UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 180 AND 179

TO THE COMBINED LICENSE NOS. NPF-91 AND NPF-92, RESPECTIVELY

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

GEORGIA POWER COMPANY

OGLETHORPE POWER CORPORATION

MEAG POWER SPVM, LLC

MEAG POWER SPVJ, LLC

MEAG POWER SPVP, LLC

CITY OF DALTON, GEORGIA

VOGTLE ELECTRIC GENERATING PLANT UNITS 3 AND 4

DOCKET NOS. 52-025 AND 52-026

1.0 INTRODUCTION

By letter dated December 13, 2019, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19347C046) and supplemented by letter dated March 20, 2020 (ADAMS Accession No. ML20080H345), Southern Nuclear Operating Company (SNC) requested that the Nuclear Regulatory Commission (NRC) amend Vogtle Electric Generating Plant (VEGP) Units 3 and 4, Combined License (COL) Numbers NPF-91 and NPF-92, respectively. The License Amendment Request (LAR) 19-019 requested changes to revise the normal thermal loads for the passive containment cooling system (PCS) tank; revise the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building; and update the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the spent fuel pool (SFP) west wall in the Updated Final Safety Analysis Report (UFSAR).

The supplement dated March 20, 2020, provided additional information that clarified the application but did not expand the scope of the application as originally noticed and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on January 27, 2020 (85 FR 4722).

2.0 REGULATORY EVALUATION

Because the amendment request involves changes to Tier 2* information, NRC approval is required before making the Tier 2* changes addressed in this departure. Tier 2* information is defined in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, Appendix D, Section II.D, "Definitions," as the portion of the Tier 2 information, designated as such in the generic Design Control Document (DCD), which is subject to the change process in Section VIII.B.6 of 10 CFR Part 52, Appendix D. Section VIII.B.6 requires NRC approval for departures from Tier 2* information. Additionally, 10 CFR Part 52, Appendix D, VIII.B.5.a requires prior NRC approval for Tier 2 information departures that involve changes to Tier 2* information.

The staff considered the following regulatory requirements in reviewing the LAR that included the proposed UFSAR changes.

10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion (GDC) 1, "Quality Standards and Records," requires that structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of safety functions to be performed.

10 CFR Part 50, Appendix A, GDC 2, "Design Bases for Protection Against Natural Phenomena," requires that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions.

10 CFR Part 50, Appendix A, GDC 4, "Environmental and Dynamic Effects Design Bases," requires that structures, systems, and components important to safety be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing and postulated accidents, including loss-of-coolant accidents.

The staff considered the following codes and regulatory guidance documents in reviewing the LAR:

- American Concrete Institute (ACI) 349-01, "Code Requirements for Nuclear Safety Related Concrete Structures"

- American Institute of Steel Construction (AISC) N690-94, "Specification for Safety-Related Steel Structures for Nuclear Facilities"

- Section 3.7.2, "Seismic System Analysis," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition"

3.0 TECHNICAL EVALUATION

3.1.1 Structural Evaluation of Proposed Changes

The proposed changes revise loads and reinforcement requirements in critical sections of the shield building, auxiliary building, and SFP walls. The changes have been divided into ten separate changes in LAR-19-019, and each change is addressed separately in this safety evaluation (SE). The proposed changes impact the following Tier 2 and Tier 2* information in the UFSAR:

