personnel or areas to detect contamination and any limits associated. Section 5.2.29 describes the CFFF contamination control program. Contamination survey limits and survey frequencies are shown in Table 5.1. Survey limits are provided only for smear (alpha contamination) surveys.	10 CFR 20.1501(a)(2)(iii)	No change made to the License Application. Surveys are conducted throughout the facility as required per the license and flow down procedures specific to the plant operations. Limits and survey frequency vary depending on the potential for contamination. CFFF procedure ROP-05-014 and associated forms (ROF-05-014-xx) describes the survey procedure, limits, and locations.
RAI 45 Discuss how the radiation protection training program is included in triennial assessment of the radiation safety program. Describe how the effectiveness of training and instructors is evaluated. Section 5.2.67 states the entire is assessed on a triennial frequency.	10 CFR 20.2102(a)(2)	No change made to the License Application. A triennial audit of the Radiation Program described in Chapter 5.0 of the License Application includes assessment of training for ALARA principles and requirements as stated in Section 5.2.3, sub-bullet 6. In addition, the CFFF training program is described in Section 3.4 of the License Application and is also assessed in the triennial management measures audit of Chapter 3.0.
RAI 46 Discuss the participation (e.g., as a member, chairperson) of a senior component manager is a member or chairs this in the ALARA Committee. Section 5.2.3 states that the Regulatory Component establishes an ALARA Committee with membership from radiation protection, environmental safety, environmental health and safety, operations managers and other professionals as needed.	10 CFR 20.1101(c)	No change made to the License Application. The Senior Regulatory Component Manager is the chairperson of the ALARA Committee. Committee membership and meeting requirements are established in a CFFF procedure.

RAI 47 Describe the effectiveness of ventilation systems as they relate to public exposure. Section 5.2.3 describes several actions taken by the CFFF to maintain exposure to the public ALARA.	10 CFR 20.1101(d)	No change made to the License Application. Ventilation systems exhausted to the atmosphere are continuously sampled for radioactivity. If action levels are exceeded, actions are taken to mitigate releases to the environment and subsequent dose to the public. There is an administrative limit for dose to the public due to effluents that is reviewed and approved by the ALARA committee annually. For CY2018, the limit is 1 mrem.
RAI 48 Identify the type and sensitivity of dosimeters. Discuss how often the dosimeters are collected and processed. In addition to annual limits specified in Section 5.2.42, discuss administrative control limits which, if exceeded, prompt an investigation into circumstances of the exposure. Section 5.2.43 states that personnel dosimeters are issued to measure external exposure to beta, gamma, and x-rays.	10 CFR 20.1502	Westinghouse uses a Type 16 TLD760 dosimeter badge from Mirion. These badges measure exposure due to β, γ, x, and η. The sensitivity is 10 mrem (γ) and 30 mrem (η). TLDs are processed on a quarterly frequency, except for personnel in final assembly and declared pregnant workers, which are processed monthly. An administrative control limit is set annually by the ALARA committee. For CY2018, the limit is 0.77 rem.
RAI 49 Describe sealed sources used in calibration and fuel facility activities. Describe storage, handling, and control procedures, for the use of such sources. Include inventory and leak check procedures.	10 CFR 70.22(a)(7)	No change made to the License Application. With one exception, sealed sources at the CFFF are licensed by the State of South Carolina as an agreement state (SCRML-094) and are not licensed under our Materials License. Sealed sources are primarily used for radiation protection instrument operability checks and calibrations. Sources are stored in a locked and designated source storage area when not in use. When in use, the user must have continuous control of the source. There are a few sealed sources that are used to monitor the density of fluids in piping and ensure quality control of pellets contained in fuel rods. These types of sources are fixed in place and can only be accessed by a very limited number of trained personnel. Inventory and leak tests of sealed sources (except sealed sources secured in storage) are performed at intervals not to exceed six months. Leak tests for any sealed source are also performed whenever notified that the source seal has deteriorated or been damaged. The procedures for storage, handling, control, inventory and leak check are the same for

		the sources licensed by the state and NRC.
RAI 50 State the commitment of the CFFF to report individual exposures annually.	10 CFR 20.2206(b)	No change made to the License Application. Personnel exposure data is uploaded to the REIRS website annually as required by 10 CFR 20.2206.
RAI 51 Demonstrate that the proposed increase in the concentration of contaminants in calcium fluoride and other mixtures sent off-site are within applicable regulatory limits. Section 12.1.6 of the renewal application requests authorization to release calcium fluoride (containing a minimum of 60-percent solids) …	10 CFR 20.1301(a)(1), 10 CFR 20.2001(a), 10 CFR 20.2002, 10 CFR 51.45	Westinghouse decided to keep Authorization 12.1.6 as currently stated in the approved SNM-1107 License, Amendment 18.

