SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS

RELATED TO AMENDMENT NO. 67

TO THE COMBINED LICENSE NOS. NPF-93 AND NPF-94

SOUTH CAROLINA ELECTRIC & GAS COMPANY

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

VIRGIL C. SUMMER NUCLEAR STATION, UNITS 2 AND 3

DOCKET NOS. 52-027 AND 52-028

1.0 INTRODUCTION

By letter dated June 16, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16168A282), the South Carolina Electric & Gas Company (SCE&G/licensee), on behalf of itself and the South Carolina Public Service Authority, requested that the U.S. Nuclear Regulatory Commission (NRC) amend the combined licenses (COL) for Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3, COLs NPF-93 and NPF-94, respectively. The SCE&G-proposed license amendment request (LAR 14-14) consists of changes to the Updated Final Safety Analysis Report (UFSAR) in the form of departures from the incorporated plant-specific Design Control Document (DCD) Tier 2 information and also involves changes to UFSAR Tier 2* information. In Enclosure 1 of this letter, the licensee included nine specific "Change Activities" that outline the scope of this request. Enclosure 2 to the letter included the pages proposed to be changed (a.k.a. "mark-up" pages). The proposed changes are generally related to the design of selected auxiliary building floors including finned floors, CA20 module floors, and precast panel floors as described below, main control room (MCR) and instrumentation and control (I&C) room ceilings, and the location of heating ventilation, and air conditioning (HVAC) ducts in the MCR floor as well as the number of supporting steel plates. Other changes include various notes that explain the extent of variations in the specific design of these structures.

In a letter dated July 7, 2016 (ADAMS Accession No. ML16189A453), the licensee submitted LAR Revision 1 (LAR 14-14 R1), that replaced Enclosures 1 and 2 of the June 16, 2016, request with Enclosures 3 and 4. These enclosures reduced the scope of the original submittal to include only the auxiliary building CA20 module floors and provided changes related to the staff's questions raised in the public meeting dated May 26, 2016 (ADAMS Accession No. ML16168A121), that were not found in the original request. Enclosure 3 included Change Activities 1, 5, and 6 only. Enclosure 4 was limited to the mark-up pages related to the associated change activities.

In a letter dated August 16, 2016 (ADAMS Accession No. ML16230A179), the licensee submitted LAR Revision 2 (LAR 14-14 R2), that replaced Enclosures 3 and 4 of the July 7, 2016, letter (that in turn replaced Enclosures 1 and 2 of the June 16, 2016, letter) Enclosures 5 and 6. In Revision 2, the licensee returned the scope of the LAR from the reduced scope of Revision 1 to the full scope of the original submittal (June 16, 2016). This letter replaced Enclosures 3 and 4 from July 7, 2016, letter with Enclosures 5 and 6 and added additional clarifications such as an exact listing of the rooms in the CA20 module (north and south sides) that are within the scope of this request.

In a letter dated October 24, 2016 (ADAMS Accession No. ML16299A064), the licensee submitted LAR Revision 3 (LAR 14-14 R3), which contained revisions and supplements to address NRC staff comments. LAR 14-14 R3 replaced Enclosures 5 and 6 from the August 16, 2016, letter with Enclosures 7, 9, and 10. This revision added, in Enclosure 7, one new Change Activity to the nine activities cited in previous revisions of the LAR. Enclosure 9 contains non-sensitive UFSAR mark-up pages that are updates to those given in the June 16, 2016, Enclosure 2. Change Activity 10 added construction information on finned floors and CA20 floors. The Enclosure 10 contained UFSAR markups that are considered to be sensitive unclassified security-related information, based on the building layout information contained in the enclosure. LAR 14-14 R3 addresses staff comments from the public meeting dated August 25, 2016 (ADAMS Accession No. ML16267A419).

In a letter dated December 21, 2016 (ADAMS Accession No. ML16357A257), the licensee submitted LAR 14-14 R3, Supplement 1 (LAR 14-14 R3 S1), to address NRC staff's request for additional information (RAI) on dose calculations (ADAMS Accession No. ML16306A309). The staff RAI was addressed in Enclosure 11 to the LAR 14-14 R3 S1.

