

## **Appendix 1**

### **Source Term and Shielding Audit Questions and Commitments**

This appendix provides U.S. Nuclear Regulatory Commission (NRC) staff questions to the audit material, as well as NRC staff follow up questions and comments to AREVA responses to earlier questions. The appendix also identifies AREVA commitments that have not yet been completed.

Following the initial NRC staff review of the radiation source and shielding calculations which was concluded in July 2013, the NRC staff identified numerous errors and inconsistencies between the FSAR and the information provided within the calculation packages and provided comments related to the review of the calculations. The NRC staff also indicated that they were unable to review the calculations in their entirety without requesting additional review time and that AREVA should review their calculations to ensure that other errors and inconsistencies were identified and corrected. AREVA provided responses to NRC staff comments in November 2014. During the December 9 and 10, 2014, audit the NRC staff provided the applicant with questions and comments related to AREVA's responses; however, the NRC staff indicated that additional review time was needed and that there could be additional comments. Therefore, the NRC staff reviewed the updated calculation packages in order to complete the review of the source terms explicitly modeled in FSAR Chapter 12 and the shielding for those sources to complete the review of this material. As a result, this appendix represents all NRC staff comments related to the source terms and shielding for the sources outside reactor containment that were explicitly modeled. These comments do not include currently open request for additional information (RAIs) and questions outside the scope of RAI 539 and RAI 548 that have not yet been addressed (RAIs 539 and 548 were the initial RAIs related to source terms and shielding, which led to the audit). Some of those open RAIs and questions involve source terms and shielding, such as RAI 622, which is related to spent fuel pool (SFP) shielding, and NRC radiation protection staff questions related to RAI 578, which have not yet been addressed. Those currently open questions have to be resolved independently of these comments. Finally, AREVA is planning to revise their approach for determining shielding thicknesses for sources that were not explicitly modeled in FSAR Section 12.2. The review of the shielding and zoning for these sources will need to commence when AREVA's approach is provided for staff review.

The staff notes that there is a potential that shielding for radiation source explicitly modelled may potentially have to be reconsidered in certain specific areas due to the combined dose rate of source explicitly modelled and those not modeled. Finally, while AREVA provided slides in the reading room to address NRC staff comments related to changes made in the Final Safety Analysis Report (FSAR) Revision 5, this material is generally separate from the initial intent of the audit and due to time limitations, the NRC staff was unable to complete a review of the material, as part of the audit at this time. Therefore, the NRC staff considers this material still open.

This Appendix includes three sections below. The first is follow-up related to AREVA's responses to the December 9 – 10, 2104, audit comments. The second is additional feedback as a result of the July 2013 questions. The third is additional NRC staff questions due to the final review of the material.

### **Section 1: Follow up to AREVA's responses to the December 9 – 10 Audit Comments**

Follow up comments to AREVA's responses to the December 9 – 10, 2014, audit comments are provided below in Table 1. For tracking purposes, Table 1 also contains a column summarizing commitments made by AREVA in the response that have not yet been completed.

<b>Table 1 – AREVA Commitments and NRC Feedback on the Responses Provided by AREVA, on Staff Comments made During the December 9 – 10, 2014 Audit</b>			
<b>Item No.</b>	<b>General Topic Description</b>	<b>Commitments Made by AREVA in the Response</b>	<b>NRC Comments to AREVA's Response and Commitments</b>
1	Degasifier	AREVA commits to adding the degasifier efficiency to Section 12.2.1.5 and Figure 12.2-3 of the FSAR.	Issue resolved, pending the completion of commitments.
2	Primary Coolant Activity based on 1 year operation	None.	Issue resolved.
3	Volume control tank (VCT)	<p>AREVA commits to revising the FSAR source term for the VCT to include contributions of the CVCS and degasification system to the gaseous source term. AREVA calculated this new source term in "Attachment 3." The source term increase is by approximately a factor of 1.8.</p> <p>In addition, AREVA commits to update Section 12.2.1.3 to describe the updated methodology as well as implement the appropriate changes</p>	<p>The NRC staff agrees with the inclusion of gaseous source term directly from the letdown flow. However, the applicant does not provide enough information regarding why it is acceptable to assume 29 psig for the source term calculations. Therefore, please provide additional justification for why the maximum pressure in the VCT would not be a radiological concern and/or why the average is acceptable. For example, it is unclear to the NRC staff how long it may take to correct pressure deviations in the VCT to 29 psig, how often may the VCT be operating at a pressure greater than 29 psig, and how much the pressure increase would affect the source term.</p> <p>Otherwise, the applicant should consider the maximum source term with the maximum pressure (40.6 psig). A possible solution may be to develop a multiplication factor, if appropriate and justifiable, to increase the source term instead of running an entirely new calculation.</p> <p>In addition, FSAR Table 12.3-15 should be</p>