Consolidated June 2016 RAI Responses for Chemical Safety (RAIs 52-58)

REQUEST FOR ADDITIONAL INFORMATION	REG BASIS	WESTINGHOUSE RESPONSE
RAI 52 Discuss the responsibilities of the chemical safety component within NRC's regulatory jurisdiction. Chapter 2, Organization, presents an organization chart (Figure 2.2) that identifies the safety components. Section 2.1.1.3(b) lacks a discussion of responsibilities of the chemical safety component within NRC's regulatory jurisdiction. 52.1. Describe the activities or responsibilities included under the Chemical Safety Component. Discuss compliance with the NRC chemical safety requirements (e.g., chemical safety aspect of the ISA, chemical safety IROFS, procedures, training, audits, as they are related to chemical safety issues that are within NRC's regulatory jurisdiction) under the "Regulatory Component" and the "Safety Component" which are discussed in Section 2.1.1.3 and Figure 2.2. 52.2. Demonstrate that the Chemical Safety Function has sufficient training and practical chemical safety experience.	10 CFR 70.22(a)(6)	No change made to the License Application. Section 2.1.1.3(c) of the License Application further details the responsibilities for the different safety functions of the Regulatory Component, including chemical safety. Chemical Safety responsibilities are part of the Occupational Health and Safety program. To specifically address RAI 52.1, see Section 2.1.1.3(c) for a description of these responsibilities. In reference to RAI 52.2, the training and qualification requirements for the chemical safety function are described in Section 2.1.1.3(d). Additional information is detailed in Section 3.4.2.2. At the CFFF, there is a training and qualification program for EH&S personnel. Training records are maintained and are available onsite for NRC review and inspection.

RAI 53 Describe the elements of training (e.g. appropriate personal protective equipment, lessons learned from conducting ISA) for the safe handling of hazardous chemicals within NRC's jurisdiction. Discuss the process in place to assure that the safety insights obtained from the ISA are incorporated into procedures and training. Discuss the types of personnel (e.g., operators, area supervisors, contractors, management) gaining such insights. Section 7.1.2.4 of the license application states that employees using hazardous chemicals are specifically trained in procedures for safe handling and disposal of them.	10 CFR 70.22(a)(8)	No change made to the License Application. The ISA is continuously evaluated to ensure that Operating Experience and plant changes are accurately reflected. This process is iterative and reflective to assure that these insights are flowed down into plant procedures and training. During site access training, all badged personnel receive hazard communication training discussing regulatory requirements associated with chemical safety, including safety data sheet locations and overview, procedural adherence, hazard identification, and labeling. Following this classroom training, plant personnel receive annual computer based training, including a test on Industrial Safety and Chemical Safety requirements. Personnel are trained to perform work activities in accordance with plant procedures. Training records are maintained and are available for NRC review and inspection. Handling of hazardous chemicals is not allowed if an individual is not current on his/her procedure or training requirements.
RAI 54 Clarify the chemical safety commitments related to compliance with 10 CFR 70 Subpart H described in Chapter 4.0 and Chapter 7.0. Section 7.1 states that all CFFF chemical safety commitments related to compliance with 10 CFR 70 Subpart H requirements are described in Chapter 4.0 of this license application. The purpose and scope of Chapter 7.0 is unclear.	10 CFR 70.62(a)	No change made to the License Application. The purpose of the Chemical Safety Program described in Chapter 7.0 to assure that hazards associated with the risk posed by chemicals used at the CFFF are evaluated, and that appropriate measures are taken to assure operations are performed in a safe manner. In addition, Chemical Safety is an element of the ISA Program described in Chapter 4.0.
RAI 55 Discuss the phases of operation (e.g., start up, shut down, maintenance, non-routine operations) addressed by the ISA. Clarify the phases of operation	10 CFR 70.62(a)	As stated in Section 4.1.2.1(c) of the License Application: "The process description addresses each process that was analyzed as part of the ISA. This description also includes a discussion of the hazards (and interactions of hazards) for each process and the accident sequences that could result from such hazards, and for which the

included in the ISA. Section 7.1 states that Chemical Safety is an element of the ISA program. The ISA is discussed in Chapter 4 of the license application, but the scope of the ISA is unclear as it relates to chemical safety. Section 4.1.1.2 discusses guidance for preparing the process description, but only discusses "normal operations".		unmitigated consequences could exceed the performance requirements of 10CFR70.61." All phases of operation (e.g., start up, shut down, maintenance, and non-routine operations) are included as part of this review. Also see response to RAI 53 for the incorporation of OE into the ISA. To eliminate confusion, Section 4.1.1.2 was removed from the License Application.
RAI 56 Discuss the relevant chemical hazards exposures included in the Chemical Safety Analysis (e.g. inhalation, dermal absorption, ocular contact, ingestion). Describe the method used to identify relevant exposure pathways that could lead to high or intermediate consequences as defined in 70.61.	10 CFR 70.62(a), 10 CFR 70.62(c)	The Chemical Safety and ISA Programs evaluate all exposure pathways to assure worker and public safety. Consequences of unmitigated accident sequences are evaluated, and if the consequence could exceed the 10CFR70.61 performance requirements for a chemical under NRC jurisdiction as defined in Attachment 1, then a likelihood analysis is performed. Attachment 1 on page 35 of this enclosure has replaced Table 4.2 in the License Application. The January 2018 ISA update incorporated these requirements.
RAI 57 Discuss the following: 57.1 Explain the apparent discrepancies between the detailed descriptions (e.g. process safety information) in ISA Summaries describing non-inhalation exposures as consequences of concern and tables lacking the quantitative standard for those consequences. 57.2 List the quantitative standards of chemical safety used to assess the consequences to an individual from acute chemical exposure analyzed in the ISA. Both the ISA Summaries and ISA Handbook identifies inhalation	10 CFR 70.65(b)(7)	Quantitative criteria were added in Attachment 1 on page 35 of this enclosure for chemical exposures to HF. The new table has been incorporated into flow down tables and diagrams in the ISA program and associated implementation. These actions resolve any discrepancies.

