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Southern Nuclear Operating Company
Vogtle Electric Generating Plant Units 3 and 4
Supplement to Request for License Amendment and Exemption Regarding
Ventilation System Changes (LAR-16-030R1S1)

Ladies and Gentlemen:

Pursuant to 10 CFR 52.98(c) and in accordance with 10 CFR 50.90, Southern Nuclear Operating Company (SNC), the licensee for Vogtle Electric Generating Plant (VEGP) Units 3 and 4, requested an amendment to Combined License (COL) Numbers NPF-91 and NPF-92, for VEGP Units 3 and 4, respectively, by SNC letter ND-16-2452, dated December 9, 2016 [ADAMS Accession Number ML16344A411]. This license amendment request (LAR), LAR-16-030, would modify design details of the containment recirculation cooling system (VCS) and the radiologically controlled area ventilation system (VAS). Pursuant to the provisions of 10 CFR 52.63(b)(1), an exemption from elements of the design as certified in the 10 CFR Part 52, Appendix D, design certification rule was also requested for the plant-specific DCD Tier 1 material departures.

SNC LAR-16-030 was subsequently withdrawn from NRC review as requested by SNC letter ND-17-1179, dated June 28, 2017 [ML17179A261], and revised and resubmitted as LAR-16-030R1, by letter ND-17-1499, dated August 31, 2017 [ADAMS Accession Number ML17243A444]. Enclosures 1 through 3 were provided with the revised LAR, LAR-16-030R1.

Enclosure 4 supplements LAR-16-030R1 by addressing a Request for Additional Information (RAI) from the NRC Staff, which was transmitted by electronic mail (email) on January 18, 2018 [ML18018B155], to support review of LAR-16-030R1.

Enclosure 5 provides changes to the text of the revised LAR, which was provided as Enclosure 1 of letter ND-17-1499. The revised text in Enclosure 5 is limited to the specific changes identified in the responses to the RAI questions discussed in Enclosure 4.

Enclosure 6 contains revised UFSAR markups to reflect the changes described in Enclosure 4.

Changes to the text of the Request for License Amendment in ND-17-1499, Enclosure 1, and to the Proposed Changes to the Licensing Basis Documents in Enclosure 3, are required per the response to NRC Issues 1 through 4. These changes are shown in Enclosures 5 and 6 of this letter.

The information provided in this LAR supplement does not impact the scope, technical content, or conclusions of the Technical Evaluation, Regulatory Evaluation (including the Significant Hazards Consideration Determination), or Environmental Considerations of the revised LAR provided in letter ND-17-1499, Enclosure 1, nor does it impact the Exemption Request provided in ND-17-1499, Enclosure 2. SNC has consulted with the NRC Project Manager responsible for this LAR, and it was confirmed that the submittal date of this RAI response is not expected to adversely impact approval of this LAR by the date requested in ND-17-1499.

This letter contains no regulatory commitments. This letter has been reviewed and confirmed to not contain security-related information.

In accordance with 10 CFR 50.91, SNC is notifying the State of Georgia of this LAR supplement by transmitting a copy of this letter and enclosures to the designated State Official.

Should you have any questions, please contact Mr. Adam Quarles at (205) 992-7031.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 23rd of March 2018.

Respectfully submitted,

Brian H. Whitley

Brian H. Whitley
Director, Regulatory Affairs
Southern Nuclear Operating Company

Enclosures: 1 - 3) (previously submitted with the revised LAR, LAR-16-030R1, in SNC letter ND-17-1499)

4) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Response to NRC Request for Additional Information (RAI) Regarding the LAR-16-030R1 Review (LAR-16-030R1S1)

5) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Revised Excerpts to Text in LAR-16-030R1 (LAR-16-030R1S1)

6) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Revised Proposed Changes to the Licensing Basis Documents (LAR-16-030R1S1)

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**Southern Nuclear Operating Company**

**ND-18-0097**

**Enclosure 4**

**Vogtle Electric Generating Plant (VEGP) Units 3 and 4**

**Response to NRC Request for Additional Information (RAI)
Regarding the LAR-16-030R1 Review**

**(LAR-16-030R1S1)**

(Enclosure 4 consists of 13 pages, including this cover page.)

The following are questions provided by the NRC Staff regarding the review of Southern Nuclear Operating Company (SNC) License Amendment Request (LAR) 16-030R1, which was submitted by SNC letter ND-17-1499 on August 31, 2017.

**Issue 1**

In the LAR 16-030, Revision 1, the licensee specifies that the radionuclides Mn-56, Br-84, Br-85, Kr-89, Rb-88, Te-131, Xe-135m, Xe-137, Xe-138, Ba-137m, and Pr-144 are not expected to exist and, hence, not a contributor to the Auxiliary Building Fuel Handling Area airborne activity source term. These radionuclides are considered to be present in very low quantities in the current UFSAR. It is unclear why some of these radionuclides would not be contributors to the airborne activity source term, based on expected SFP inventories and related radionuclides included in the source term. For example, Cs-137 is included in the source term, as would be expected, yet its daughter Ba-137m, which should be in equilibrium is considered to not exist. Similarly, it’s unclear why Rb-88 would not be present, when its parent Kr-88 and another isotope of Rb, Rb-86, which is usually less prevalent, is. Please provide clarification or additional details, as appropriate, for the assumptions made in determining the Auxiliary Building Fuel Handling Area airborne activity source term and how it was determined that the above radionuclides are not expected to exist.

**SNC Response to NRC Issue 1**

The previous calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area did not account for the production of daughter nuclide activity from decay of the parent nuclide. In order to account for this, the activity concentrations have since been adjusted to account for nuclides which are in secular equilibrium with their parent. Since secular equilibrium occurs when the half-life of the daughter nuclide is significantly shorter than the half-life of the parent nuclide, only the following decay chains were considered:

- Kr-88 → Rb-88 (BF = 1.00)
- Sr-90 → Y-90 (BF = 1.00)
- Mo-99 → Tc-99m (BF = 0.876)
- Ru-103 → Rh-103m (BF = 0.997)
- Te-131m → Te-131 (BF = 0.222)
- Cs-137 → Ba-137m (BF = 0.946)
- Ce-144 → Pr-144 (BF = 0.982)
- Ru-106 → Rh-106 (BF = 1.00)

To simplify the calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area, the daughter nuclide activity concentration is assumed to be equal to the parent nuclide activity concentration while also taking into account the branching fraction (BF) of the particular decay chain. This approach conservatively ignores the effects of daughter nuclides which propagate differently from the fuel and water to the airspace. The activity buildup for nuclides which are not in secular equilibrium with their parent nuclide is not modeled.