- Subsection 3H.3.3, “Loads”
- Subsection 3H.5.1.1, “Exterior Wall at Column Line 1”
- Table 3.8.5-3, “Definition of Critical Locations, Thicknesses and Reinforcement for Nuclear Island Basemat”
- Table 3H.5-1, “Nuclear Island: Design Temperatures for Thermal Gradient,”
- Table 3H.5-2, “Exterior Wall at Column Line 1 Forces and Moments in Critical Locations”
- Table 3H.5-3, “Exterior Wall on Column Line 1 Details of Wall Reinforcement”
- Table 3H.5-4, “Interior Wall at Column Line 7.3 Forces and Moments in Critical Locations”
- Table 3H.5-5, “Interior Wall on Column Line 7.3 Details of Wall Reinforcement”
- Table 3H.5-6, “Interior Wall at Column Line L Forces and Moments in Critical Locations”
- Table 3H.5-7, “Interior Wall on Column Line L Details of Wall Reinforcement,”
- Table 3H.5-8, “Design Summary of Spent Fuel Pool Wall Design Loads, Load Combinations, and Comparisons to Acceptance Criteria – Element No. 20477”
- Table 3H.5-9, “Shield Building Roof Reinforcement Summary (Tension Ring)”
- Table 3H.5-11, “Design Summary of Floor at Elevation 135’-3” Area 1 (Between Column Lines M and P)”
- Table 3H.5-12, “Design Summary of Floor at Elevation 135’-3” (Operations Work Area (Previously Known as ‘Tagging Room’) Ceiling)”
- Table 3H.5-15, “Shield Building Roof Reinforcement Ratio of Code Required Versus Provided”

The shield building is the structure that surrounds the containment vessel. The shield building cylinder is a composite steel and concrete structure except for the portion surrounded by the auxiliary building, which is reinforced concrete. During normal operations, a primary function of the shield building is to provide shielding of the containment vessel and the radioactive systems and components located in the containment vessel. The shield building also protects the containment vessel from external events, such as tornados and tornado produced missiles, and aircraft impact. The shield building is an integral part of the passive containment cooling system.

The auxiliary building is a reinforced concrete and structural steel structure with three floors above grade and two floors below grade. The floor slabs and the structural walls of the auxiliary building are structurally connected to the cylindrical section of the shield building. The primary function of the auxiliary building is to provide protection and separation for the seismic Category I mechanical and electrical equipment located outside the containment building. The safety-related systems and components needed to bring the plant to safe shutdown are located

inside the auxiliary building which has thick structural concrete exterior walls that provide protection from missiles generated in other portions of the plant. The external walls and roofs are reinforced concrete.

To perform the technical evaluation, the staff considered VEGP UFSAR Section 3.8, "Design of Category I Structures." The staff also examined the portions of NUREG–1793, Supplement 2, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design" (ADAMS Accession No. ML112061231), and "Final Safety Evaluation Report for the Vogtle Electric Generating Plant Units 3 and 4 Combined License Application" (ADAMS Accession No. ML110450302) documenting the staff's technical evaluation of those aspects of the AP1000 DCD and VEGP Units 3 and 4 COL application, respectively.

Sections 3.1.1.1 through 3.1.1.10 and Section 3.1.2, below, summarize the staff's review of each of the ten separate changes described in LAR 19-019.

3.1.1.1 Change 1A – PCS Tank Wall Normal Temperature (UFSAR Subsection 3H.3.3 and Table 3H.5-1)

The LAR notes that there is an inconsistency in the assumed PCS Water Storage tank temperature identified in UFSAR Subsection 3H.3.3, Table 3H.5-1, and other portions of the licensing basis. Subsection 3H.3.3 identifies the water temperature in the tank as 70ºF when the outside temperature is 115ºF, and Table 3H.5-1 uses these values when determining the thermal gradient across the PCS tank walls for normal thermal loading. However, the technical specifications (TS) identify the minimum tank temperature as 40ºF and the maximum temperature as 120ºF. The structural design was based on the allowed TS temperature and assumes the inside temperature will be 40ºF, even in the summer. The structural design uses the following values for the thermal gradient: 40ºF (inside) / 115ºF (outside) and 40ºF (inside) / -40ºF (outside). SNC in LAR 19-019 seeks to update subsection 3H.3.3 and the "PCS Tank Walls" row in Table 3H.5-1 to show the revised temperatures.

In support of LAR 19-019, SNC evaluated the PCS tank exterior wall for the updated temperature. The results of the evaluation determined that the existing design, and the associated reinforcement provided in the design, were bounding and; therefore, no changes to the PCS tank design or reinforcement were necessary. SNC stated that the temperature change does not impact the demands or reinforcement details captured in UFSAR Table 3H.5-9, Sheet 3 or Figure 3H.5-11.

The staff reviewed the proposed temperature change, as captured in UFSAR Section 3H.3.3 and Table 3H.5-1, and concludes the change is acceptable because using the lower allowable temperature to determine the thermal gradient is conservative. The change in temperature does not impact the overall design of the PCS tank and the design continues to meet the requirements of ACI 349-01 and AISC N690-94.