standards, such as ERPG-3 and ERPG-2, taken as consequences of concern for high and intermediate consequences. Specific ISA Summary chapters and detailed descriptions of specific accident sequences (e.g., chemical release sequences for ADU vaporization system) identify other consequences of concern		
RAI 58 Provide the basis for excluding that 49 percent HF pipe inside the enclosed area of the HF spiking station. Provide assurance all credible chemical safety related accident sequences in this HF spiking station have been considered. Demonstrate that there are no chemical hazards of licensed material and facility hazards (e.g. releases from HF piping) that could affect the safety of licensed materials (including routine and non-routine operations)…. Section 7.1.3.4 states that the Chemical Safety Analysis is a comprehensive assessment of each component within a defined system. This section also states that the scope and content of a Chemical Safety Analysis are customized to reflect the particular characteristics and needs of the system being analyzed. To gain reasonable assurance that the ISA demonstrates the appropriately identified hazards delineated in 10 CFR 70.62(c)(1)(ii) – (iii), the NRC staff performed vertical slice reviews of the	10 CFR 70.62 (c)(ii) and (c)(iii)	No change made to the License Application. The purpose of the HF spiking station is to mix a small amount of 49% HF with liquid Uranyl Nitrate (UN). The "HF spiked" UN is then used as a feed material to the conversion process for producing uranium dioxide powder. There are two lines supplying material to the HF spiking station mix tanks, T-1280 and T-1281. Of the two supply lines, one is from the UN bulk storage tank which contains SNM. The second supply line is from the HF bulk storage tank which does not contain SMN. A recently completed process hazard analysis (PHA) evaluated the entire HF system. This included the 49% HF in the bulk storage tank and supply line as well as the 4 to 5 wt % HF contained in the mix tanks with the "spiked UN." The 4 to 5 wt% HF portion contains SNM due to the intentional comingling of HF and UN in the spiking station mix tank. Backflow of SNM into the 49% HF supply line and bulk storage tank is analyzed in a Criticality Safety Evaluation (CSE), and was determined to be highly unlikely based on the IROFS that were credited. These IROFS are ADUHFS-121 (2.5 inch diameter passive overflow in top of the spiking station mix tanks) and ADUHFS-903 (vacuum break in the vent line of the spiking station mix tanks). These independent IROFS are included in the existing ISA and prevent backflow of SNM from the spiking station mix tanks into the 49% HF supply line. ADUHFS-903 is currently designated as both a criticality safety and chemical safety IROFS in the ISA. ADUHFS-121 was designated as both a criticality safety and a chemical safety IROFS in the January 2018 ISA update. ADUHFS-

ISA Summary, to provide assurance that the ISA is adequately evaluating chemical hazards within NRC Jurisdiction. On page 117 of ISA 03, Westinghouse states that the supply piping contains 49 weight percent HF solution. On page 126 of ISA 03, Westinghouse states, "A 5 percent (maximum) HF solution co-mingled with SNM is contained in vessels T-1280, T-1281… and the piping and equipment (e.g. pumps) attached to these vessels. The supply piping to T-1280 and T-1281 is excluded since no SNM is contained in this piping."		121 was renamed ADUHFS-907 since it is a multi-discipline SSC. Regarding chemical exposures, the potential impact of the 49% portion of the HF system on the 4 to 5 wt% portion was evaluated in the recently completed HF PHA. The potential to get a higher concentration of HF (i.e., greater than 4 to 5 wt%) into the "spiked UN" was determined to be possible if there was a Programmable Logic Controller (PLC) program error or load cell malfunction. The current ISA determined that spilling more than 1.29 gallons of 5 wt% HF could result in an intermediate consequence event and spilling more than 3.23 gallons of 5 wt% HF could result in a high consequence event. Being sprayed by HF could also result in a high or intermediate consequence dermal or ocular exposure event. The current ISA classifies a dermal or ocular HF exposure as a high or intermediate consequence event based on the percentage of HF (up to 50%), exposure time, and percent of body (or eyes) exposed. IROFS have been established to prevent/mitigate against a HF release incident (all exposure pathways) for the portion of the HF system containing 4 to 5 wt% HF. The recently completed PHA determined that existing IROFS that prevent/mitigate against a 4 to 5 wt% HF release incident will equally prevent / mitigate a higher concentration release incident. The ISA text was revised to reflect this information in the January 2018 ISA update. In addition ADUHFS-502 (Structural integrity of system components (e.g., vessels, attached piping, valves, pumps)) was revised to include the supply piping containing 49% HF.

Attachment 1: See Response to RAI 56

Severity Ranking	Consequence Description		
	Workers	Offsite Public	Environment
High	• Radiological dose greater than or equal to 1 Sv (100 rem) Total Effective Dose Equivalent • 400 mg soluble uranium intake or greater • Chemical exposure greater than or equal to ERPG-3 • Dermal Exposure to an HF solution of less than 50 weight percent HF but greater than 11 weight percent over 10 percent of the worker body surface area (1610 cm2) for more than 30 minutes without medical treatment • A nuclear criticality accident	• Radiological dose greater than or equal to 0.25 Sv (25 rem) Total Effective Dose Equivalent • 30 mg soluble uranium intake or greater • Chemical exposure greater than or equal to ERPG-2	• None
Medium	• Radiological dose greater than or equal to 0.25 Sv (25 rem) but less than or equal to 1 Sv (100 rem) Total Effective Dose Equivalent • 150 mg soluble uranium intake or greater • Chemical exposure greater than or equal to ERPG-2 but less than ERPG-3 • Dermal exposure to an HF solution of 11 weight percent HF or less but greater than or equal to 1 weight percent over 10 percent of the worker body surface area (1610 cm2) for more than 30 minutes without medical treatment • Ocular exposure to HF solution of greater than 1 weight percent for more than 30 minutes without medical treatment	• Radiological dose greater than or equal to 0.05 Sv (5 rem) but less than or equal to 0.25 Sv (25 rem) Total Effective Dose Equivalent • Chemical exposure greater than or equal to ERPG-1 but less than ERPG-2	• A 24-hour averaged Radioactive release outside the restricted area greater than 5,000 times Table 2 Appendix B of 10 CFR Part 20
Low	• Accidents with radiological and/or chemical exposures to workers less than those above	• Accidents with radiological and/or chemical exposures to the public less than those above	• Radioactive releases to the environment producing effects less than those specified above