To address this issue, the calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area has been revised, and UFSAR Table 12.2-25 is proposed to be further revised, to account for activity generation from daughter production to include the impact of decay chains in secular equilibrium as described above.

Note that other nuclides with sufficiently short half-lives, and with a minimal production or in-growth source term after shutdown, are easily shown to produce negligible contributions to Derived Airborne Concentrations (DAC) (for example, Xenon-137, with a half-life of less than 5 minutes), and are not explicitly reported in the final tabulation.

<u>Changes to LAR text in ND-17-1499, Enclosure 1, and Proposed Changes to the Licensing Basis Documents in ND-17-1499, Enclosure 3</u>

The following changes to the text of the Request for License Amendment in ND-17-1499, Enclosure 1, and to the Proposed Changes to the Licensing Basis Documents in Enclosure 3, are required per the response to NRC Issue 1. These changes are shown in Enclosures 5 and 6 of this letter.

1. On page 10 of Enclosure 1, and on pages 15 and 16 of Enclosure 3, for changes to UFSAR Table 12.2-25, the fuel handling area maximum airborne radioactivity concentrations are revised to update values and to add isotopes that exceed 1.0E-20 μCi/cm$^3$. This includes adding the appropriate concentrations for Br-83, Kr-87, Rb-88, Sr-92, Y-92, Te-131, I-129, I-132, Ba-137m, Pr-144, Rb-86, Rh-103m, Ru-106, Rh-106, Np-239, Sb-127, Sb-129, Rh-105, Zr-97, Nd-147, and Pu-241 to UFSAR Table 12.2-25.
2. On page 10 of Enclosure 1, and on page 17 of Enclosure 3, for changes to UFSAR Table 12.2-25, Footnote 2 is revised to show deletion of isotopes that have a value of 0.0E+00 or greater than 1.0E-20 μCi/cm$^3$ in the updated calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area, and to retain or include isotopes that are expected to exist in the fuel handling area with radionuclide specific maximum airborne radioactivity concentrations less than 1.0E-20 μCi/cm$^3$. This final listing includes $^{191m}$Y, $^{129}$Te, $^{134}$Te, $^{134}$I, $^{139}$Ba, $^{105}$Ru, $^{141}$La, $^{142}$La, $^{241}$Am, $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Cm, and $^{244}$Cm.
3. On page 13 of Enclosure 1, the last two sentences of item 4 are deleted, as this information is redundant to the previously described changes to UFSAR Table 12.2-25. These two sentences are not necessary, as the paragraph containing item 4 applies to changes to the input parameters for the calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area shown in UFSAR Table 12.2-24, not Table 12.2-25.
4. On page 14 of Enclosure 1, the resulting maximum airborne radioactivity concentrations for the fuel handling area are revised to reflect a maximum DAC fraction of less than 9.37E-01.

**Issue 2**

In LAR 16-030, Revision 1, the licensee reduces the nominal spent fuel pool purification flow rate from 250 gpm to 200 gpm. In the airborne activity calculations, the licensee specifies that 150 gpm purification flow is assumed. The licensee also made other changes to the parameters and assumptions used for calculating spent fuel pool radioactivity concentrations and fuel handling area airborne radioactivity concentrations as part of the LAR. Staff has the following questions related to the reduced purification flow rate and other changes related to spent fuel pool activity and spent fuel handling area airborne activity:

1. On Page 12 of Enclosure 1, near the bottom of the page, the licensee indicates that lowering the SFS (the abbreviation "SFS" is not defined in the LAR and but is defined in Tier 1 of the UFSAR as the spent fuel pool cooling system) purification flow rate to 150 gpm is conservative and has no adverse effect on the results of the calculation of fuel handling area airborne radioactivity. This statement has no further explanation or technical basis specified and may be inaccurate. Lowering purification flow would be expected to increase SFP activity due to reduced removal rates and therefore result in an increase in potential for airborne activity.

   Please provide clarification or additional information describing how decreasing spent fuel pool purification has no adverse effect on airborne radioactivity. If this statement is inaccurate, please remove it and discuss the impacts that decreasing SFP purification flow has on airborne radioactivity, in conjunction with the other changes in the LAR.

2. The licensee specifies that the dose rates to personnel on the SFP handling machine will remain below 2.5 mrem/hour specified in the UFSAR. However, the licensee proposed removing information specifying that 2.5 mrem/hour corresponds to an activity level in the water of approximately 0.005 microcurie per gram for the dominant gamma emitting isotopes at the time of refueling (based on UFSAR Table 12.2-8, which provides source terms for components in the SFP purification system, it would appear that the dominant isotopes may be assumed to be Co-58 and Co-60). No source term or other information is provided for the spent fuel pool water to support the statement that the dose on the SFP handling machine will remain below 2.5 mrem/hour nor is the dose contribution from the water to operators on the spent fuel handling machine discussed. In addition to providing information on the dose to an operator during refueling, the SFP water is also a necessary input to the airborne activity calculations in the fuel handling area. Please provide the new spent fuel pool water source term and the methods used to calculate said source term and specify if there are any significant dose increases to operators on the spent fuel handling machine platform or area during refueling.

3. During the audit, it was determined that the revised spent fuel pool water activity was based on the advanced first core RCS source term, which is a lower source term than the design basis RCS source term provided in UFSAR Table 11.1-2. Please justify why it is appropriate to base the fuel handling area airborne activity calculations, fuel handling area ventilation design, and doses from the spent fuel pool water on the advanced first core RCS source term or revise the calculations based on the source term in UFSAR 11.1-2. If an RCS source term other than that provided in UFSAR

Table 11.1-2 is being used, update the UFSAR, as appropriate, to document the alternative source term being used.