On August 2, 2016, the NRC staff published a proposed no significant hazards consideration determination in the *Federal Register* (81 FR 50729) for the proposed amendment. Subsequently, by letter dated August 16, 2016, the licensee provided additional information that expanded the scope of the amendment request as originally noticed in the *Federal Register*. Accordingly, the NRC published a second proposed no significant hazards consideration determination in the *Federal Register* on September 2, 2016 (81 FR 60749), which superseded the original notice in its entirety.

By letter dated June 14, 2016 (ADAMS Accession No. ML16166A409), Southern Nuclear Operating Company, Inc. (SNC), the licensee for Vogtle Electric Generating Plant (VEGP) Units 3 and 4, submitted LAR 16-009. VCSNS's LAR 14-14 is identical in technical content to that of the license amendment request submitted to the NRC by SNC for VEGP Units 3 and 4, as revised and supplemented. On March 6, 2017, the NRC issued License Amendment Nos. 75 and 74 for VEGP Units 3 and 4, respectively, (ADAMS Accession No. ML17037D033) regarding LAR 16-009.

The staff's review of the VCSNS's LAR 14-14 is included in this safety evaluation.

2.0 REGULATORY EVALUATION

Regulations in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Appendix D, "Design Certification Rule for the AP1000 Design," Sections VIII.B.6.a require, in part, NRC approval for departures from Tier 2* information. Because the proposed amendment request involves changes to Tier 2*

information, NRC approval is required before making the Tier 2* changes addressed in this departure. LAR 14-14, as revised and supplemented, involves changes to Tier 2* information.

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

Regulations in 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," require that structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed.

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

Regulations in 10 CFR Part 50, Appendix A, GDC 3, "Fire Protection," require, in part, that structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions.

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

Regulations in 10 CFR Part 50, Appendix A, GDC 19, "Control Room," require that adequate radiation protection shall be provided to ensure that radiation exposure shall not exceed 0.05 Sv (5 rem) total effective dose equivalent (TEDE) as defined in 10 CFR 50.2 for the duration of the accident.

Regulations in 10 CFR 50.34(f)(2)(vii) require that radiation shielding and design reviews of spaces around systems that may, as a result of an accident, contain accident source term radioactive materials, and design as necessary to permit adequate access to important areas and to protect safety equipment from the radiation environment.

Regulations in 10 CFR 50.48, require a fire protection plan that satisfies Criterion 3 of Appendix A, and details the features required in that plan.

Regulations in 10 CFR 52.79(a)(17) require that a combined license final safety analysis report (FSAR) address the information with respect to compliance with technically relevant positions of the Three Mile Island requirements in 10 CFR 50.34(f).

Regulations in 10 CFR 52.79(a)(41) require an evaluation of the design against the Standard Review Plan (SRP) including but not limited to the difference in analytical techniques of the proposed design and the corresponding techniques given in the SRP acceptance criteria.

3.0 TECHNICAL EVALUATION

3.1 Evaluation of Proposed Changes

Introduction

The NRC staff considered the current VCSNS UFSAR Section 3.8, “Design of Category I Structures” in the performance of the technical review. The staff also reviewed portions of NUREG-1793, Supplement 2, “Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design, Docket No. 52-006” (NUREG-1793) (ADAMS Accession No. ML112061231), and the “Final Safety Evaluation Report for Combined Licenses for Virgil C. Summer Nuclear Station Units 2 and 3,” dated August 2011 (ADAMS Accession No. ML110450305) documenting the staff’s technical evaluation of those aspects of the AP1000 DCD and VCSNS COL application, respectively. The requested the design of selected auxiliary building floors including finned floors, CA20 module floors, and precast panel floors, MCR and I&C room ceilings, and the location of HVAC ducts in the MCR floor as well as the number of supporting steel plates. The staff reviewed the American Concrete Institute (ACI) 349-01, “Code Requirements for Nuclear Safety-Related Concrete Structures,” code requirements related to the proposed changes. The staff reviewed the licensee’s proposed changes to evaluate the impact of the requested UFSAR changes to the affected floors on the overall safety of the nuclear power plant.