		to shielding and zoning. These proposed shielding and zoning changes have not yet been provided for NRC staff review.	updated to clearly indicate the entire volume control tank dimensions, as well as the dimensions of the liquid and gas source term (currently, it is unclear if the dimensions and volume provided represent the entire tank or represent both the liquid and gas source term separately). Review of the calculations and FSAR Chapter 9 confirm that the current dimensions in 12.3-15 represent both the gaseous and liquid source term independently. This is simply for clarity in the application.
4	VCT – addressed in item 3 above.	See item 3	See item 3.
5	Scoping Study	AREVA to develop a plan to address the NRC concerns relative to shielding for those rooms that contain components which were not explicitly modeled. The plan has not yet been provided for NRC review.	<p>The NRC staff will review the shielding approach for sources not explicitly modeled in Calculation Package 126-9043718-008 when provided by AREVA.</p> <p>For sources explicitly modeled, all remaining questions related to these sources are contained within the audit report and the appendices, unless noted otherwise.</p> <p>In addition, there are certain questions outside the scope of RAI 539 and RAI 548, related to shielding that have not yet been resolved (for example, RAI 622 is open related to SFP shielding). Therefore, those open questions outside of RAI 539 and RAI 548 remain open pending resolution of the specific question(s) asked.</p> <p>In addition, while AREVA provided slides on “U.S. EPR Tier 2 Chapter 12 – FSAR Revision 5 Meeting Comments,” in the reading room, the NRC staff was unable to review these issues at this time. In addition, this information is beyond the initial scope of the audit</p>
6	Equipment Qualification (EQ)	AREVA is to review FSAR Section 3D.5.1.1 to determine if a summary of the methodology used to develop the normal EQ radiation doses is needed in the FSAR.	<p>FSAR Table 3D-8 needs to be updated to reflect revised maximum source terms. For example, the volume control tank source term is being revised and other maximum dose rates in that table do not appear to be based on the current source terms. Please ensure this table is accurate for the updated source terms.</p> <p>It is unclear to staff why certain areas in</p>

			<p>FSAR Table 3D-8 are listed as Zone 2 (2.5E-04 rad/hr) when there are no rooms in Chapter 12 zoned to less than Zone 3 (greater than 2.5 mrem/hour). Please explain this apparent discrepancy.</p> <p>The applicant considers the VCT to be the largest source in the fuel building for normal operation equipment qualification purposes. Are there any components in the EQ program that would be effected by spent fuel, such as during fuel transfer?</p> <p>Please correct the error in FSAR Table 3D-8 for UJA, "Equipment Area – All Equipment." There is an error in the dose rate and/or the cumulative dose.</p> <p>Please confirm that there is no equipment inside the reactor building with dose rates higher than the amounts specified. What about nuclear instrumentation?</p> <p>Finally, please update FSAR Table 3D-8 to list the equipment in the Reactor Building that results in the highest dose, as was done for other buildings. For example, for the Auxiliary building it indicates that the mixed bed filters are the limiting source. While for the Reactor building it is unclear what was assumed to be the limiting source term.</p>
7	ANP 10292 Compliance Table	AREVA to consider updating the table based on final approach used for sources outside containment, if appropriate.	Approach acceptable. AREVA to update the table in the future, if appropriate.
8	Spent Fuel Pool Shielding (SFP)	AREVA to update Fuel Building Shielding Calculation to address deficiencies regarding the dose rates calculated around the SFP. FSAR Figures 12.3-34 through 12.3-37 will be updated accordingly. The	Approach acceptable. In addition, the FSAR should be updated to describe how the shielding around the SFP is determined.