3.1.1.2 Change 1B – Auxiliary Building Exterior Walls Below Grade and Basemat Accidental Thermal Loads (UFSAR Table 3H.5-1)

The LAR notes that there is an inconsistency in the thermal loads in UFSAR Table 3H.5-1 and UFSAR Table 3D.5-4, "Abnormal Operating Environments Outside Containment," for the below-grade exterior walls and the basemat in the auxiliary building. UFSAR Table 3H.5-1 currently does not require considering accident thermal loads in the below-grade exterior walls and the basemat in the auxiliary building. However, UFSAR Tables 3D.5-4 and 3D.5-5, "Accident

Environments," show that accident temperatures of 140ºF could occur in rooms with below-grade exterior walls and basemat due to loss of heating, ventilation, and air conditioning (HVAC) or AC power. Therefore, SNC stated that the walls need to be designed for an accident thermal gradient, and UFSAR Table 3H.5-1 needs to be updated accordingly. The licensee stated that using the standards of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the exterior, below-grade temperature is estimated as 50ºF. In addition to the changes in UFSAR Table 3H.5-1, the critical sections of the basemat and Wall 1 were impacted; however, the associated changes are addressed in change 2A and 2B.

The staff reviewed the proposed temperature change, as captured in UFSAR Table 3H.5-1, and concludes the change is acceptable because it updates the table to accurately reflect the existing accident thermal gradient. The associated impacts on the governing load combinations and demands for the impacted critical sections are discussed and reviewed below in changes 2A (UFSAR Table 3.8.5-3) and 2B (UFSAR Tables 3H.5-2 and 3H.5-3).

3.1.1.3 Change 2A – Basemat Critical Section Table Update (UFSAR Table 3.8.5-3)

UFSAR Table 3.8.5-3 shows the required and provided reinforcement for critical sections in the basemat. While updating the temperatures in Table 3H.5-1, as discussed above, the critical section tables were revisited, and the values were updated as necessary. The original Table 3.8.5-3 also included a note that seismic loads and normal thermal loads were evaluated in the design calculations, but the tables did not reflect demands from the combined loads because the thermal loads were determined to be insignificant and the provided reinforcement would bound the required reinforcement when seismic and thermal loads were combined. The proposed change in LAR 19-019 removes that note and updates the table to show the required reinforcement for load combinations with seismic and thermal loads combined. These changes add clarity to the table but do not impact the design because the provided reinforcement is adequate because it continues to meet the requirements of ACI 349-01.

In addition to the changes in the thermal loads, SNC in LAR 19-019 proposes additional changes in the design documents and in Table 3.8.5-3 as summarized below:

- An updated nuclear island finite element model was used to revise the liftoff and basic stress analyses;
- The top reinforcement cover was revised due to construction requirements;
- Existing Note 6 related to the thermal loads was replaced with a note explaining that a 5'-0" portion of the basemat between column line L to 5' east of the column line and between the shield building and column line 9.2 is not included in the table.

The LAR notes that the revised analysis remains in compliance with the licensing basis requirements and with the updated demands, and the basemat design continues to comply with ACI 349-01.

The staff reviewed the proposed changes and the updates to UFSAR Table 3.8.5-3. The staff notes that the revised analysis is consistent with UFSAR Appendix 3G, "Nuclear Island Seismic Analyses," and the concrete cover continues to comply with the requirements in ACI 349-01. The staff also reviewed the updated table and noted that all the required reinforcement values per ACI 349-01 code are below the reinforcement values provided in the design. Therefore, the analysis changes do not impact the final design. The staff concludes the changes in UFSAR Table 3.8.5-3 are acceptable because they update the table to accurately reflect the analysis,

which was conducted in accordance with the methods described in the UFSAR, and the updated design continues to meet the requirements of ACI 349-01. The revision of Note 6 is acceptable because it clearly explains that a small portion of the basemat is not addressed by the information in the table and removes the note regarding thermal loads, which is no longer accurate.