* SV = Sieverts; ERPG = Emergency Response Planning Guidelines

Consolidated June 2016 RAI Responses for Fire Safety (RAIs 59–62)

REQUEST FOR ADDITIONAL INFORMATION	REG BASIS	WESTINGHOUSE RESPONSE
RAI 59 Discuss and demonstrate that the Fire Safety Function has sufficient training and practical fire safety experience in nuclear facilities. Section 2.1.1.3.e of the license application describes the qualifications of Regulatory Engineering Functions.	10 CFR 70.22(a) (6)	No change made to the License Application. The Fire Safety function falls under the requirements in Sections 2.1.1.3(c) and 2.1.1.3(d) of the License Application. Figure 2.1 of the License Application shows the safety functions that are part of the Regulatory Component. Additional training information is provided in Section 3.4.2.2 of the License Application. At the CFFF, there is a training and qualification program for EH&S personnel. Training records are maintained and are available onsite for NRC review and inspection. The current job description for the "Senior Fire Safety Engineer" details the essential functions/supporting responsibilities of the position such as: Education – (Minimum Required) Bachelor's Degree in any engineering discipline or life or physical sciences, or other EHS related subject matter. (Preferred) - Bachelor's Degree in life or physical sciences, engineering, or other EHS related subject matter. Experience - (Minimum Required) 2-5 years fire safety experience is required. (Preferred) - 5 years is preferred and at least 2 years with nuclear experience. KSA (Knowledge/Skills/Abilities) - (Minimum Required) Demonstrate knowledge in Fire Safety Management Systems, Risk Management processes, Audit/Assessment Processes, Training processes, and Fire prevention. Demonstrate knowledge and have work experience in Fire Safety Suppression and Detection systems. Communication and writing skills are required as well as the ability to influence and effectively partner with others is required. (Preferred) - Minimum requirements plus knowledge in Fire Safety Rated Barriers, Fire Safety Interlocks and Project management skills. Certifications - (Minimum Required) NFPA-CFPS-Certified Fire Protection Specialist. (Preferred) - NFPA-CFPS-Certified Fire Protection Specialist, NFPA-CFPE-Certified Fire Plan Examiner, NFPA-CFI-Certified Fire Inspector I, and OSHA 30 Hour.
RAI 60 Discuss, in detail, training and qualification of the Emergency Response	10 CFR 70.22(a) (6),	No change made to the License Application.

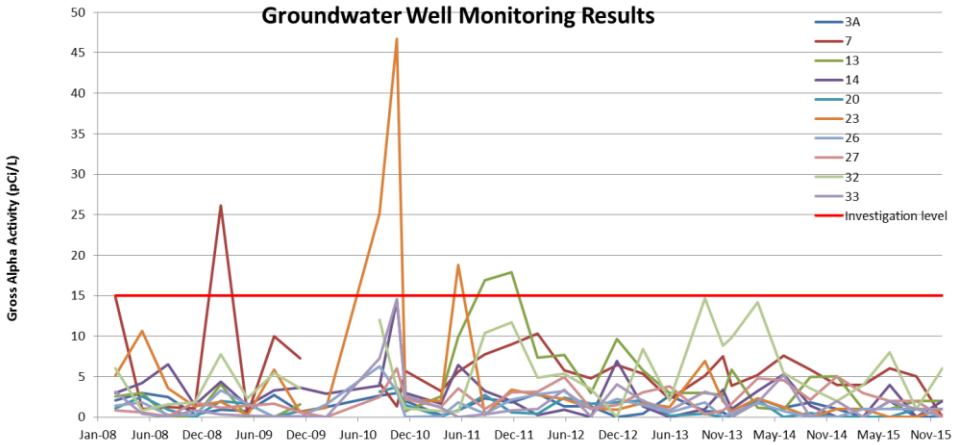
Team, including general operations, risk management policy, education, training, organization, medical/physical requirements, incident command, protective clothing, equipment, apparatus, and any agreements with outside emergency organizations.	10 CFR 70.62(a), 10 CFR 70.61	These details are described in the current revision of the NRC-approved Westinghouse Site Emergency Plan (SEP). The SEP contains Security Related Information, which is withheld from public disclosure under 10CFR2.390.
RAI 61 Discuss, in detail, combustible/flammable liquids and gases, including the design, construction, installation, labeling, testing, operation, and maintenance of tanks, containers, and cabinets; the control of ignition sources in these areas; and the procedures for the dispensing, handling, transfer, and use.	10 CFR 70.22(a)(6), 10 CFR 70.62(a)	No change made to the License Application. Chapter 8.0 of the License Application outlines the structure of the Fire Safety Program. The CFFF maintains a Fire Safety Program for protection of the site. The primary purpose of this Fire Safety Program is to assure that the opportunity for fires in and about the facility is kept As Low As Reasonably Achievable (ALARA). Fire protection is achieved by combinations of fire protection measures and systems. Such measures and systems are designed and maintained in accordance with industry standards and prudent industry practices. The standards and practices most often consulted are those of the National Fire Protection Association (NFPA). Chapter 8.0 goes on to discuss the details of the program. The commitments in this chapter are implemented in lower-tier site procedures to ensure safety and compliance. These flow down procedures describe the specific requirements related to design, construction, installation, labeling, testing, operation, and maintenance of tanks, containers, and cabinets; the control of ignition sources in these areas; and the procedures for the dispensing, handling, transfer, and use.
RAI 62 Discuss, in detail, the determination of areas of "substantial combustible loading," as referenced in Section 8.1.5.1 of the license application. Include training, procedures, and any correlations with the Fire Hazards Analysis.	10 CFR 70.22(a) (6), 10 CFR 70.62(a), 10 CFR 70.61	No change made to the License Application. Areas of substantial combustible loading are identified in the Fire Hazards Analysis (FHA), which is an input to the ISA. The FHA uses a conservative assessment of several items for each of the areas of substantial loading, such as fire hazards, ignition sources, fire loading, design basis fire scenarios, and fire-fighting impact. As documented in the last revision of the FHA, the requirements outlined in 10CFR70.22 and 10CFR70.65 provide the basis for the FHA. It also provides information to assist in assessing compliance with 10CFR70.61, 10CFR70.62, and 10CFR70.64. The risk of fire in the facility in relation to the existing fire protection program is also assessed to ascertain whether the facility meets the objectives of NUREG-1520 and the guidance provided by NFPA 801, "Standard for Fire Protection for Facilities Handling Radioactive Materials."