		<p>technical specifications (TS) will be updated to place restrictions on fuel placement within the SFP.</p> <p>See response to C.1 in the response to the July 2013 comments.</p>	
9	Coolant Storage Tanks	<p>AREVA commits to updating FSAR Figure 12.3-43 due to change in the coolant storage tank gas-phase source term.</p> <p>In addition, AREVA is to consider the combined dose contribution for multiple coolant storage tanks in the shielding analysis, as discussed in D.1 in the response to the July 2013 comments.</p>	<p>The source term needs to be updated because originally the gaseous source term did not include contribution due to direct input of primary coolant to the VCT. Therefore, the source terms provided in FSAR Section 12.2 for the coolant storage tanks will need to be updated in addition to FSAR Figure 12.3-43.</p> <p>In addition, the NRC staff asks AREVA to confirm that plant zoning in other areas considers multiple sources, where appropriate. The NRC staff notes that the methodology developed for the sources not explicitly modelled will need to consider the impact of other sources in the area, including those sources in the area that were explicitly modelled.</p>
10	Scoping Study	Same as item 5 above.	Same as item 5 above.
11	Tank dimension inconsistencies between Chapter 11 and 12	<p>In the response to the July 2013 comments, item E.8, The applicant committed to update FSAR Table 11.2-2 to state that the Concentrate Tanks are 9500 gallons gross and 9000 gallons net.</p> <p>In addition, the applicant committed to update FSAR Table 11.4-14 as follows: Resin Proportioning Tank 132 gallons gross /</p>	<p>The NRC staff believes the note that the applicant proposes adding to FSAR Table 11.4-14, should also be added to Table 11.2-2 (i.e., the note that states, "The gross volume of the tanks refers to the total volume and the net volume refers to the maximum available volume available to the user.")</p> <p>Otherwise, the applicant's proposed approach is acceptable from a FSAR Chapter 12 perspective. The FSAR Chapter 11 reviewer was notified of the proposed changes. This item will be reviewed by the FSAR Chapter 11 reviewer upon the restart of the review.</p>

		105 gallons net; Concentrate Buffer Tank 2853 gallons gross / 2642 gallons net; Condensate Collection Tank 132 gallons gross / 105 gallons net; add a note stating, "The gross volume of the tanks refers to the total volume and the net volume refers to the maximum available volume available to the user."	
12	Steam Generator Blowdown (SGBD) Resin	The applicant indicates that since the SGBD resin volumes are regenerated or flushed out to a resin truck transfer station where the resins are shipped offsite. Therefore, the resins are not accounted for in the waste and shipping volumes presented in FSAR Table 11.4-1.	<p>The NRC staff (FSAR Chapter 11 and 12 reviewers) disagrees with the applicant's conclusion that SGBD resin can be ignored when removed from the resin media. FSAR Table 11.4-1 contains expected and maximum waste generation and shipping volumes. Therefore, all waste needing to be shipped should be included in FSAR Table 11.4-1. The maximum waste generation and shipping volumes should be consistent with assumptions made in developing the FSAR Chapter 12 source terms. In addition, it does not appear to the staff that any of the other FSAR Chapter 12 source terms account for the radioactive material removed in the regeneration of the SGBD resin. The radioactive material in the resin should be accounted for in either the buildup of the radioactive material from flushing of the resin or in FSAR Chapter 11, under waste generation and shipping.</p> <p>In addition, the applicant assumes a 12 and 36 week resin change out frequency for the steam generator blowdown demineralizer source terms. This frequency is required to meet the source term and minimum shield wall thicknesses described in FSAR Chapter 12 and seems more frequent than what would typically be anticipated based on resin exhaustion. Please update FSAR Chapter 12 to include some type of commitment ensuring that if the dose rates in the areas surrounding the SGBD</p>

			<p>demineralizers begin approaching the zone limits provided in FSAR Chapter 12, that appropriate action will be taken to reduce the demineralizer source term, or provide a combined operating license (COL) Action Item requesting the COL applicant to provide information on how the dose rates will be maintained.</p> <p>The NRC staff also notes that the steam generator blowdown rate used in the calculation is 2.08E+5 lb/hr, while the FSAR states the value is 2.184E+5 lb/hr. AREVA should ensure that the correct value is stated in the FSAR and ensure that the error does not result in any significant changes in source term and shielding calculations.</p>
13	Concentrate Buffer Tank Shielding	AREVA commits to update FSAR Figure 12.3-53 based on revised Microshield calculations.	<p>It is the NRC staff's understanding that on Figure 12.3-53, the entire west wall is 1.6 feet (shielding for both rooms west of the concentrate buffer tank room is 1.6 feet), and this will be clarified in the revised figure.</p> <p>In addition, the entrance way between rooms 60 and 76 (appears to the staff to be 76, difficult to read), will be upgraded to Zone 6 based on shielding calculation results. In addition, the thickness of the wall (including the door) between the entranceway and room 60 will be specified as 1.0 foot.</p> <p>Also, the zoning for room 60 may be adjusted as appropriate to account for the entranceway (as appropriate).</p> <p>If the above information accurately describes the applicant's approach, the staff finds the approach acceptable.</p>
14	Shielding above the Concentrate Buffer Tank	In feedback to the July 2013 Audit, the applicant committed to revise FSAR Figure 12.3-54 to correct the floor thickness above the concentrate Buffer Tank room to 1.3 feet.	The approach is acceptable.
15	Activity Buildup in	None.	Issue Resolved.