As documented in LAR 14-14 R3, Enclosure 9, the licensee proposed to depart from the Tier 2* and Tier 2 material in UFSAR Subsections 3.8.4.1.2, “Auxiliary Building,” 3H.5.4, “Concrete Finned Floors,” and UFSAR Figures 3H.5-9, “Auxiliary Building Finned Floor,” and 3H.5-13, “Design Summary of Floor at Elevation 135'-3" Area 1 (Main Control Room Ceiling),” related to the finned floor design. The licensee also proposed changes to UFSAR Subsections 3.8.4.4.1, “Seismic Category I Structures,” related to the CA20 module floor design and to UFSAR Subsection 3H.5.3.1, “Operations Work Area (Tagging Room) Ceiling,” and Figure 3H.5-8, “Auxiliary Building Operations Work Area (Tagging Room) Ceiling,” related to cast-in-place concrete on precast panels.

In the LAR 14-14 R3, Enclosure 10, classified as non-public Sensitive Unclassified Security-Related Information (SUNSI), the licensee also requested changes related to the HVAC duct locations in the MCR. The licensee proposed to depart from Tier 2* and Tier 2 material in UFSAR Subsections 1.2-10, “Nuclear Island General Arrangement Plan at Elevation 135'-3”, and UFSAR Figures 9A-1, “Nuclear Island Fire Area Plan at El. 135'-3” (Sheet 7 of 16),” 12.3-1 “Radiation Zones, Normal Operations/Shutdown, Nuclear Island, Elevation 135'-3", (Sheet 8 of 16),” 12.3-2, “Radiation Zones, Post-Accident Nuclear Island, Elevation 135'-3", (Sheet 8 of 15),” and 12.3-3, “Radiological Access Controls, Normal Operations/Shutdown, Nuclear Island, Elevation 135'-3", (Sheet 8 of 16),” related to changes to the HVAC duct locations in the MCR.

The staff’s evaluation of these design changes, and the impact of the changes to the safety of the nuclear power plant are summarized below.

3.1.1 Structural Design

Auxiliary Building Finned Floor Design Changes

The licensee proposed changes to portions of the finned floors listed as follows:

- Lower Main Steam Isolation Valve (MSIV) Compartment B Room
- Lower non-radioactive ventilation system (VBS) in B&D Equipment Rooms
- Portions of MCR
- VBS in MCR/A&C Equipment Rooms

In the LAR, the licensee proposed modifications to the design of the finned floors. These modifications are described in UFSAR Subsections 3.8.4.1.2, "Auxiliary Building," 3.8.4.4.1, "Seismic Category I Structures," 3H.5.4, "Concrete Finned Floors," Table 3H.5-13, "Design Summary of Floor At Elevation 135'-3" Area 1," and Figure 3H.5-9, "Auxiliary Building Finned Floor."

These changes primarily identify how the floors other than the critical sections vary from the detail design shown on the UFSAR Figure 3H.5-9. Notes are added to the figure to describe the specific variations in detail design, which include information such as size and spacing of reinforcement in the floors and the span of the floors. Note 1 specifically addresses the applicability of the figure to the critical section and for other floor sections and connections to other walls.

The staff evaluation of the structural changes to the finned floors is categorized into two areas: steel reinforcement and construction sequence.

Steel Reinforcement

The proposed structural design changes include changes to the design of steel reinforcement in the finned floors. The changes affect the fabrication, construction, and design of the steel plates and steel reinforcing bars. The staff evaluated each of these changes, which include, among other things, (1) the number and size of steel panels used to construct the floor, (2) the use of headed reinforcement instead of standard hooks for development of the floor reinforcement in the walls, (3) reinforcement spacing and size for connecting dowels, (4) additional bottom layer reinforcing, (5) the gap between steel plate and wall, (6) the use of construction joints, and (7) the variation in the number of layers of top reinforcement and top dowels. The staff reviewed all proposed changes to ensure the integrity of the floor is maintained under the applicable loads and that the licensee remains committed to codes and standards acceptable to the staff. The results of that review are described in sections below.