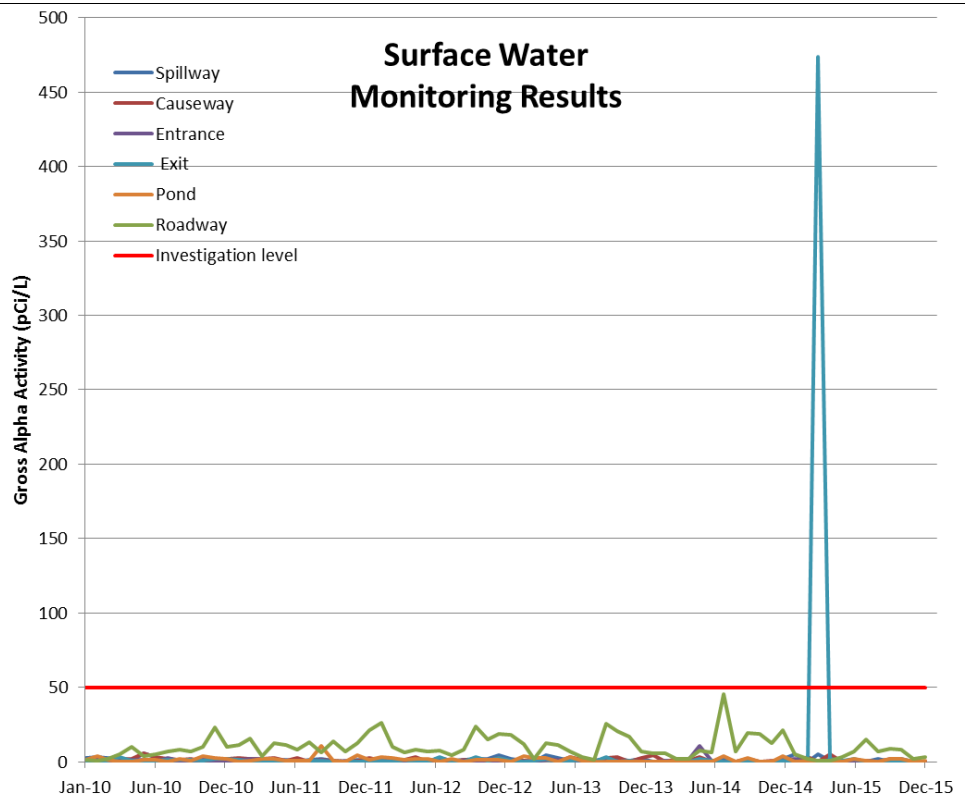
Consolidated June 2016 RAI Responses for Environmental Protection and Environmental Assessment (RAIs 63-77)

REQUEST FOR ADDITIONAL INFORMATION	REG BASIS	WESTINGHOUSE RESPONSE
RAI 63 Describe how air effluents are controlled. Specifically, describe how gaseous effluent controls ensure compliance with the dose constraint in 20.1101(d).	10 CFR 20 Subpart B, D, F, K, L, M; 10 CFR 70.22(a)(7)	No change made to the License Application. HEPA filtration is installed on systems with the potential to release radioactive materials. Each radiological stack is continuously sampled to ensure release concentrations are less than the action level. The ALARA goal and action levels are based on RG 4.16 and the effluent concentrations listed in Appendix B of 10 CFR Part 20.
RAI 64 Discuss how stack sampling is performed, or commit to follow Regulatory Guide 4.16, Monitoring and Reporting Radioactive Materials in Liquid and Gaseous Effluents from Nuclear Fuel Cycle Facilities, Revision 2, December 2010; and Regulatory Guide 4.20, Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other Than Power Reactors, Revision 1, April 2012. American National Standards Institute (ANSI) standard ANSI N42.18-1980, "Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactive Effluents" provides additional guidance for effluent monitoring.	10 CFR 20 Subpart B, D, F, K, L, M; 10 CFR 70.22(a)(7)	No change made to the License Application. Air exhausted from each stack is sampled near the point of release after fans, HEPA filters, and/or scrubber systems. A vacuum source draws effluent air through filter media, which is collected and analyzed on a daily frequency. Each stack is sampled continuously.