	Coolant Purification System		
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## **Section 2: Follow up to the July 2013 Question Responses**

AREVA also made several commitments in the table, “NRC Feedback from July 2013 Audit and Comments Received for Advance Response to RAI 539 Q12.03-12.04-29 and RAI 548 Q12.03-12.04-31a(ii).” Table 2 below is intended to track commitments made by AREVA to modify the FSAR in that document, which have not yet been completed, based on Revision 8 provided in the reading room. In addition, the NRC staff acknowledged that due to time limitations, the NRC staff was unable to fully review the responses prior to the audit on December 9 and 10, 2014. Therefore, FSAR Table 2 also contains additional NRC staff questions/comments beyond what was discussed on December 9 and 10, 2014. Only the items for which the NRC staff identified that a follow up action is warranted are identified in Table 2 below. Also, items discussed in Table 1 above are not included below. The item number corresponds to the item number in the table provided by AREVA.

In the table below, “AREVA Commitments” represent commitments made by AREVA that the staff considers an acceptable approach, but has not yet been completed by AREVA; “Staff Comments” represent an additional NRC staff question or comment related to the response, which the NRC staff requests that AREVA address.

<b>Table 2 – AREVA Commitments and Follow up Comments from AREVA’s July 2013 Responses</b>		
<b>Item No.</b>	<b>General Topic Description</b>	<b>AREVA Commitments or Staff Comments</b>
3.b	Degasifier Liquid Source Term	AREVA Commitment: AREVA indicates that they will update FSAR Table 12.3-17 to indicate the correct Degasifier liquid source term dimensions (i.e., a 3.0 cubic meter volume).
3.c	Degasifier Gas Source Term	AREVA Commitment: AREVA indicates that they will update FSAR Table 12.3-17 to indicate the correct Degasifier gaseous source term dimensions (i.e., a 6.0 cubic meter volume).
4.c	Activity of KBE20-AT001 Mixed Bed Demineralizer	AREVA Commitment: AREVA will correct the heading of FSAR Table 12.2-64 from MeV/sec to MeV/sec-cubic meters.
5	Spent Fuel Pool (SFP) Related Source Terms	NRC staff comment: AREVA revised the SFP water source term and the airborne source term for the SFP room as part of this response. However, AREVA did not update, nor did they discuss updating the FSAR for any of the SFP related sources, including the SFP water, SFP air, the SFP filter, and the SFP demineralizer. AREVA needs to ensure that all of these source terms in the FSAR reflect the updated source terms based on the corrections made to the SFP water source term.
6	Spent Fuel Pool Mixed Bed Demineralizer	NRC staff comment: AREVA states that although the calculation indicated the incorrect resin volume for the spent fuel pool mixed bed demineralizer was provided in the calculation document. This value was not used to calculate the source term. The calculation is ambiguous as to how the source term for the spent fuel pool mixed