**SNC Response to NRC Issue 2**

1. The acronym SFS does stand for the spent fuel pool cooling system. The language in LAR-16-030R1 is not intended to indicate that lowering the SFS purification flow has no impact upon airborne radioactivity values in the fuel handling area, but rather to indicate that the purification flow value considered in LAR-16-030R1 (and supporting calculations) is a conservative lower bound of any likely flowrate that the SFS purification train may exhibit during plant operations, based on conservative decision making in design following established principles of nuclear safety. The nominal design SFS purification flow rate is reduced from 250 gpm to 200 gpm, and a flow rate of 150 gpm is used for the calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area for conservatism. As demonstrated by the results shown in the proposed UFSAR Table 12.2-25, the airborne radioactivity values (and related 10 CFR 20 occupational DAC fractions shown in the calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area) are affected by the proposed changes to this input as well as to the other changes proposed in UFSAR Table 12.2-24, but remain acceptable. Therefore, there is no adverse effect from this and the other proposed changes that impact the calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area.

2. As was done for the certified design described in DCD Revision 19, the 2.5 mrem/hr value was developed from separate design basis analyses than those used to establish airborne radioactivity concentrations, and the 2.5 mrem/hr value is used to establish operational requirements for spent fuel pool activity concentrations, while the calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area is used to illustrate that the ventilation systems, considering plant design and layout arrangements, are capable of sustaining sufficient airflow so as to minimize postulated airborne radioactivity concentrations while meeting heating and cooling and other environmental ventilation requirements.

   The 2.5 mrem/hr value is satisfied as long as concentrations within the spent fuel pool remain below those calculated to correspond to the 2.5 mrem/hr dose rate criterion. The 2.5 mrem/hr is not necessarily indicative of the conservative calculations of spent fuel pool radioactivity concentrations used to determine the bounding airborne radioactivity concentrations in UFSAR Table 12.2-25. Similar to statements provided previously, calculations show that spent fuel pool radioactivity concentrations of between 0.001 microCi/cc (for cobalt-60) and 0.07 microCi/cc (for chromium-51) correspond to 2.5 mrem/hr. The design also includes considerations that take into account mixtures of radionuclides that may be present in the spent fuel pool. These measures convey sum-of-fractions approaches to concentration limits to ensure that when spent fuel pool liquid is controlled to within the stated concentrations, any given mixture does not produce a dose rate in excess of the 2.5 mrem/hr criterion on the fuel handling bridge deck.

   Due to the differences and contrasts in bases between the 2.5 mrem/hr criterion for the fuel handling bridge deck, and the conservative assumptions used to develop the calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area, there is an acknowledged difference in design basis concentrations of liquid in the spent fuel pool in these two analyses. This difference can be attributed to the multiple, large conservatisms that are applied in calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area, where these conservatisms can support an as low as is reasonable achievable (ALARA) program by ensuring that more than adequate ventilation is provided to these areas during operations.

3. As stated in this question, the Advanced First Core Analysis Program (AFCAP) source term values were used in the previous revision of the analysis. However, the original design basis reactor coolant system (RCS) source terms as shown in UFSAR Table 11.2-1 should have been used instead. Therefore, the calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area has since been revised to incorporate inputs using the design basis RCS source terms as shown in UFSAR Table 11.2-1 and to incorporate an updated calculated volume for the fuel handling area to reflect the latest ventilation calculation value, which increases this volume from the originally proposed 225,450 $ft^3$ to 284,000 $ft^3$. Therefore, UFSAR Table 12.2-24 is proposed to be revised to update the fuel handling area free air volume, and UFSAR Table 12.2-25 is proposed to be revised to incorporate revised radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area at the limiting time (48 hours).

<u>Changes to LAR text in ND-17-1499, Enclosure 1, and Proposed Changes to the Licensing Basis Documents in ND-17-1499, Enclosure 3</u>

The following changes to the text of the Request for License Amendment in ND-17-1499, Enclosure 1, and to the Proposed Changes to the Licensing Basis Documents in Enclosure 3, are required per the response to NRC Issue 2, Item 3. These changes are shown in Enclosures 5 and 6 of this letter.

1. On pages 9 and 13 of Enclosure 1, and on page 14 of Enclosure 3, for changes to UFSAR Table 12.2-24, the fuel handling area free air volume is increased from 225,450 $ft^3$ to 284,000 $ft^3$ to reflect the latest ventilation calculation value.
2. On page 10 of Enclosure 1, and on pages 15 and 16 of Enclosure 3, for changes to UFSAR Table 12.2-25, the fuel handling area maximum airborne radioactivity concentrations are revised to update values and to add isotopes that exceed 1.0E-20 $\mu Ci/cm^3$. This includes adding the appropriate concentrations for Br-83, Kr-87, Rb-88, Sr-92, Y-92, Te-131, I-129, I-132, Ba-137m, Pr-144, Rb-86, Rh-103m, Ru-106, Rh-106, Np-239, Sb-127, Sb-129, Rh-105, Zr-97, Nd-147, and Pu-241 to UFSAR Table 12.2-25.

3. On page 10 of Enclosure 1, and on page 17 of Enclosure 3, for changes to UFSAR Table 12.2-25, Footnote 2 is revised to show deletion of isotopes that have a value of 0.0E+00 or greater than 1.0E-20 $\mu Ci/cm^3$ in the updated calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area, and to retain or include isotopes that are expected to exist in the fuel handling area with radionuclide specific maximum airborne radioactivity concentrations less than 1.0E-20 $\mu Ci/cm^3$. This final listing includes $^{191m}Y$, $^{129}Te$, $^{134}Te$, $^{134}I$, $^{139}Ba$, $^{105}Ru$, $^{141}La$, $^{142}La$, $^{241}Am$, $^{238}Pu$, $^{239}Pu$, $^{240}Pu$, $^{242}Cm$, and $^{244}Cm$.

4. On page 13 of Enclosure 1, the last two sentences of item 4 are deleted, as this information is redundant to the previously described changes to UFSAR Table 12.2-25. These two sentences are not necessary, as the paragraph containing item 4 applies to changes to the input parameters for the calculation of radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area shown in UFSAR Table 12.2-24, not Table 12.2-25.
5. On page 14 of Enclosure 1, the resulting maximum airborne radioactivity concentrations for the fuel handling area are revised to reflect a maximum DAC fraction of less than 9.37E-01.