3.1.1.4 Change 2B – Wall 1 Critical Section Table Update (UFSAR Tables 3H.5-2 and 3H.5-3)

The LAR notes that there are two critical section tables for Wall 1 in the UFSAR. UFSAR Table 3H.5-2 shows the moments and forces in different sections of Wall 1, while Table 3H.5-3 shows the required and provided reinforcement based on the demands in Table 3H.5-2. While updating the design and associated tables to account for the changes in the thermal loads, additional changes were proposed in LAR 19-019 as summarized below:

- The basic load combinations were expanded upon to consider the directionality of the seismic loads along with the thermal loads;
- The calculations were updated by using refined meshing in the finite element analysis (FEA) and taking design forces and moments from the global finite element model (FEM);
- The updated calculations use a thermal reduction factor that changes by elevation and more accurately represents the thermal demand;
- Note 2, related to the thermal loads, was deleted since it was no longer accurate.

The LAR notes that the required reinforcement is less than the provided reinforcement in all cases and the provided reinforcement complies with ACI 349-01.

The staff reviewed the changes to the design and finds them acceptable. The updated load combinations are more comprehensive, and the refined analysis provides more accurate results by using the global FEM, which more accurately reflects localized demands. In addition, altering the thermal reduction factor by elevation more accurately reflects the actual thermal behavior and provides a more accurate analysis.

The staff also reviewed the proposed changes to UFSAR Tables 3H.5-2 and 3H.5-3. The staff performed an audit as part of its review of this LAR (ADAMS Accession No. ML20084L502). During its audit of calculations associated with Table 3H.5-2, the staff questioned if the controlling load case for elevation 82'-6" to 66'-6" should include accident thermal and pipe reaction (i.e., load combination 7) since the staff believed this area contained piping. In response to the staff's questions, the licensee verified that the load cases shown in the table are the governing load cases. To add clarity, the licensee updated UFSAR Section 3H.5.1.1 to clearly state that the information provided in Tables 3H.5-2 and 3H.5-3 is related to the governing load conditions. During the audit, the staff verified the associated calculation (APP-1200-S3C-106, Revision 2) and confirmed that load combination 3, shown in the proposed markup, is the governing load case. Based on the audit and the information provided in the LAR, the staff concludes that the changes in UFSAR Section 3H.5.1.1 and Table 3H.5-2 are acceptable because they update the UFSAR to accurately reflect the analysis, which was conducted in accordance with the methods described in the UFSAR and continues to meet the requirements of ACI 349-01.

The staff also reviewed the updated values in Table 3H.5-3 and noted that all the required reinforcement values are below the provided minimum reinforcement values in the design. The revised analysis is consistent with the UFSAR and the updated design reinforcement meets the

requirements of ACI 349-01. The staff concludes that the changes in UFSAR Table 3H.5-3 are acceptable because they update the table to accurately reflect the analysis, which was conducted in accordance with the methods described in the UFSAR, and continue to meet the requirements of ACI 349-01. The removal of Note 2 is acceptable because it removes the previous note regarding thermal loads, which is no longer accurate.

3.1.1.5 Change 2C – Wall 7.3 Critical Section Table Update (UFSAR Tables 3H.5-4 and 3H.5-5)

The LAR notes that there are two critical section tables for Wall 7.3 in the licensing basis. UFSAR Table 3H.5-4 shows the moments and forces in different elevations of Wall 7.3, based on the controlling load combination, while Table 3H.5-5 shows the required and provided reinforcement based on the demands in Table 3H.5-4. SNC in LAR 19-019 proposes to update these two tables to account for changes in the design, which are summarized below:

- The basic load combinations were expanded upon to consider the directionality of the seismic loads along with thermal loads;
- The calculations were updated by using refined meshing in the FEA and taking design forces and moments from the global FEM;
- The updated calculations use a thermal reduction factor that changes by elevation and more accurately represents the thermal demand;
- Concrete reinforcement cover was increased to 2" to accommodate embedment plates;
- The T headed shear reinforcement between elevation 155'-6" and the roof was replaced with conventional reinforcement, and the area in Table 3H.5-5 was updated accordingly;
- Note 1 in Table 3H.5-5, related to thermal loads, was deleted since it was no longer accurate.