		<p>bed demineralizer was determined. Please provide information describing how the spent fuel pool mixed bed demineralizer source term was determined.</p> <p>As discussed above, the spent fuel pool mixed bed demineralizer source term should be based on the revised SFP water source term.</p>
B.1 and E.5	Radwaste Building (UKS) Shielding Calculation	<p>AREVA Commitment and NRC staff comment: AREVA will remove the notes that indicate, "This drawing is not to be used for construction," and "Bechtel activities are limited to drafting functions based on AREVA input" from the UKS FSAR figures (note: UKS is the designation AREVA uses for the Radwaste Building).</p> <p>AREVA also indicates that they will replace those notes with the note "See FSAR Section 3.7.2.8 for design requirements for the UKS building."</p> <p>While the NRC staff agrees with removing the two footnotes, the NRC staff does not agree with adding the note "See FSAR Section 3.7.2.8 for design requirements for the UKS building." This note would seem to imply that the FSAR Chapter 12 drawings do not provide design requirements, when they do provide minimum shielding thicknesses. Therefore, AREVA should clearly state in FSAR Chapter 12 that the radiation zone figures, including the UKS figures provide minimum shielding thicknesses for the plant design. If this statement is included in the FSAR, then the applicant may refer to FSAR Section 3.7.2.8, as long as it is clear that in referring to FSAR Section 3.7.2.8, that the minimum shield wall thicknesses must still be met, as provided in the FSAR Chapter 12 figures.</p> <p>As a suggestion, the footnote could state, "This figure provides minimum radiation shielding and zoning information. See FSAR Section 3.7.2.8 for the structural design requirements for the UKS building."</p>
B.2	UKS Shielding	AREVA Commitment: AREVA is going to update the west wall of room UKS01 064 on FSAR Figure 12.3-52 from 2.3 feet to 3.3 feet to make it consistent with the calculation.
B.3	UKS Shielding	AREVA Commitment: AREVA is to modify FSAR Figure 12.3-52 as appropriate based on reevaluation of wall north of UKS01-046 and UKS01-048. It is not known if AREVA's reevaluation will result in changes at this time.
E.1	Resin Waste Tank Locations	AREVA Commitment: AREVA is to modify the response to RAI 539 and RAI 548 and shielding calculations to provide correct locations for resin waste tank rooms. UKS01-006 (ID 4) and UKS01-011 (ID 7).
E.3	Waste Drum	AREVA Commitment: The shielding calculation and the response to RAI 539 will be updated to clarify the composite source term for the waste drums (27 cubic meters of wet waste, 22 from concentrates, 5 from resins, results in 8 cubic meters of dry waste, which fills approximately 40 drums at 0.2 cubic meters per drum).
E.4	Figure Clarity	AREVA Commitment: AREVA is to improve the clarity of the FSAR

		Chapter 12 figures so that they are more easily legible.
E.6	Shielding in Tier 1 and VHRAs	<p>AREVA Commitment and NRC staff comment: AREVA states that they will update applicable UFA (i.e., Fuel Building) shield wall thicknesses in relation to this question. While AREVA should ensure all shielding is accurate and adequate, it is unclear to the NRC staff what AREVA is updating in relation to this response.</p> <p>AREVA also commits to add radiation barriers for very high radiation areas (VHRAs) immediately adjacent to green zones into Tier 1. However, AREVA has previously committed in the FSAR and previous RAI responses (see the response to Question 14.03.08-1) to include not only VHRAs next to green zones, but also Zone 7 areas next to green zones. Therefore, AREVA should ensure that all such shielding wall and floor thicknesses throughout the plant are included within Tier 1. In addition, in the response to Question 14.03.08-1, AREVA committed to include all safety significant radiation barriers, needed for post-accident shielding in Tier 1. AREVA should review the barriers listed and the revised source terms and ensure that the updated source terms do not result in a need for additional radiation barriers to be added for post-accident radiation shielding purposes.</p> <p>AREVA also committed to adding subsections to list the VHRAs in the UKA and UKS in FSAR Tier 2, Section 12.3.1.8. AREVA should ensure that all VHRAs throughout the plant are discussed in the FSAR.</p> <p>While the NRC staff has previously accepted AREVA's methodology of only listing radiation barriers that separate Zone 7 and 8 areas from green zones, and post-accident shielding barriers in FSAR Tier 1 (as provided in response to Question 14.03.08-1), the updated radiation source terms provide additional VHRAs and significant high radiation sources and higher radiation zoning around some of these sources. Some of the areas around these significant sources, may not be green areas (or may have originally been green areas but are now zoned higher), but are corridors, stairways, or other areas which would be expected to be accessed routinely or somewhat routinely. Based on AREVA's criteria these radiation barriers would not be included in Tier 1.</p> <p>Standard Review Plan (SRP) Section 14.3.8 indicates that the reviewer should ensure that Tier 1 clearly describes the structures, systems, and components (SSCs) that provide a significant radiation protection function. Based on the revised zoning and shielding, it is unclear to the NRC staff why the only significant barriers around Zones 7 and 8 sources are those that shield Zone 3 areas. The NRC staff believes it would be more appropriate to include all radiation barriers separating significant radiation sources (Zone 7 or 8) from any adjacent area zoned lower than the room with the significant radiation sources in Tier 1. This is more consistent with what has been done with other PWR new reactor designs. Please</p>

		update Tier 1 to include these radiation barriers, or provide justification for why the current approach remains adequate.
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### **Section 3: Additional Questions and Comments**

This section provides additional NRC staff comments not associated with the previous sections.