- Variation in the number of steel panels (Figure 3H.5-9, note 2 and UFSAR Subsection 3.8.4.1.2)

The licensee proposed to modify the number of finned floor steel plates between column lines 9.2 and I to L. In this location, shown in UFSAR Figure 3H.5-9, Sheet 1, the licensee specifically proposed to increase the number of panels to 6 between column lines 9.2 and 11 and I though K and to 5 between column lines 9.2 and 11 and K through L. The licensee additionally proposed to add a note to the figure to clarify that the number of steel plates will vary at other locations and to modify UFSAR Subsection 3.8.4.1.2 to state that the number of panels may vary.

The staff reviewed changes to the number of finned floor steel plates. The staff considered the impact of the number of plates to the design of the connection to the wall and whether the steel plates could continue to support wet concrete loads during construction. The staff additionally evaluated impact of the change on the capacity of the floor to withstand normal operation and accident loads. The staff determined that the floor design is in accordance with American Concrete Institute (ACI) 349 and American Institute for Steel Construction (AISC) N690, "Specification for the Design, Fabrication, and Erection of Steel Safety Related Structures for Nuclear Facilities," and does not alter the capacity of the floor. Therefore, the variation in the number of steel plates between column lines is acceptable.

- Clarification of Figure 3H.5-9 (UFSAR Subsection 3.8.4.1.2 and Figure 3H.5-9, note 10)

The licensee modified UFSAR Subsection 3.8.4.1.2 and added note 10 to clarify the applicability of Figure 3H.5-9 to the floor above the MCR and above the I&C rooms. The licensee specifically clarified that the floors are similar, but have some differing design details and local variances. The licensee added a series of notes to Figure 3H.5-9 to describe the design variances. The description in UFSAR Subsection 3.8.4.1.2 clarifies the intent of the figure, the design of which continues to meet applicable codes and standards, and is therefore acceptable to the staff. Detailed staff review of the individual figure notes is provided in the following paragraphs.

- Clarification of reinforcement and connection dowels shown in Figure 3H.5-9 (Addition of notes 5, 11, 12, and 15 to Figure 3H.5-9)

The licensee added notes 5, 11, and 15 to Figure 3H.5-9, respectively, to clarify that the reinforcement and connection dowels shown in the figure are away from openings, penetrations, embedments and other obstructions (note 5); the shear stud design shown on the figure is for locations away from openings, penetrations, embedments, and other obstructions (note 11); and the design of fins varies at locations near opening, penetrations, and other obstructions (note 15). The licensee also added note 12 to state that the centerlines of the shear studs and fins may not line up.

The staff reviewed these notes which clarify the critical section details. Specifically, the licensee clarified that the design of reinforcement and connection dowels, shear studs, and fins shown on the figure are for locations away from openings, penetrations, embedments, and other obstructions. Because UFSAR Section 3.8.4.2 states that the design must be in conformance with ACI 349 and AISC N690, and the staff confirms that the reinforcement and connection dowels, shear studs, and fins meets the applicable ACI 349 and AISC N690 Code requirements, therefore the staff finds the clarification to be acceptable. The staff also reviewed the impact of the centerlines of the shear studs and fins lining up and determined that, for the specified design spacing, the performance of the floor is independent of the relationship between the location of the shear studs and fins. The staff concluded that there is no impact of the proposed design spacing on the performance of the floors and that it is therefore acceptable.

- Use of headed reinforcement (Addition of note 4 to Figure 3H.5-9)

The licensee added note 4 to Figure 3H.5-9 to allow the use of headed reinforcement instead of standard hooks to develop the floor reinforcement in the walls. UFSAR Subsection 3.8.4.4.1 allows for the development of headed reinforcement in accordance with the provisions of ACI 318-11, "Building Code Requirements for Structural Concrete and Commentary," Section 12.6.