**Issue 3**

With respect to Auxiliary Building airborne radioactivity concentrations the staff notes that using the information provided in LAR 16-030, Revision 1, and methodology provided in the UFSAR, the staff calculates Auxiliary Building airborne radioactivity concentrations for numerous radionuclides over twice as high as what is provided in DCD Table 12.2-27. As part of the audit on this LAR, the licensee explained that while the UFSAR revision to Table 12.2-26, indicates that the primary coolant leakage rate to the Auxiliary Building is 296 lb/day (1.554 grams/second), the value actually used to calculate the airborne activity concentrations in the Auxiliary Building is 0.715 grams/second. The value of 0.715 grams/second is derived based on the assumption that some of the leakage is from sampling and handling activities, which is assumed to be at a lower concentration than the design basis RCS source term. The assumptions made for leakage are more conservative than in the UFSAR and the staff finds them acceptable, however, prior to the LAR, Table 12.2-26 provided sufficient information to calculate the airborne activity concentrations provided in UFSAR Table 12.2-27. Therefore, please update UFSAR Table 12.2-26, so that it provides all the appropriate input parameters to calculate the airborne activities in the Auxiliary Building (i.e. update Table 12.2-26 to explain that although the leakage is assumed to be 1.554 grams/second, the value used to calculate airborne activity is 0.715 grams/second, and explain how the value was derived).

**SNC Response to NRC Issue 3**

As discussed in the NRC Staff audit of the calculation of radionuclide specific maximum airborne radioactivity concentrations in the auxiliary building, it is important to note that not all of the primary coolant leakage to the auxiliary building of 1.554 grams/second (296 lb/day) should be assumed to transport directly to the auxiliary building atmosphere. Of this 1.554 grams/second in assumed leakage, 0.883 grams/second (168 lb/day) are assumed to result from sampling and sample handling activities taking place as part of normal operations. However, not all of this sampling leakage consists of design basis RCS source term activity that is directly available for evaporation to the auxiliary building atmosphere. Previous studies and documents (including ANSI/ANS 55.6-1993) have indicated that assuming that evaporation of fluids from sampling contains 5% RCS activity is appropriate. Therefore, of the total primary coolant leakage to the auxiliary building, only 0.715 grams/second (136 lb/day, calculated as 1.554 grams/second – (0.883 grams/second·* 0.95)) is assumed to be available for direct transport to the auxiliary building atmosphere.

Therefore, UFSAR Table 12.2-26 is proposed to be revised to clarify the assumptions in the calculation of radionuclide specific maximum airborne radioactivity concentrations in the auxiliary building due to primary coolant leakage.

<u>Changes to LAR text in ND-17-1499, Enclosure 1, and Proposed Changes to the Licensing Basis Documents in ND-17-1499, Enclosure 3</u>

The following changes to the text of the Request for License Amendment in ND-17-1499, Enclosure 1, and to the Proposed Changes to the Licensing Basis Documents in Enclosure 3, are required per the response to NRC Issue 3. These changes are shown in Enclosures 5 and 6 of this letter.

1. On pages 10 and 15 of Enclosure 1, and on page 18 of Enclosure 3, for changes to UFSAR Table 12.2-26, discussions are added, and a new Note 3 is added to the table, to clarify the value of primary coolant leakage to auxiliary building of 296 lb/day shown in UFSAR Table 12.2-26. Note 3 is revised to state: "This value represents the total leakage of primary coolant to the auxiliary building from equipment leakage (128 lb/day) and from primary sampling activities (168 lb/day). As indicated in ANSI/ANS 55.6-1993, only 5% of the 168 lb/day leakage from primary sampling activities can be assumed to contain design basis RCS source term activity. This decreases the total primary coolant leakage to the auxiliary building with design basis RCS source term activity used for calculating auxiliary building radioactivity concentrations to 136 lb/day."

**Issue 4**

Staff has the following questions regarding the revisions to UFSAR Table 12.2-26 made in LAR 16-030, Revision 1.

1. The Auxiliary Building and Annex Building HVAC system, shown in UFSAR Figure 9.4.3-1 (Sheet 2 of 3), is made up of three channels. All three channels separate after a common intake and then rejoin at a common exhaust point. Channel 1 (monitored by radiation monitor VAS-RE-002) serves much of the Auxiliary Building controlled area, channel 2 (monitored by radiation monitor VAS-RE-003) serves the remainder of the Auxiliary Building controlled area, and channel 3 (monitored by radiation monitor VAS-RE-008), serves radiologically controlled portions of the Annex Building (note that the fuel handling area HVAC system serves the fuel handling area and other associated areas not covered by the Auxiliary Building and Annex Building HVAC system).

   Prior to the LAR, Note 1 in Table 12.2-26 specified that the Auxiliary Building Airborne Radioactivity Concentrations were calculated without considering the Annex Building exhaust flow. However, in the LAR, Note 1 is revised and specifies that only the Annex Building Exhaust flow from rooms 40357 (containment access corridor), 40551 (containment air filtration exhaust room A), and 40552 (containment air filtration exhaust room B) is excluded. In reviewing UFSAR Figure 9.4.3-1 (Sheet 2 of 3), it clarifies that the portion of the system in the Annex Building (channel 3) also includes the radwaste building access corridor, corridor (unnamed), and the staging and storage area, which are all located in the Annex Building.

   a. Please explain why Table 12.2-26, which provides the input parameters to calculate Auxiliary Building airborne activity, specifically excludes Annex Building rooms 40357, 40551, and 40552, but does not exclude the radwaste building access corridor, corridor (unnamed), and the staging and storage area, which are all in the Annex Building and in the same line. If portions of the Annex Building are being considered in the Auxiliary Building airborne activity calculations please justify why they are being included.

   b. The “free air volume” for the Auxiliary Building in Table 12.2-26 is increased in the LAR. The text of the LAR states that, this change is the result of calculations completed during design finalization activities using final as-designed structural information for the Auxiliary Building. Please clarify if the new “free air volume” now includes some of the Annex Building air volume, since the exhaust flow included in the table appears to account for some areas of the Annex Building. If the volume does include some of the Annex Building areas, explain which portions of the Annex Building are included and why.

2. Table 12.2-26 provides a flashing fraction for noble gases of 1 and other gases of 0.1. Please clarify if “other gases” is referring to all other particulates and halogens discussed in Table 12.2-27. Revise Table 12.2-26, as appropriate and justify the use of the 0.1 value. Also explain what flashing fraction is being used for tritium and justify its use.