1. FSAR Table 11.4-1 indicates that the total annual quantity of resin for the coolant purification and spent fuel pool spent resins combined is equal to 90 cubic feet. Calculation Package 126-9043718-008 provides source terms for these components based on one year operation and Table 4-1 of the calculation package indicates that 1 year of operation of the CPS is based on 90 cubic feet of resin. The calculation package also provides a resin volume for each CPS of 70 cubic feet and 106 cubic feet for the spent fuel pool demineralizer.
  - a. Please explain how the total combined resin volume in FSAR Table 11.4- 1 of 90 cubic feet was determined.
  - b. Please explain why an annual activity of 90 cubic feet is an appropriate approximation for coolant purification and spent fuel pool resins, when the Chapter 12 source terms would indicate that 246 cubic feet of resin would be used per year (70+70+106).
  - c. The applicant should explain discrepancies between the maximum waste activity and shipping values provided in FSAR Table 11.4-1 and the maximum source terms provided in FSAR Chapter 12.
2. In Calculation Package 126-9043718-008, Section 5.8.1.3, the applicant provided the source term for the spent fuel pool mixed bed demineralizer, however, the calculation package provides know information on how the source term was developed. Please provide this information. The NRC staff also notes that the spent fuel pool demineralizer seems significantly lower than previously approved new reactor designs.
3. The source terms provided in FSAR Section 12.2-47 and 12.2-48 for SFP Water and Fuel Building Air sources do not appear to match the source terms in 126-9043718-008, please correct this discrepancy.
4. Questions related to the liquid waste water storage and processing systems and Concentrate Solidification:
  - a. The evaporator efficiencies provided for the liquid waste evaporator in Calculation Package 126-9043718-008 is higher than the waste evaporator efficiencies provided in NUREG-0017, Table 1-4. In addition, FSAR Table 11.2-3 indicates a combined evaporator and demineralizer efficiency equivalent to the efficiency credited to the evaporator in Calculation Package 126-9043718-008. Please explain these apparent discrepancies and explain how the high efficiency value for the evaporator in Calculation Package 126-9043718-008 was determined.

- b. The evaporator efficiency is factored into the calculation for the liquid waste storage tank source term. However, the liquid waste storage tanks feed the evaporator. Therefore, it is unclear to staff why the efficiency of the evaporator is factored into the liquid waste storage tank source term. Please explain why the evaporator efficiency is factored into the liquid waste storage tank source terms.
  - c. Please indicate in the FSAR that the maximum expected fill up rate for the liquid waste storage tank is 26,500 gal/week.
  - d. The staff notes that there appears to be a discrepancy between the volume of the evaporator and the evaporator column in Calculation 32-9040619-003, Table 5-1 and FSAR Table 12.3-16 please explain this apparent discrepancy and correct as appropriate.
  - e. Please explain why the demineralizer in the liquid waste storage and processing system is not explicitly modeled as a radiation source and included in FSAR Section 12.2. SRP Section 12.2 indicates that source terms for permanent sources within the plant that require shielding should be included in FSAR Section 12.2. Please update the FSAR, as appropriate.
  - f. A liquid and vapor source term for the evaporator is provided in Table 4-5 of Calculation 32-9040619-003, however, the FSAR only provides a liquid source term and FSAR Table 12.3-16 refers to the liquid source term for all portions of the evaporator and the evaporator column. Please explain this apparent discrepancy.
5. The NRC staff notes that the calculation package for Fuel Building shielding (32-9040619-003) does not appear to consider the source term for fuel in the spent fuel pool when determining spent fuel pool shielding, including shielding for the side walls of the spent fuel pool when a raised fuel assembly is being transported.
- a. The applicant has previously indicated that they are planning to update the spent fuel pool shielding calculation. The source term used to determine spent fuel pool shielding should be consistent with information in the FSAR and should consider maximum fuel assembly transfer and worst case fuel pool configuration allowed by the technical specifications.
  - b. Finally, the applicant should ensure that fuel transfer tube shielding is based on the maximum assembly being passed through the tube, at the earliest possible time for fuel movement.
6. Some of the shielding calculations for specific components appear to be based on very specific air gaps between the source and the radiation barriers. For example, in Table 4-38 of the Auxiliary Building Calculation Package (126-9037188-003) the applicant indicates that specific air gaps of 65 cm, 70 cm, 88 cm, were assumed in the calculation package, for the distances between the sources and the walls. Please explain how the specific air gaps for different components were determined. Also, if the dose rate for a room outside a shield wall is close to exceeding a radiation zone designation, how will a COL licensee ensure that the component is not located closer to the wall than the air gap provided in the calculation?