Therefore, it is acceptable to use headed reinforcement or standard hooks to develop the floor reinforcement in the walls.

- Variation in spacing and size of connecting dowels and reinforcing bars (Figure 3H.5-9, notes 6, 9, 14)

The licensee added note 6 to Figure 3H.5-9 to clarify that the connecting dowels vary in spacing and size and to provide a range of values to describe the extend of the variations. The note also specifies that the spacing and size meet the requirements in ACI 318-11, Section 12.6, and ACI 349 and that some connecting dowels are developed into adjacent floors instead of terminating as a hooked bar or headed reinforcement in the wall.

The staff reviewed the variation in the spacing and size of connecting dowels. The staff reviewed the UFSAR 3.8.4.4.1 to confirm that the stated requirements in ACI 318-11 and ACI 349 are appropriate for the spacing and size of the connecting dowels. Additionally, the staff determined that it is acceptable to develop the reinforcement into adjacent floors, terminating in a hook, or terminating with a head. The staff also reviewed the licensee's statement that the connection length requirements for the connecting dowel use the ACI 349 requirements for splice length. Because the finned floor design is applicable to multiple rooms, with different structural demands, and the design is in conformance with the applicable codes, it is acceptable to the staff that the spacing and size of connecting dowels varies.

The licensee added note 9 to Figure 3H.5-9 which states that the reinforcement spacing and size varies. Because this note applies to floors at multiple locations with different structural demands, and the design of the reinforcement meets ACI 349, variation of the reinforcement spacing and size is acceptable to the staff.

The licensee added note 14 to state that variation in the number of layers of top reinforcement and top dowels may vary, and clarified that the minimum required reinforcement specified by ACI 349 will be met. Because the design of the reinforcement is in accordance with ACI 349, the variation in the number of layers of top reinforcement and top dowels is acceptable to the staff.

- Additional bottom layer reinforcement for structural integrity of the fire barrier (UFSAR Subsections 3.8.4.1.2 and 3H.5.4, Figure 3H.5-9, note 8)

The licensee added note 8 to Figure 3H.5-9 which states that additional bottom layer reinforcing is provided in the finned floors at El. 117'-6" where needed to maintain the structural integrity of the fire barrier. During a public meeting on August 25, 2016 (ADAMS Accession No. ML16267A419), the staff requested that the licensee explain the difference between the floors at El. 117'-6" and 135'-3" with respect to fire reinforcement. In Enclosure 8, in response to NRC Comments #2A and #2B, the licensee clarified that the changes are consistent with the UFSAR Subsection 9.5.2.1.1, which describes the consideration of fire events on structural members. The staff reviewed the information in UFSAR Subsection 9.5.2.1.1 and concluded that the licensee's explanation that additional reinforcement for integrity during a fire event for the finned floors at El. 117'-6" was not necessary because the MCR is designed to permit rapid detection and location of fires in underfloor and ceiling spaces and therefore additional reinforcement is not necessary, is acceptable. The staff also concluded that the information in UFSAR Subsection 9.5.2.1.1 supports the licensee's conclusion that the finned floor at El. 135'-3", (below the MCR) does not require additional fire protection reinforcement. The staff concludes that the addition of note 8 to Figure 3H.5-9 and the descriptions added to UFSAR Subsections

3.8.4.1.2 and 3H.5.4 clarify the design and identify the differences between the finned floor critical section at El. 135'-3" and other finned floors, and are acceptable.

- Gap between steel plate and wall and construction joints (Figure 3H.5-9, note 13)

The licensee added note 13 to clarify that the gap between the steel plate and wall and the use of construction joints varies. The staff concludes that it is acceptable for the gap and construction joints to vary since these changes are fabrication and construction features and do not alter the design or structural performance of the floor.