**SNC Response to NRC Issue 4**

1. In response to the first part of this question:
   a. Although rooms 40357, 40415, 40550, 40551, and 40552 are located in the annex building, they are served by the radiologically controlled area ventilation system (VAS). Of these, only rooms 40357, 40551, and 40552 are exhausted through the VAS towards the plant vent. Therefore, the exhaust flows only from rooms 40357, 40551, and 40552 are excluded for the purposes of calculating radionuclide specific maximum airborne radioactivity concentrations in the auxiliary building.
   b. Only the annex building rooms served by VAS were considered in the calculation of radionuclide specific maximum airborne radioactivity concentrations in the auxiliary building, and this consideration was only to document the design evaluation of airborne radioactivity internal to these spaces. Note that these annex building rooms were not a source of identified leakage, and so detailed analyses of the airborne radioactivity in these spaces was not required. The exhaust flow from these rooms was not included in the calculation of radionuclide specific maximum airborne radioactivity concentrations in the auxiliary building spaces, as indicated above.

   No annex building volumes are included in this total.
2. A flashing fraction of 1.0 is used for noble gases and tritium, and 0.1 for all other radionuclides. Non-noble gas radionuclides in gaseous form convey a negligible contribution to overall DAC. UFSAR Table 12.2-26 is proposed to be further revised to clarify the assumed flashing fractions.

<u>Changes to LAR text in ND-17-1499, Enclosure 1, and Proposed Changes to the Licensing Basis Documents in ND-17-1499, Enclosure 3</u>

The following changes to the text of the Request for License Amendment in ND-17-1499, Enclosure 1, and to the Proposed Changes to the Licensing Basis Documents in Enclosure 3, are required per the response to NRC Issue 4. These changes are shown in Enclosures 5 and 6 of this letter.

1. On pages 10 and 15 of Enclosure 1, and on page 18 of Enclosure 3 for changes to UFSAR Table 12.2-26, the assumed flashing fractions are revised to specify 1.0 for both noble gases and tritium and 0.1 for other radionuclides.

**Issue 5**

Requirement

In review of LAR 16-30 R1, the staff observes the changes to the radionuclide specific maximum airborne radioactivity concentrations in the auxiliary building. Specifically the staff notes a change to the assumed primary coolant leakage to the auxiliary building. This change results in an increased leakage rate to 296 lb/day from the originally described 20 lb/day in UFSAR Section 12.2, Table 12.2-26. The staff's concern is that the increased primary coolant leakage assumption is not completely described by the licensee and that methods for controlling releases of radioactive material need to be described for 10 CFR Part 20 and 10 CFR Part 50 Appendix I limits.

Issue

Based on the information provided in the subsection titled "Auxiliary Building Airborne Radioactivity Concentration Calculation Input Parameter Changes," the staff is unable to verify if there are anticipated changes to Chapter 11,"Radioactive Waste Management," as a result of the updated assumptions provided to the primary coolant leakage rate into the auxiliary building. The licensee states on page 16 of enclosure 1 that: "During normal operation, the dose from concentrations of airborne radioactive material in unrestricted areas beyond the site boundary is ALARA and within the limits specified in 10 CFR Part 20 and 10 CFR Part 50, Appendix I." In review of the information contained in chapter 11 the staff references NUREG-0017, Rev 1, as describing a 160 lb/day primary coolant leakage rate for use in determining the normal operations source term. This source term is subsequently used to demonstrate compliance with 10 CFR Part 20, Appendix B, effluent concentration limits, and 10 CFR Part 50, Appendix I, dose objectives.

The staff requests the following information:

1. Given the information contained in chapter 11 are based on a 160 lb/day primary coolant leakage rate to the auxiliary building, how is the licensee addressing the increased leakage rate assumption for normal effluent releases to ensure that requirements in 10 CFR Part 20 and 10 CFR Part 50, Appendix I will be met?
2. Describe the assumed changes to the calculated releases for providing reasonable assurance that the 10 CFR Part 50, Appendix I, dose objectives continue to be met.
3. The licensee has not described any monitoring or programs that would be leveraged to ensure 10 CFR Part 20 and 10 CFR Part 50, Appendix I, requirements are met. Please explain how the licensee will ensure compliance with 10 CFR Part 20 and 10 CFR Part 50, Appendix I via monitoring or some other means.

**SNC Response to NRC Issue 5**

UFSAR Chapter 11 describes the model and parameters for analysis of radiological effluents resulting from the radioactive waste management program controls and operation of the radioactive waste processing systems used to verify compliance with 10 CFR Part 20 requirements and the annual offsite dose limits specified in 10 CFR Part 50, Appendix I, including the primary coolant source term, secondary coolant source term, and core source term used in the analysis. UFSAR Section 11.1 distinguishes between the conservative, design basis source term that assumes the design basis fuel defect level that forms the basis for system design and shielding requirements, and the realistic source term that assumes the expected average concentrations of radionuclides in the primary and the secondary coolant used in the UFSAR Chapter 11 radiological effluents calculation. The annual average release of radionuclides from the plant is determined using the PWR-GALE code (UFSAR Subsections 11.2.3.2 and 11.3.3.2), and the use of the realistic source term is incorporated into the AP1000 methodology that applies PWR-GALE (UFSAR Subsections 11.1 and 11.1.3).

LAR-16-030R1 proposes changes to the analysis to determine the radionuclide-specific maximum airborne radioactivity concentrations in the auxiliary building described in UFSAR Chapter 12, which uses the conservative, biased upward design basis source term and uses other conservative input parameters such as a more conservative primary coolant leakage rate to the auxiliary building than assumed in the UFSAR Chapter 11 analyses. Therefore, there are no proposed changes to the expected or realistic conditions used to verify compliance with 10 CFR Part 20 and 10 CFR Part 50, Appendix I dose limits described in UFSAR Chapter 11, and no changes to the model and parameters for analysis of radiological effluents resulting from the radioactive waste management program controls and operation of the radioactive waste processing systems are warranted. The radionuclide specific maximum airborne radioactivity concentrations models include multiple, significant conservatisms that do not represent actual plant operations but are intended to bias airborne radioactivity results upwards. The assumed presence of significant primary leakage is one such assumption. For this reason, no changes are necessary to the UFSAR Chapter 11 radiological analyses or program controls in relation to compliance with 10 CFR Part 20 requirements

Editorial Changes to LAR-16-030R1

The following changes to the text of the Request for License Amendment in ND-17-1499, Enclosure 1, and to the Proposed Changes to the Licensing Basis Documents in Enclosure 3, are made to address editorial inconsistencies to the text shown in these enclosures. These changes are shown in Enclosures 5 and 6 of this letter.