The LAR notes that the required reinforcement is less than the provided reinforcement in all cases. Since the required reinforcement is less than the provided reinforcement, the changes comply with ACI 349-01.

The staff reviewed the changes to the design and finds them acceptable. The updated load combinations are more comprehensive, and the refined analysis provides more accurate results by refining the FEA mesh and using the global FEM, which more accurately reflects localized demands. In addition, altering the thermal reduction factor by elevation more accurately reflects the actual thermal behavior and provides a more accurate analysis. The updated concrete cover and changed shear reinforcement both continue to meet the requirements of ACI 349-01.

The staff also reviewed the proposed changes to UFSAR Tables 3H.5-4 and 3H.5-5. The staff noted that all the required reinforcement values are below the reinforcement values provided in the design. The revised analysis is consistent with the requirements described in the UFSAR and the updated design reinforcement meets the requirements of ACI 349-01. The staff concludes that the changes in UFSAR Tables 3H.5-4 and 3H.5-5 are acceptable because they update the table to accurately reflect the analysis, which was conducted in accordance with the methods described in the UFSAR, and continues to meet the requirements of ACI 349-01. The removal of Note 1 is acceptable because it removes the previous note regarding thermal loads, which is no longer accurate.

3.1.1.6 Change 2D – Wall L Critical Section Table Update (UFSAR Tables 3H.5-6 and 3H.5-7)

The LAR notes that there are two critical section tables for Wall L in the licensing basis. UFSAR Table 3H.5-6 shows the moments and forces in different elevations of the wall, based on the controlling load combination, while Table 3H.5-7 shows the required and provided reinforcement based on the demands in Table 3H.5-6. SNC in LAR 19-019 proposes to update these two tables to account for changes in the design, which are summarized below:

- The basic load combinations were expanded upon to consider the directionality of the seismic loads along with thermal loads;
- The calculations were updated by using refined meshing in the FEA and taking design forces and moments from the FEM;
- The updated calculations use a thermal reduction factor that changes by elevation and more accurately represents the thermal demand;
- Concrete reinforcement cover was increased to 2" to accommodate embedment plates;
- The T headed shear reinforcement between elevation 135'-3" and 154'-2" was replaced with conventional reinforcement and the area in Table 3H.5-7 was updated accordingly;
- The main steam isolation valve (MSIV) and steam generator accident pressure was updated to account for a previous LAR 17-028;
- Note 1 in Table 3H.5-7, related to thermal loads, was deleted since it was no longer accurate.

The LAR notes that the required reinforcement is less than the provided reinforcement in all cases. Since the required reinforcement is less than the provided reinforcement, SNC states that the changes comply with ACI 349-01 and are acceptable.

The staff reviewed the changes to the design and finds them acceptable. The updated load combinations are more comprehensive, and the refined analysis provides more accurate results by refining the FEA mesh and using the global FEM, which more accurately reflects localized demands. In addition, altering the thermal reduction factor by elevation more accurately reflects the actual thermal behavior and provides a more accurate analysis. The updated concrete cover and changed shear reinforcement both continue to meet the requirements of ACI 349-01. The change to the MSIV and steam generator accident pressure (LAR 17-028) was previously approved (ADAMS Accession No. ML18085A932), and the updated values have been incorporated into the design.

The staff also reviewed the proposed changes to UFSAR Tables 3H.5-6 and 3H.5-7. The staff noted that all the required reinforcement values are below the provided minimum reinforcement values. The revised analysis is consistent with the methods described in the UFSAR and the updated design reinforcement meets the requirements of ACI 349-01. The staff concludes that the changes in UFSAR Tables 3H.5-6 and 3H.5-7 are acceptable because they update the table to accurately reflect the analysis, which was conducted in accordance with the UFSAR and continues to meet the requirements of ACI 349-01. The removal of Note 1 is acceptable because it removes the previous note regarding thermal loads, which is no longer accurate.