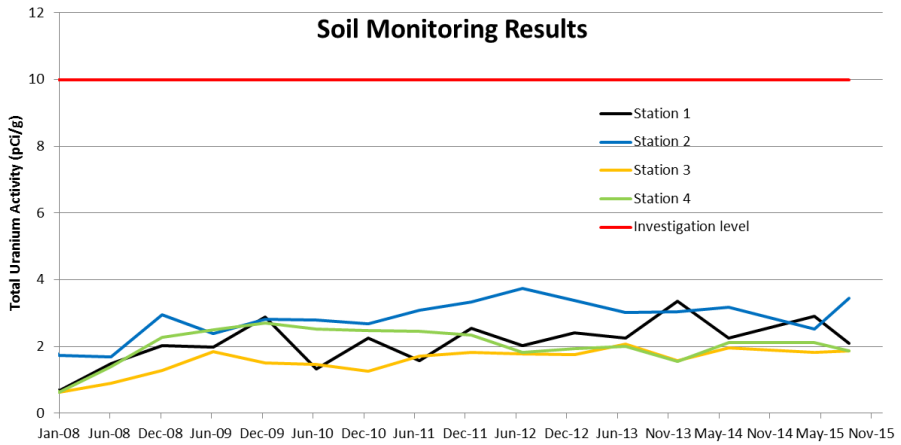
RAI 65 Provide ALARA goals for gaseous and liquid effluents. Guidance for establishing ALARA goals are given in Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities," July 1993.	10 CFR 20.11.0	The current ALARA goals for gaseous and liquid effluents are as follows: • Annual Average Concentration of Radiological Material in Gaseous Effluents = 6.0E-13 µCi/mL; • Annual Average Concentration of Radiological Material in Liquid Effluents = 2.0E-7 µCi/mL; and • Dose To Members Of The Public (Gaseous And Liquid Effluents) = 1 mrem/year.
RAI 66 Describe the program for waste minimization. Guidance for a waste minimization program is given in NRC Information Notice 94-23, "Guidance to Hazardous, Radioactive, and Mixed Waste Generators on the Elements of a Waste Minimization Program," March 25, 1994.	10 CFR 20.1406, 10 CFR 20.1101	The Westinghouse President and CEO issues an EHS and Sustainability policy, which is fully supported throughout all levels of the organization. Waste minimization aspects of this policy include: • Minimizing raw materials and energy usage while reducing waste, preventing pollution, and re-using and recycling materials and resources to the extent that is economically and technically feasible; • Achieving compliance, at a minimum, with all applicable EHS legal requirements, and any other requirements to which the company subscribes; and • Continually improving EHS Management Systems and performance by establishing meaningful Objectives and Targets, and periodically monitoring and evaluating EHS performance as it relates to applicable requirements and established Objectives and Targets. Westinghouse implements this policy through a formal Environmental Management System (EMS). The CFFF waste minimization program is included in the EMS. Every year, an EHS and Sustainability Improvement Plan is issued, describing the improvement plan for that year. Specifically for waste minimization, there is required annual refresher training for employees. Also, procedures, training and postings educate CFFF employees of the importance in keeping unnecessary materials from contaminated areas to reduce radioactive and mixed waste. Recommendations and Suggestions For Improvement are addressed through the CAP.

RAI 67 Correct the coordinates of Pond (Gator) or spring in Section 10.1.4, unless they are duplicates. The coordinates are identical.	10 CFR Part 70.22(e)	The "Gator" Pond is a manmade structure that was created where a natural spring originates. Therefore, the "Gator" Pond and spring are the same. The term “spring” has been removed from Section 10.1.4 of the License Renewal Application.
RAI 68 Describe how leakage from the Ponds would be detected.	10 CFR Part 70.22(a)(7)	Section 10.1.4 of the License Renewal Application lists surface water sampling points for water bodies on the property of the facility such as the “Gator” pond, upper and lower sunset lake, and Mill Creek Swamp. It also includes sampling points for Mill Creek and the Congaree River, which are not on Westinghouse property and are downstream of permitted discharges leaving the property. All sampling locations are monitored for gross alpha and gross beta. The “entrance, exit, roadway, spillway, causeway, and gator pond” are also sampled for ammonia, fluoride, and pH. Monitoring results for all sampling locations are reviewed and any unusual or upward trends are investigated.
RAI 69 Describe laboratory quality control procedures.	10 CFR 70.22(a) (8)	CFFF's Chemical Laboratory, which conducts analysis of some effluent environmental samples, is certified by South Carolina Department of Health and Environmental Control (SCDHEC) under certificate number 40561001. Certification lasts for three years, includes periodic inspections by SCDHEC, and includes independent annual proficiency testing for each parameter listed on the certification.
RAI 70 Identify the locations of river water and sediment samples listed in Figure 10.1.	10 CFR 70.22(a)(7)	Sediment samples are taken annually at or near the point of diffuser discharge into the Congaree River. River water samples are taken at the following locations: • Blossom Street Bridge; • 500 yards above the discharge; • 500 yards below the discharge; and • Mill Creek.
RAI 71 Describe all applicable Federal and State standards for discharges and any permits issued by Federal, State, or local governments, for gaseous and liquid effluents.	10 CFR 70.22(a) (8)	See the table provided as Attachment 2 on page 47 of this enclosure.
RAI 72 Provide gross alpha monitoring data including exceedances of the maximum contaminant level for ground water and surface water and above	10 CFR Section 51.45.(b)(1), 10 CFR	The maximum contaminant level (MCL) for drinking water is 15 piCu/l, which is the investigation action level for subsequent isotopic uranium analysis at the Westinghouse CFFF per license SNM-1107. Since 2008, the 15 piCu/l MCL has been exceeded six times in NRC wells, as documented in both the table and figure below.