- Dowel Length (Figure 3H.5-9, note 7)

The licensee added note 7 to clarify the methodology used to develop the capacity of the dowel and the demand in the bottom plate. The licensee provided an explanation of a supplemental evaluation to demonstrate sufficient development length to transfer tensile force between the dowel and the bottom plate. This explanation is provided in Enclosure 7, and is supported by discussions with the licensee on May 26, 2016 with illustrations in presentation slides (ADAMS Accession No. ML16168A121). This explanation describes that the reinforcing bar is sized based on out-of-plane flexure and membrane tension. In the supplemental evaluation, the connection is divided into three regions over the length of the reinforcing bar. In the region adjacent to the wall, the reinforcing bar dowel is fully developed. In the middle region, the dowel transitions from fully developed to the end of the dowel and the bottom plate is developed to carry floor module demand in accordance with ACI 349 and AISC N690 requirements.

During the public meeting on August 25, 2016 (ADAMS Accession No. ML16267A419), the staff requested an example calculation demonstrating that, for the most severe loading on a floor, the capacity exceeds the demand in the three regions described above. This example is provided in Enclosure 8 in response to NRC Comment #4. In addition to the example calculation, the staff requested the applicant provide the origin of the requirement for the distance between the dowels and shear studs. In response to NRC Comment #5 in Enclosure 8, the licensee clarified that the spacing meets the ACI 349 Section 12.14.2.3 code requirement for non-contact lap splices because the force transfer mechanism between the bottom plate and the reinforcing bar dowel is similar to a noncontact lap splice.

The staff reviewed the supplemental calculation in response to Comment #4 and the conformance of the design with ACI 349 and AISC N690. The staff also reviewed the description of the construction sequence added to UFSAR Subsection 3H.5.4 and evaluated it below under the Construction Sequence heading. Because the evaluation and design of the connection meets the requirements of ACI 349 and AISC N690, the methodology for the design of the connection is acceptable to the staff.

- Corrections to UFSAR Table 3H.5-13 (Table 3.H.5-13)

The licensee revised UFSAR Table 3H.5-13, "Design Summary of Floor at Elevation 135'-3" Area 1 (Main Control Room Ceiling)." Specifically, the licensee corrected the title to be consistent with UFSAR Figure 3H.2-1, and corrected design forces to reflect the revised design. Specifically, the licensee added the area of steel provided for a 9-inch-wide strip to resist negative bending moment capacity, revised the maximum negative bending moment, and provided clarifications on the structural capacities of the slab. The licensee also removed information on the required shear stud spacing and clarified that the design summary applies to areas away from penetrations, openings and other obstructions.

The staff reviewed the changes made to UFSAR Table 3H.5-13. The staff concluded that the revised maximum negative bending moment is acceptable on the basis that demand reported represents a different location than the demand reported in the original table. Because the changes to the table clarify and correct the design summary information presented and the capacity exceeds the demand, the revised UFSAR Table 3H.5-13 is acceptable to the staff.

Construction Sequence

In support of the development length calculation, the staff requested the licensee provide information on the construction sequence, to highlight any differences between the construction elements used for the finned floor system and CA20 module floor system reviewed in the next section. The licensee provided information in UFSAR Subsection 3.H.5.4 to describe the construction sequence for the finned floors. This description clarifies that the fins frame into steel shapes at the ends of the floors. The steel shapes are supported by intermittent brackets connected to the walls. Additionally, the wet concrete load is carried by the steel plate and fins. In contrast with the CA20 design discussed below, the brackets do not contribute to the transfer of loads, and therefore are not used in the development length calculation as described above. This subsection describes a construction sequence consistent with design details in Figure 3H.5-9 and the supplemental evaluation for the dowel development length and is acceptable to the staff.