3.1.1.7 Change 2E – Shield Building Roof Critical Section Table Update (UFSAR Tables 3H.5-9 and 3H.5-15)

The LAR notes that there are two critical section tables for the shield building roof in the licensing basis. UFSAR Table 3H.5-9 shows the demands and capacities of the air inlet and tension ring, while Table 3H.5-15 shows the demands and capacities of the PCS tank exterior

wall and conical roof. SNC in LAR 19-019 proposes to update these two tables to account for changes in the analysis that accounted for seismic and thermal loads combined. Note 2 in Table 3H.5-9, related to thermal loads, was deleted since it was no longer accurate.

The LAR notes that the required reinforcement is less than the provided reinforcement in all cases and the structural design remains in compliance with the applicable requirements in ACI 349-01 and AISC N690-94. In UFSAR Table 3H.5-9, the demand to capacity ratio in the tension ring section "1 lower" is equal to 1.0; however, the LAR explains that this value contains conservatisms beyond those required by AISC N690-94. If those conservatisms are removed, the ratio is reduced to 0.625.

The staff reviewed the proposed changes to UFSAR Tables 3H.5-9 and 3H.5-15 and as part of the review, the staff audited the supporting calculations. AISC N690-94 allows a stress limit coefficient of 1.6 to be applied to the allowable stresses associated with load combinations including safe shutdown earthquake (SSE) loads. During its audit, the staff confirmed that calculation APP-1278-GEF-084, Revision 0 conservatively used a coefficient of 1.0, instead of the allowable coefficient of 1.6. Therefore, the design ratio of 1.0 on Sheet 1 of 3 of Table 3H.5-9 is acceptable, since it would be well below 1.0 if the conservatisms were removed and the coefficient of 1.6 was applied.

During its audit of calculation APP-1278-GEF-084, the staff noted that the values in Table A.4-4, which supports the values in UFSAR Table 3H.5-9, Sheet 2b of 3, did not match with the values provided in the proposed UFSAR markup. In addition, the calculation contained a note explaining that the stresses in the upper and lower sections have been averaged; however, a corresponding note was not included in the proposed UFSAR markup. In response to the staff's questions on this issue, the licensee verified that the load cases shown in the table are the governing load cases. To add clarity, the licensee updated Sheet 2b of Table 3H.5-9 to align with the calculation and added a note clearly stating the values reflect averaged results between the upper and lower sections. During its review of Table 3H.5-9, the licensee identified other values that needed to be updated to properly reflect the updated analysis in both Table 3H.5-9 and Table 3H.5-15, as well as an additional note that needed to be added to Table 3H.5-15 that stated the values reflected average results between different angles of the stress line. The licensee updated the tables in a supplement to the LAR which was submitted by letter dated March 20, 2020 (ADAMS Accession No. ML20080H345). The staff verified that the updated tables align with the values in the supporting calculations and that the required reinforcement continues to be less than the provided reinforcement.

The staff concludes that the changes in UFSAR Tables 3H.5-9 and 3H.5-15 are acceptable because they update the table to accurately reflect the analysis, which was conducted in accordance with the methods described in the UFSAR, and continue to meet the requirements of ACI 349-01 and AISC N690-94. The removal of Note 2 from Table 3H.5-9 is acceptable because it removes the previous note regarding thermal loads, which is no longer accurate, and the addition of Note 3 to Tables 3H.5-9 and 3H.5-15 is acceptable because it clearly notes that the values shown in the table are averages from the calculation.

3.1.1.8 Change 3 – SFP West Wall Critical Section Table Update (UFSAR Table 3H.5-8)

The LAR notes that the west wall of the SFP, along column line L-2, is a critical section. UFSAR Table 3H.5-8 shows the design forces and moments under critical load cases at seven critical locations, which are defined in UFSAR Figure 3H.5-10, "Spent Fuel Pool Wall Divider Wall Element Locations." Table 3H.5-8 also shows the required steel plate thickness without thermal

versus provided steel plate thickness, maximum principal stress versus yield stress, and maximum stress intensity versus allowable stress intensity. SNC in LAR 19-019 proposes to update Table 3H.5-8 to account for changes in the SFP wall design, which are summarized below:

- The accident thermal loads are combined with the seismic loads;
- The SFP FEM is refined by changing the element size from 5' x 5' to 1' x 1';
- The boundary conditions in the FEM were updated to include a fixed-pinned condition to account for changes to the floor-wall connection that was approved in LAR-16-009 (ADAMS Accession No. ML17037D024).