regulatory concern for soil contamination since 2008. Identify the year(s) of occurrence(s), source(s), amount of estimated releases, and location of any gross alpha contamination, and the status of the measures used to identify the source of contamination, and the contaminant elements contributing to the contamination in ground water, surface water, and soil. Discuss ground water and surface water pathways, and the understandings within the conceptual site model of the contaminant plumes, the technical basis of gross alpha contamination to the drinking water sources, potable water wells south of the site, and the environmental impacts on ground water, surface water, and soil resources due to gross alpha contamination for the proposed action and no-action alternative.	51.45.(b)(2), 10 CFR 51.45.(b)(3)	Note only the exceedances are listed below: Well 7: 26 March 2009 Well 13: 17 Sept 2011; 18 December 2011 Well 23: 25 Sept 2010; 47 November 2010; 19 June 2011  For surface water, the investigation action level has been 50 piC/l. This action level has been exceeded once since 2010. This occurred in March 2015. The alpha result was 474 piC/l at the "exit" sampling location, as documented in the following figure:



There have been no exceedances of the investigation action level of 10 piC/g total uranium activity in soil monitoring results, as documented in the following figure:



Information on environmental contamination has been provided through the Environmental Report submittals as described in Section 10.1 of the License Application. Sources include the wastewater treatment lagoons and a leaking underground pipe identified in 2011. These have been mitigated by the installation of new lagoon liners and the installation of above ground piping, respectively.

The distance between the alpha/beta plume and the nearest CFFF property line is approximately 3,200 feet. The nearest off-site receptor is approximately 6,500 feet west of the plume. This nearest off-site receptor is a hunting lodge that is not directly in the path of the plume. There are no known off-site drinking water sources in the direction of the plume within 3 miles. The plume has expanded approximately 300 ft over the course of 9 years.

Assessment of groundwater at CFFF began in 1989 and is on-going. During previous investigations, aquifer characteristics such as groundwater flow direction and velocity at CFFF were assessed. Based upon data collected during the site investigations, groundwater beneath the CFFF flows to the southwest at a velocity of approximately 153 feet/year.

There is no difference in the proposed action and no action alternative. Alpha monitoring results are reviewed and assessed annually as part of the ALARA report,

		including those that may exceed the investigation action level. Assuming no additional events occur with alpha as a contaminant, the facility's condition will remain the same during its current operating license as it would in the proposed 40-year license renewal. If events and areas are identified as alpha contributors, they will be mitigated to the maximum extent practicable.
RAI 73 Provide the mitigation measures used to reduce gross alpha contamination for the proposed action and no-action alternative and the year of implementation of such measures.	10 CFR 51.103(a)(4)	The primary Westinghouse CFFF approach to minimizing potential environmental impacts to water resources is through the following measures: • Prevention through robust process control and best management practices for material handling; • Safe and proper management of liquid effluents leading to and from the six lagoons; • Implementation of the environmental monitoring program as described in Section 6.0 of the Environmental Report; • Assessment of elevated concentrations of liquid effluent constituents in surface waters and groundwater; and • Mitigation through training and rapid response to any spills. Liquid effluent monitoring requirements at the CFFF are in accordance with the permit requirements, as described in Section 6.0 of the Environmental Report. Also, groundwater around the CFFF is routinely monitored and evaluated, as described in Section 6.0 of the Environmental Report. Observation of an upward trend initiates investigation and corrective action, including mitigation response if necessary.
RAI 74 Provide an estimate of the amount of gross alpha contamination that has been released to the environment. Discuss the cumulative effects of the proposed action and no action alternative on ground water, surface water, and soil resources due to gross alpha contamination….Examples of cumulative impacts are given in Section 4.2.5.2 of the NRC staff's environmental review guidance (Ref. 2).	10 CFR 51.45(c), 40 CFR 1508.7	There are no estimates of releases. Information on environmental contamination has been provided through the Environmental Report submittals as described in Section 10.1 of the License Application. Sources include the wastewater treatment lagoons and a leaking underground pipe identified in 2011. These have been mitigated by the installation of new lagoon liners and the installation of above ground piping, respectively. The distance between the alpha/beta plume and the nearest CFFF property line is approximately 3,200 feet. The nearest off-site receptor is approximately 6,500 feet west of the plume (hunting lodge that is not directly in the path of the plume). There are no known off-site drinking water sources in the direction of the plume within 3 miles. The plume has expanded approximately 300 ft over the course of 9