1. On page 9 of Enclosure 1, an editorial change is made to define the acronym for SFP as “spent fuel pool (SFP).”
2. On page 12 of Enclosure 1, an editorial change is made to define the acronym for SFS as “spent fuel pool cooling system (SFS).”
3. On page 14 of Enclosure 1, an editorial change is made to delete the word “each.”
4. On page 17 of Enclosure 3 for changes to UFSAR Table 12.2-25, an editorial change is made to Footnote 1 to delete the word “This.”

**Southern Nuclear Operating Company**

**ND-18-0097**

**Enclosure 5**

**Vogtle Electric Generating Plant (VEGP) Units 3 and 4**

**Revised Excerpts to Text in LAR-16-030R1**

**(LAR-16-030R1S1)**

**Note:**
New text that is added to that shown in SNC letter ND-17-1499 is shown in **bold, black font**, and text that is added or deleted is annotated with a revision bar in the right-hand margin.

(Enclosure 5 consists of five pages, including this cover page.)

1. ND-17-1499, Enclosure 1, page 9 of 24: Paragraph 2, subparagraph a) is revised as follows:

   a) Subsection 9.1.3.1.4 is revised to delete the activity level in the **spent fuel pool (SFP)** that is equivalent to exposure rates to personnel on the SFP fuel handling machine of less than 2.5 millirem per hour.

2. ND-17-1499, Enclosure 1, page 9 of 24: Paragraph 2), subparagraph a) ii is revised as follows:

   ii. The fuel handling area free air volume is increased to **284,000** $ft^3$.

3. ND-17-1499, Enclosure 1, page 10 of 24: Paragraph 2), subparagraphs f) and g) are revised as follows:

   f) Tier 2 Table 12.2-25 is revised to change the radionuclide specific maximum airborne radioactivity concentrations in the fuel handling area to reflect the current maximum airborne radioactivity calculations. **This includes adding the appropriate concentrations for Br-83, Kr-87, Rb-88, Sr-92, Y-92, Te-131, I-129, I-132, Ba-137m, Pr-144, Rb-86, Rh-103m, Ru-106, Rh-106, Np-239, Sb-127, Sb-129, Rh-105, Zr-97, Nd-147, and Pu-241, as the current calculation determined a concentration greater than 1.0E-20 μCi/$cm^3$ for each of these radionuclides.** In addition, the footnotes are revised as follows:

      i. Footnote 1 is revised to state that the maximum activity concentration is calculated to occur 50 hours after shutdown in this case.

      ii. Footnote 2 is revised as follows:

         - An editorial change is made to replace “that” with “than” so that the note reads “…less than…”
         - Reference to $^{56}$Mn, $^{84}$Br, $^{85}$Br, **$^{83m}$Kr,** $^{89}$Kr, $^{89}$Rb, $^{135m}$Xe, $^{137}$Xe, $^{138}$Xe, **and $^{138}$Cs** are deleted, as these radionuclides are not expected to exist in the auxiliary building fuel handling area.
         - References to $^{83}$Br, $^{87}$Kr, **$^{88}$Rb,** $^{92}$Sr, $^{92}$Y, **$^{131}$Te,** $^{129}$I, $^{132}$I, **$^{137m}$Ba, and $^{144}$Pr** are deleted, as the current calculation determined a concentration greater than 1.0E-20 μCi/$cm^3$ for each of these radionuclides.
         - Reference to **$^{139}$Ba, $^{105}$Ru, $^{141}$La, $^{142}$La, $^{241}$Am, $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Cm, and $^{244}$Cm are** added, and existing references to $^{91m}$Y, $^{129}$Te, $^{134}$Te, **and** $^{134}$I are retained, as the current calculation determined a concentration less than 1.0E-20 μCi/$cm^3$ for each of these radionuclides.

g) Tier 2 Table 12.2-26 is revised to change the assumptions used in the calculation of radionuclide specific maximum airborne radioactivity concentrations in the auxiliary building as follows:

   i. The nominal expected ventilation exhaust air flow rate for the VAS auxiliary/annex building ventilation subsystem is increased to 25,320 cfm, which is then reduced by 10% for conservatism in the calculations of the auxiliary building radionuclide specific maximum airborne radioactivity concentrations consistent with Note 2.

   ii. The auxiliary building free air volume is increased to 411,200 $ft^3$.

   iii. The primary coolant leakage to auxiliary building is increased to 296 lbs/day.

   iv. The flashing fraction is revised to add separate flashing fractions for noble gases **and tritium** of 1 and for other **radionuclides** of 0.1.

   v. Note 1 is revised to state: "This flow rate is defined as the sum of the auxiliary/annex building exhaust fan flow minus the annex building exhaust flows from room 40357 (containment access corridor), room 40551 (containment air filtration exhaust room A), and 40552 (containment air filtration exhaust room B)."

   vi. **A new Note 3 is added state: "This value represents the total leakage of primary coolant to the auxiliary building from equipment leakage (128 lb/day) and from primary sampling activities (168 lb/day). As indicated in ANSI/ANS 55.6-1993, only 5% of the 168 lb/day leakage from primary sampling activities can be assumed to contain design basis RCS source term activity. This decreases the total primary coolant leakage to the auxiliary building with design basis RCS source term activity used for calculating auxiliary building radioactivity concentrations to 136 lb/day."**

4. ND-17-1499, Enclosure 1, page 12 of 24: Second paragraph, first sentence is revised as follows:

   During design finalization, the sum of changes to **spent fuel pool cooling system (SFS)** line routing, tee losses, as well as verification of pump inputs and piping, result in changes to the required SFS pump design point (i.e., increases the required total head versus flow rate).

5. ND-17-1499, Enclosure 1, page 13 of 24: First paragraph, subparagraph 3 is revised as follows:

   3. The fuel handling area free air volume used in determining airborne radioactivity concentrations is increased to **284,000** $ft^3$. This change is the result of calculations completed during design finalization activities using final as-designed structural information for the auxiliary building.