The LAR notes that the required plate thickness remains below the thickness provided in the design and the maximum stresses remain below the allowable values. SNC further stated that the design continues to comply with the applicable requirements in ACI 349-01 and AISC N690-94.

The staff reviewed the changes to the design and noted that the updated load combinations are more comprehensive, and as stated by the licensee, the refined FEM provides a more realistic representation of the stresses at discontinuities in the structure, such as corners. In addition, the new FEM boundary conditions more accurately represent the floor to wall connection in the SFP. Further, the seismic design analysis methods and FEA models are described in the UFSAR Section 3.7, “Seismic Design,” and related appendixes. In these sections ANSYS models are sufficiently detailed to capture global and in-structure response at key equipment and building locations. However, for detailed design, local FEA models with a refined mesh size different than the global seismic models are used to capture a more detailed response of localized demand for the reinforcement design in the localized area. These subsystem models use the seismic inputs and boundary conditions consistent with the nuclear island model(s) as described in the UFSAR. For conservatism, two models were developed, one with fixed-fixed connections and the other with fixed-pinned connections, and the limiting values from each model were chosen for the updated design. The staff finds the design changes acceptable because the updated models more accurately capture the actual behavior of the structure and the updated load combinations are more comprehensive. In addition, the updated design continues to meet the requirements of ACI 349-01 and AISC N690-94. The staff also reviewed the proposed changes to UFSAR Table 3H.5-8. The staff noted that all the maximum principal stresses remain below the yield stress, and the maximum stress intensity remains below the allowable stress intensity. The staff concludes that the changes in UFSAR Table 3H.5-8 are acceptable because they update the table to accurately reflect the analysis, which was conducted in accordance with the methods described in the UFSAR and they continue to meet the requirements of ACI 349-01 and AISC N690-94.

3.1.1.9 Change 4A – Auxiliary Building Composite Floor Critical Section Table Update (UFSAR Table 3H.5-11)

The LAR notes that UFSAR Table 3H.5-11 shows the demands and capacities of the auxiliary building area 1 (between column lines M and P) composite floor at elevation 135'-3". SNC in LAR 19-019 proposes to update this table to account for changes in the floor design, which are summarized below:

- Seismic mass was modified by counting 25% of the live load instead of 100%;
- Refined vertical seismic acceleration;
- Accounted for air handling unit loads.

The LAR notes that the required reinforcement remains below the provided reinforcement and the design continues to comply with the applicable requirements in ACI 349-01 and AISC N690-94.

The staff reviewed the changes to the design and noted that the acceptance criteria in Section 3.7.2, "Seismic System Analysis," of NUREG-0800, the Standard Review Plan (SRP), allows 25% of the live load to be used when determining the seismic mass. Refining the seismic acceleration and accounting for additional loads more accurately estimates the stresses in the structures. The staff finds the design changes acceptable because the updated mass is consistent with the guidance in the SRP and refining the acceleration and loading in the analysis provides a more accurate estimate of the stresses in the structure. In addition, the updated design continues to meet the requirements of ACI 349-01 and AISC N690-94. The staff also reviewed the proposed changes to UFSAR Table 3H.5-11. The staff noted that all the governing stresses remain below the allowable stress, and the required reinforcement remains below the provided reinforcement. The staff concludes that the changes in UFSAR Table 3H.5-11 are acceptable because they update the table to accurately reflect the analysis, which was conducted in accordance with the methods described in the UFSAR and continue to meet the requirements of ACI 349-01 and AISC N690-94.

3.1.1.10 Change 4B – Auxiliary Building Tagging Room Ceiling Critical Section Table Update (UFSAR Table 3H.5-12)

The LAR notes that UFSAR Table 3H.5-12 shows the demands and capacities of the tagging room ceiling, which is cast-in-place concrete placed on precast concrete, at elevation 135'-3". SNC in LAR 19-019 proposes to update this table to account for changes in the design, which are summarized below:

- Refined analysis to more accurately account for 2-way behavior of the slab;
- Revised design methodology as approved in LAR 14-003.