7. Section 6.1 of Calculation 32-9040617-003 discusses multiplying the adjacent room dose rate and reference dose rates by the scoping study value of 1.9, in Calculation Table 6-3, which includes source terms explicitly modeled in FSAR Section 12.2. The applicant previously indicated that the scoping study was not used for sources explicitly modeled in FSAR Section 12.2. Please explain how this table and the scoping study results were used to determine radiation zoning and shielding for the radiation sources provided in FSAR Section 12.2. If the radiation scoping study was used to determine zoning or shielding for any of the sources explicitly modeled in FSAR Section 12.2, please identify those areas to the NRC staff.
8. In Calculation Package 126-9037188-003, Section 7.1.16 discusses using Revision 002 of the calculation that included the administrative limits to limit doses, which have since been removed from the FSAR. The calculation justifies using Revision 002 of the calculation package since Revision 002 considered doses from all contributing rooms, while Revision 003 only considers dose from the CPS and FPPS components. However, use of Revision 002 would mean that the dose still includes contribution of sources that have been administratively limited. Therefore, it would seem that if all the sources were considered in Revision 003, doses would be higher than what was calculated in Revision 002, because in Revision 002, the administrative limits were lessening some of the dose. Therefore, please justify the use of Revision 002, for determining shield walls thicknesses.
9. Room 27 on Auxiliary Building elevation -11 foot is a reserve room for a mixed bed demineralizer.
  - a. Why isn't it zoned and shielded the same as the other mixed bed demineralizer rooms?
  - b. Was the dose rate to this room during resin transfer considered in the shielding analysis?
10. The staff notes that the applicant appears to have determined the approximate tenth thicknesses for many of the sources explicitly modeled in FSAR Section 12.2 in order to determine plant shielding. For some of the sources, the staff notes that the applicant appears to use a specific tenth thickness developed for the individual source, while for others a generic tenth thickness value of 22 cm was used. The Fuel Building Calculation Package 32-9040617-003 indicates that 22 cm is conservative for all sources except for the boric acid storage tanks. However, using the VCT source term in Calculation Package 126-9043718-008 (not considering the updated source term provided in response to the December 9<sup>th</sup> and 10<sup>th</sup> audit questions), the NRC staff calculated an approximate tenth thickness value for the VCT of 24.5 cm. Please provide additional justify for the use of 22 cm for sources for which the specific tenth thickness was not determined.
11. Calculation Package 32-9040619-003 indicates that the dose rate in the three foot gap between the Radwaste Building and the Auxiliary Building is not considered because the area will not be accessed by personnel. However, a three foot gap is sufficient space for a worker to fit and there are fairly significant sources along the wall on the Auxiliary Building side of the Radwaste Building. The applicant should either evaluate the dose rates in this area and evaluate the impacts of individuals being located in this area and

update the FSAR accordingly, or if the area is truly inaccessible, the applicant should provide information in the FSAR explaining that this area is inaccessible and why it is inaccessible (for example, provide any physical barriers or controls that will be in place which justifies why this area can be considered inaccessible).

12. The applicant does not mention the use of the ELISA-2 computer code in the FSAR. The FSAR should be updated to explain the function of the ELISA-2 computer code in developing the radiation source terms.
13. While the boric acid column source term is modeled in Calculation Package 126-9043718-008. The boric acid column does not appear to be included as a source explicitly modeled in the Auxiliary Building calculation (126-9037188-003). In addition, the boric acid column is not included in FSAR Section 12.2 as a radiation source.
  - a. Please update FSAR Section 12.2 to include the boric acid column. Ensure that the appropriate shielding calculations are performed for the boric acid column and ensure that the FSAR Figures are updated appropriately.
  - b. Please verify that the boric acid column is located in room UKA13-048.