6. ND-17-1499, Enclosure 1, page 13 of 24: First paragraph, subparagraph 4 is revised by deleting the last two sentences, such that the revised subparagraph reads as follows:

   4. The revised airborne radioactivity concentration calculations for the fuel handling area also include reducing the time from shutdown to removal of the reactor vessel head to 48 hours, and an increase of the assumed reactor coolant tritium concentration to 3.5 µCi/g. The airborne isotopic concentrations for the fuel handling area provided in UFSAR Table 12.2-25 are based on the assumption described in Footnote 1 to the table, which states that the maximum activity concentration is calculated to occur 2 hours after removal of the head, or 102 hours after shutdown in this case. However, COL Appendix A Technical Specification 3.9.5, Decay Time, allows movement of irradiated fuel assemblies in the reactor pressure vessel after the reactor is subcritical for at least 48 hours for radioactive decay time. Therefore, the airborne radioactivity concentration calculation for the fuel handling area is revised to include this change in input assumption from 102 hours after shutdown to 50 hours after shutdown, which results in the need to revise UFSAR Table 12.2-25.

7. ND-17-1499, Enclosure 1, page 14 of 24: First paragraph, fourth sentence is revised as shown below:

   The proposed changes do not adversely impact this objective, as the design of the VAS still maintains the design functions, including maintaining a ventilation air flow pattern from areas of lower radioactivity to areas of higher radioactivity to prevent releases of radioactive materials to non-radioactive areas, and the resulting maximum airborne radioactivity concentrations for the fuel handling area are maintained at an acceptable level with a maximum DAC fraction of less than **9.37E 01**.

8. ND-17-1499, Enclosure 1, page 15 of 24: Second paragraph under the heading, *Auxiliary Building Airborne Radioactivity Concentration Calculation Input Parameter Changes,* subparagraph 3 is revised as shown below:

   3. The assumed primary coolant leakage to the auxiliary building is increased to 296 lbs/day. This change is the result of calculations completed during design finalization activities using final as-designed piping systems that may contain reactor coolant in the auxiliary building, and accounts for pump, valve, and sampling leakage. **This value represents the total leakage of primary coolant to the auxiliary building from equipment leakage (128 lb/day) and from primary sampling activities (168 lb/day). As indicated in ANSI/ANS 55.6-1993, only 5% of the 168 lb/day leakage from primary sampling activities can be assumed to contain design basis RCS source term activity. This decreases the total primary coolant leakage to the auxiliary building with design basis RCS source term activity used for calculating auxiliary building radioactivity concentrations to 136 lb/day.**

9. ND-17-1499, Enclosure 1, page 15 of 24: Second paragraph under the heading, *Auxiliary Building Airborne Radioactivity Concentration Calculation Input Parameter Changes,* subparagraph 4 is revised as shown below:

    4. The assumed flashing fractions for noble gases **and tritium** of 1 and for other **radionuclides** of 0.1 are added based on Appendix A, Section 5, of Regulatory Guide 1.183.

**Southern Nuclear Operating Company**

**ND-18-0097**

**Enclosure 6**

**Vogtle Electric Generating Plant (VEGP) Units 3 and 4**

**Revised Proposed Changes to the Licensing Basis Documents**

**(LAR-16-030R1S1)**

**Note:**

Added text is shown as bold **Blue Underline**

Deletions are shown as ~~Red Strike-out~~

New text that is added to that shown in SNC letter ND-17-1499 is annotated with a revision bar in the right-hand margin.

(This enclosure consists of six pages, including this cover page.)

**6. UFSAR Section 12.2, "Radiation Sources," Table 12.2-24, "Parameters and Assumptions Used for Calculating Fuel Handling Area Airborne Radioactivity Concentrations":**

**Revise Tier 2 information in this table, as follows:**

| Parameter/Assumption | Value |
|---|---|
| Assumed fuel load | Full core offload |
| Ventilation flow through fuel handling area(1) | ~~17,000~~ 9,500 cfm(2) |
| ~~Iodine filter efficiency~~ | ~~0~~ |
| ~~Particulate filter efficiency~~ | ~~0.99~~ |
| Fuel handling area free air volume | ~~200,000~~ 284,000 $ft^3$ |
| Fuel defects | 0.25% |
| Time from shutdown to reactor vessel head removal | ~~100~~ 48 hours |
| Refueling time | 10 days |
| Spent fuel pool purification flow rate | ~~250~~ 150 gpm |
| * * * | * * * |
| Partition coefficients: | |
| Noble gases | Freely released |
| Tritium | 1 |
| Halogens | 100 |
| Others | 1,000 |
| Evaporation rate of spent fuel pool water | ~~486~~ 430 lbs/hr |
| ~~Spent fuel pool~~ Reactor coolant tritium concentration | ~~1.0~~ 3.5 μCi/g |

**Notes:**

1. This flow rate is defined as the sum of the fuel handling area exhaust ~~fan~~ flow~~s minus the rail car bay/solid radwaste system exhaust flow~~ from room 12562 (fuel handling area) and exhaust flow from room 12562 to room 12471 (solid radwaste system valve/piping area).
2. This is the nominal expected ventilation flow rate. For conservatism, the calculated airborne radioactivity concentrations are based on a 10% lower flow rate.

**7. UFSAR Section 12.2, "Radiation Sources," Table 12.2-25, "Fuel Handling Area Airborne Radioactivity Concentrations":**

**Revise Tier 2 information in this table, as follows:**

| Isotope | Activity(2) |
|---|---|
| Cr-51 | ~~8.7E-12~~ 2.2E-12 |
| Mn-54 | ~~4.8E-12~~ 1.2E-12 |
| Fe-55 | ~~3.7E-12~~ 8.7E-13 |
| Fe-59 | ~~8.7E-13~~ 2.2E-13 |
| Co-58 | ~~1.4E-11~~ 3.3E-12 |
| Co-60 | ~~1.6E-12~~ 3.8E-13 |
| Br-83 | 1.9E-16 |
| Kr-85m | ~~7.6E-16~~ 4.0E-12 |
| Kr-85 | ~~2.2E-10~~ 4.6E-10 |
| Kr-87 | 1.6E-20 |
| Kr-88 | ~~2.7E-19~~ 1.2E-13 |
| Rb-88 | 1.2E-13 |
| Sr-89 | ~~4.2E-12~~ 1.9E-12 |
| Sr-90 | ~~3.7E-13~~ 8.6E-12 |
| Sr-91 | ~~2.1E-14~~ 6.9E-14 |
| Sr-92 | 8.1E-19 |
| Y-90 | ~~1.5E-14~~ 8.7E-14 |
| Y-91 | ~~1.6E-13~~ 2.4E-13 |
| Y-92 | 2.5E-17 |
| Y-93 | ~~1.6E-13~~ 5.8E-15 |
| Zr-95 | ~~1.2E-11~~ 2.7E-13 |
| Nb-95 | ~~8.2E-12~~ 2.7E-13 |
| Mo-99 | ~~7.1E-11~~ 2.1E-10 |
| Tc-99m | ~~1.4E-15~~ 1.9E-10 |
| Ru-103 | ~~2.2E-10~~ 2.4E-13 |
| Ag-110m | ~~4.0E-11~~ 7.0E-13 |
| Te-127m | ~~2.9E-18~~ 1.3E-12 |
| Te-129m | ~~5.4E-12~~ 4.3E-12 |
| Te-131m | ~~4.9E-12~~ 3.9E-12 |
| Te-131 | 8.7E-13 |