		years. Assessment of groundwater at CFFF began in 1989 and is on-going. During previous investigations, aquifer characteristics such as groundwater flow direction and velocity at CFFF were assessed. Based upon data collected during the site investigations, groundwater beneath the CFFF flows to the southwest at a velocity of approximately 153 feet/year. There is no difference in the cumulative effects for the proposed action and no action alternative. Alpha monitoring results are reviewed and assessed annually as part of the ALARA report, including those that may exceed the investigation action level. Assuming no additional events occur with alpha as a contaminant, the facility's condition will remain the same during its current operating license as it would in the proposed 40-year license renewal. If events and areas are identified as alpha contributors, they will be mitigated to the maximum extent practicable.
RAI 75 Discuss the environmental impacts from the flooding at CFFF caused by the October 2015 storm. Address if any of the lagoons especially those which contained radionuclides were impacted by the flood either by flooding and overtopping or by elevated water table causing ground flooding. Provide estimates of amount and type of contaminants, particularly radionuclides, released from the site due to flooding. Address the impacts (e.g., radioactivity, chemical toxicity) of these releases to the environment from contaminants such as uranium and Technecium-99 from the lagoons and solids in calcium fluoride and other mixtures from the site.	10 CFR 51.45	During a three day period from 10/2/15 through 10/4/15, the CFFF received approximately 15 inches of rainfall as a result of a 1000-year flood event. Subsequently, two process lagoons overfilled beyond containment during the early morning of 10/3/15. The Sanitary lagoon overflowed out of the chlorine contact chamber and flowed into the adjacent North and South lagoons. The West 2 lagoon was measured at approximately 15" beyond the liner onto the surrounding ground, but remained within the berm. An emergency discharge to the river was initiated on 10/3/15, per procedure which allowed the levels to be decreased at a faster rate. In-process sampling for Fluoride, Ammonia, pH, Total Suspended Solids (TSS), and activity was conducted during the flood period for the following lagoons: North, South, West 1, West 2 and Weir Box. Only one elevated reading for TSS was recorded on October 4th from the Round Tank Weir Box. Activity samples that were taken yielded zeros in some areas and the remaining resulted in maximum measurements of 10^{-07} and 10^{-08} µCi/ml, values consistent with background activity levels. There is no long term impact associated with the flooding that occurred in October 2015. This information has been discussed in the Environmental Review supporting the CFFF License Renewal Application.
RAI 76 Provide references from which	10 CFR 51.45	Copies of the necessary reference materials were attached to letter LTR-RAC-16-21,

data was obtained or conclusions drawn for use in the preparation of the responses to RAIs, the environmental report (e.g., AECOM Remedial Investigation Reports), and other documents prepared for the NRC's environmental review. Provide a written justification for references that should be withheld from public disclosure in accordance with 10 CFR 51.16.	(c), 10 CFR 51.16	dated June 14, 2016, "*Westinghouse 40-Year License Renewal Summary of Site Visit on August 18-19, 2015*." Also, a copy of the AECOM report was submitted per LTR-RAC-16-36, dated June 14, 2016, "*Westinghouse License Renewal Application – Requested Document."*
RAI 77 Reconcile the conflicting statements in the environmental report related to cylinder recertification and cylinder washing.	10 CFR 51.45	The reference to "cylinder washing" in Chapter 8 of the Environmental Report is a typographical error. The source was traced to technicium-99 (Tc-99), originating from UF_6 cylinder recertification, as stated correctly in Chapter 4 of the Environmental Report.

Attachment 2: Response to RAI 71

Applicable Federal and State Standards:

Applicable Federal Regulations	
Gaseous Effluents	
40 CFR 50-97	Clean Air Act
40 CFR 51	Requirements for Preparation, Adoption, and Submittal of Implementation Plans
40 CFR 52	Approval and Promulgation of Implementation Plans
40 CFR 52.21	Prevention of Significant Deterioration of Air Quality
40 CFR 60	Standards of Performance for New Stationary Sources
40 CFR 63	National Emissions Standards for Hazardous Air Pollutants for Source Categories
40 CFR 63 Subpart WWWWWW	National Emissions Standards for Hazardous Air Pollutants: Area Source Standards for Plating and Polishing Operations
40 CFR 68	Chemical Accident Prevention Provisions
40 CFR 68	EPA Risk Management Program
40 CFR 70	State Operating Permit Programs
40 CFR 82	Protection of Stratospheric Ozone
40 CFR 82	Subpart F: Recycling and Emissions Reduction
40 CFR 82	82.156 Required Practices
40 CFR 82	82.166 Reporting and Recordkeeping Requirements
40 CFR 98	Mandatory reporting of Greenhouse Gases (currently exempt)
Liquid Effluents	
40 CFR 100-149	Clean Water Act
40 CFR 110	Discharge of Oil
40 CFR 112	Oil Pollution Prevention
	112.1 General Applicability
	112.3 Requirement to Prepare and Implement a Spill Prevention, Control, and Countermeasure Plan by Owners or Operators
	112.7 General Requirements for Spill Prevention, Control, and Countermeasure Plans
	112.8 Spill Prevention, Control, and Countermeasure Plan Requirements for Onshore Facilities (excluding production)
	Appendix C Substantial Harm Criteria

40 CFR 122	EPA Administered Permit Programs: The National Pollutant Discharge Elimination System
	122.26 Storm Water Discharges

Applicable State Regulations	
61-9	Water Pollution Control
61-9.122	NPDES - National Pollutant Discharge Elimination Systems
61-30	Environmental Protection Fees
61-62	Air Pollution Control Regulations
61-62.61	National Emission Standards for Hazardous Air Pollutants (NESHAP)

Permits Issued by Federal, State, or Local Governments, for Gaseous and Liquid Effluents		
Permit	**Permit Number**	**Permit Administrator**
National Pollutant Discharge Elimination System (NPDES) Permit	SC0001848	South Carolina Department of Health and Environmental Control
NPDES General Permit for Storm Water Discharges	SCR000000	South Carolina Department of Health and Environmental Control
Office of Environmental Quality Control Bureau of Air Quality Operating Permit	1900-0050	South Carolina Department of Health and Environmental Control