The LAR notes that the required reinforcement remains below the provided reinforcement and the design continues to comply with the applicable requirements in ACI 349-01.

The staff reviewed the changes to the design and finds them acceptable. The refined analysis provides more accurate estimates of the stresses in the structure, and updating the design methodology (LAR 14-003) was previously approved (ADAMS Accession No. ML14150A133). Using the updated methodology is conservative and increases the amount of reinforcement necessary in the cast-in-place portion of the floor. The required reinforcement remains smaller than the provided reinforcement, and the updated design continues to meet the requirements of ACI 349-01. The staff also reviewed the proposed changes to UFSAR Table 3H.5-12. The staff noted that all the required reinforcement values are below the reinforcement values provided in the design.

3.1.2 Mechanical Evaluation

Regarding piping systems including piping, pipe supports, pumps, and valves, the LAR states that the proposed changes align the impacted sections with the temperature inputs used in the physical design, qualification, and operation of systems and components, such as those in Appendix 3D of the UFSAR for equipment qualification. Because the proposed changes in temperature are aligned with the temperature design inputs used in the piping design analysis,

the staff finds that there is no adverse impact on the structural integrity of piping systems related to this change. Further, the staff finds that there is no adverse impact on the capability of components, such as pumps and valves, to perform their design functions from the alignment of the temperature inputs used in the physical design, qualification, and operation of systems and components.

3.1.3 Evaluation Summary

The staff has reviewed the licensee's analysis provided in the LAR, specifically Sections 2 and 3 of its submittal dated December 13, 2019, and Supplement 1, dated March 20, 2020. Based on its technical review, the staff concludes that the applicable design provisions of ACI 349-01 and AISC N690-94 have been met, which ensures there is reasonable assurance that 10 CFR Part 50 Appendix A, GDC 1, GDC 2, and GDC 4, and 10 CFR Part 52, Appendix D will continue to be met. Therefore, the staff finds the proposed changes to be acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Georgia State official was notified of the proposed issuance of the amendment on January 27, 2020. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (85 FR 4722, dated January 27, 2020). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

The staff has concluded, based on the considerations discussed in Section 3.0, that there is reasonable assurance that: (1) the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public. Therefore, the staff finds the changes proposed in this license amendment acceptable.

6.0 REFERENCES

1. Southern Nuclear Operating Company, Vogtle Electric Generating Plant Units 3 and 4, "Request for License Amendment: Reconciliation of Environmental Conditions Inputs to Civil Structural Design Licensing Basis (LAR-19-019)," December 13, 2019 (ADAMS Accession No. ML19347C046).

2. Southern Nuclear Operating Company, Vogtle Electric Generating Plant Units 3 and 4, "Revision to Request for License Amendment: Reconciliation of Environmental Conditions Inputs to Civil Structural Design Licensing Basis (LAR-19-019R1)," March 20, 2020 (ADAMS Accession No. ML20080H345).

3. Vogtle Electric Generating Plant Units 3 and 4, Updated Final Safety Analysis Report, Revision 8 and Tier 1, Revision 7, June 14, 2019 (ADAMS Accession No. ML19171A096).

4. AP1000 Design Control Document, Revision 19, June 13, 2011 (ADAMS Accession No. ML11171A500).

5. Combined License NPF-91 for Vogtle Electric Generating Plant Unit 3, Southern Nuclear Operating Company (ADAMS Accession No. ML14100A106).

6. Combined License NPF-92 for Vogtle Electric Generating Plant Unit 4, Southern Nuclear Operating Company (ADAMS Accession No. ML14100A135).

7. Vogtle Electric Generating Plant Units 3 and 4, License Amendment Request 19-019, Staff Audit Discussion Topics. U.S. Nuclear Regulatory Commission (Public-Redacted). U.S. Nuclear Regulatory Commission. January 29, 2020 (ADAMS Accession No. ML20029F008).

8. Regulatory Audit Summary for License Amendment Request: Reconciliation of Environmental Conditions Inputs to Civil Structural Design Licensing Basis (LAR 19-019). U.S. Nuclear Regulatory Commission. April 20, 2020 (ADAMS Accession No. ML20084L502).