| Isotope | Activity[(2)] |
|---|---|
| Te-132 | ~~2.3E-11~~ 8.7E-11 |
| I-129 | 2.6E-16 |
| I-130 | ~~3.5E-18~~ 1.1E-11 |
| I-131 | ~~1.0E-08~~ 1.0E-08 |
| I-132 | 2.7E-15 |
| I-133 | ~~1.8E-09~~ 4.1E-09 |
| I-135 | ~~2.3E-12~~ 5.9E-11 |
| Xe-131m | ~~1.7E-10~~ 4.1E-10 |
| Xe-133m | ~~3.1E-10~~ 1.2E-09 |
| Xe-133 | ~~2.2E-08~~ 6.0E-08 |
| Xe-135 | ~~4.2E-12~~ 4.1E-10 |
| Cs-134 | ~~2.2E-10~~ 1.2E-09 |
| Cs-136 | ~~2.3E-11~~ 1.6E-09 |
| Cs-137 | ~~3.0E-10~~ 8.9E-10 |
| Ba-137m | 8.4E-10 |
| Ba-140 | ~~3.2E-10~~ 1.6E-12 |
| La-140 | ~~1.5E-10~~ 2.2E-13 |
| Ce-141 | ~~4.4E-12~~ 2.7E-13 |
| Ce-143 | ~~1.1E-11~~ 8.3E-14 |
| Pr-143 | ~~9.0E-11~~ 2.4E-13 |
| Ce-144 | ~~1.3E-10~~ 2.1E-13 |
| Pr-144 | 2.1E-13 |
| H-3 | ~~3.9E-06~~ 6.4E-06 |
| Rb-86 | 4.6E-18 |
| Rh-103m | 2.3E-13 |
| Ru-106 | 1.3E-19 |
| Rh-106 | 1.3E-19 |
| Np-239 | 2.7E-18 |
| Sb-127 | 1.1E-17 |
| Sb-129 | 1.5E-20 |
| Rh-105 | 8.6E-20 |
| Zr-97 | 5.0E-20 |
| Nd-147 | 1.5E-19 |
| Pu-241 | 2.9E-20 |

| Isotope | Activity(2) |
|---|---|
| **Total (excluding tritium)** | ~~3.7E-08~~ 8.2E-08 |
| **Iodines** | ~~1.2E-08~~ 1.4E-08 |
| **Particulates** | ~~1.7E-09~~ 5.1E-09 |
| **Noble Gases** | ~~2.3E-08~~ 6.3E-08 |

**Notes:**

1. ~~This~~ The maximum activity concentration is calculated to occur 2 hours after removal of the head, or ~~102~~ 50 hours after shutdown in this case.
2. The following nuclides are expected to exist in the FHA at the time of maximum airborne concentrations with individual nuclide activity concentrations less ~~that~~ than 1.0E-20 µCi/cm$^3$:

   ~~$^{56}$Mn, $^{83}$Br, $^{84}$Br, $^{85}$Br, $^{83m}$Kr, $^{87}$Kr, $^{89}$Kr, $^{88}$Rb, $^{89}$Rb, $^{92}$Sr,~~ $^{91m}$Y, ~~$^{92}$Y,~~ $^{129}$Te, ~~$^{131}$Te,~~ $^{134}$Te, ~~$^{129}$I, $^{132}$I,~~ $^{134}$I, $^{139}$Ba, $^{105}$Ru, $^{141}$La, $^{142}$La, $^{241}$Am, $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Cm, and $^{244}$Cm. ~~$^{135m}$Xe, $^{137}$Xe, $^{138}$Xe, $^{138}$Cs, $^{137m}$Ba, and $^{144}$Pr.~~

## 8. UFSAR Section 12.2, "Radiation Sources," Table 12.2-26, "Parameters and Assumptions Used for Calculating Auxiliary Building Airborne Radioactivity Concentrations":

**Revise Tier 2 information in this table, as follows:**

| Parameter/Assumption | Value |
|---|---|
| Ventilation exhaust flow(1) | ~~25,000~~ 25,320 cfm(2) |
| Free air volume | ~~365,400~~ 411,200 $ft^3$ |
| Primary coolant leakage to auxiliary building(3) | ~~20~~ 296 lb/day |
| Flashing fraction | ~~0.4~~ |
| Noble gases and Tritium | 1 |
| Other Radionuclides | 0.1 |
| Primary coolant source term | See Table 11.1-2. |
| Fuel defects | 0.25% |

**Notes:**

1. This flow rate is defined as the sum of the ~~aux/annex~~ auxiliary/annex building exhaust fan flow minus the annex building exhaust flows from room 40357 (containment access corridor), room 40551 (containment air filtration exhaust room A), and 40552 (containment air filtration exhaust room B). ~~minus room 12555 (VES) and 12556 (containment access) exhaust flow.~~
2. This is the nominal expected ventilation flow rate. For conservatism, the calculated airborne radioactivity concentrations are based on a 10% lower flow rate.
3. This value represents the total leakage of primary coolant to the auxiliary building from equipment leakage (128 lb/day) and from primary sampling activities (168 lb/day). As indicated in ANSI/ANS 55.6-1993, only 5% of the 168 lb/day leakage from primary sampling activities can be assumed to contain design basis RCS source term activity. This decreases the total primary coolant leakage to the auxiliary building with design basis RCS source term activity used for calculating auxiliary building radioactivity concentrations to 136 lb/day.