CA 20 Module Floor Design Changes

The licensee proposed changes to the following CA20 module floors:

- Piping/Valve Room
- Pipe Chase
- Cask Loading Pit
- Spent Fuel Storage Pit
- Waste Monitor Tank Room B
- Normal Residual Heat Removal Heat Exchanger Room
- Waste Monitor Tank Room A
- Cask Washdown Pit
- A portion of the Fuel Handling Area

The staff evaluation of the structural changes to the CA20 module floors is categorized into two areas: steel reinforcement, and construction sequence. Changes related to fire protection, HVAC, and radiation protection as discussed in Sections 3.1.2, 3.1.3, and 3.1.4 respectively, are limited to the finned floors only.

Steel Reinforcement

Many of the proposed changes to the steel reinforcement in the finned floors as reviewed above are also applicable to the CA20 module floors. Specifically, the staff conclusions related to Figure 3H.5-9 notes 4, 5, 6, 7, 9, 10, 13, 14, and 15 as presented in the preceding sections also apply to the CA20 module floors. The licensee proposed two changes related to steel reinforcement that is specific to the CA20 module floor system. The staff evaluation of this change is provided in this section.

- Orientation of hooked reinforcing bars (Figure 3H.5-9, note 6)

The licensee added a statement to note 6 on Figure 3H.5-9 which is specific to the CA20 module floors. The note states that the hook orientation in CA20 floors may vary from that of the finned floors. A description of the orientation of the standard hooks is also added to UFSAR Subsection 3.8.4.4.1. The licensee stated that the connection configuration, including the variance in hook orientation, meets ACI 349 code requirements for standard hooks and ACI 318-11 requirements for headed reinforcement. To clarify the request, on October 24, 2016 (ADAMS Accession No. ML16299A064), the licensee provided information in LAR 14-14, Revision 3, justifying the use of a hook orientation that does not go through the confined center of the joint because the hook orientation is important to the seismic behavior of a joint.

The licensee stated that the reason for the variation in hook orientation is due to potential interferences with shear studs, wall truss components, overlay plate anchorage, embedments, or other obstructions. The licensee stated that the justification for the hook orientation is based on Regulatory Guide (RG) 1.142 and the behavior due to the design features of the CA20 module walls. RG 1.142, Position 3 provides criteria for determining whether lateral force-resisting structures need to be considered flexural members. The licensee demonstrated that because the demand-to-capacity ratios for bending moments do not exceed the RG criteria, the ACI 349-01 Chapter 21 provisions for joints of frames are not applicable. The licensee further stated that the CA20 floors in the south end of the auxiliary building do not see a significant load reversal under seismic demand because the upward acting forces do not overcome deadweight. The licensee explains that the demand remains within elastic limits, and because joint degradation does not occur due to cycling, the hook orientation can vary.

Staff performed a review of the licensees proposed change to the orientation of hooked reinforcing bars in the CA20 module floor system. The staff confirmed that the orientation of the hooked bars is in conformance with ACI 349 requirements and that the licensee considered the effect of the hooked bar orientation on joint degradation due to seismic load reversal. The staff finds the changes to be acceptable on the basis that the commitment to design the CA20 module floor systems in accordance with ACI 349 remains unchanged.

- Connection design (Figure 3H.5-9, note 7)

The staff conclusions regarding the technical basis for the connection design are described in the discussion of the finned floors in the previous section. The technical basis for design of the dowel length for the CA20 module floor system is similar to the finned floor system with minor differences. For this reason, the staff reviewed the technical basis for the connection design of the CA20 module floors with respect to these differences.

As for the finned floors, in Enclosure 7 of the LAR, the licensee stated that the connection is designed such that at any location along the connection, either the plate or the dowel can carry the tensile force. The design details of the CA20 module floors contribute to the differences between the evaluation of the finned floor and the CA20 module floor. The CA20 module floors are supported by seat angles attached to the CA20 walls. These seat angles are designed for construction and service loading conditions. The seat angles are considered to contribute to the development of the bottom plate. The bottom plate of the CA20 module floors is also attached to the concrete slab by structural shapes in addition to shear studs. These structural shapes are not considered in the development of the bottom plate for the transfer of tensile forces. These design details are discussed further in the Construction Sequence section below.

The staff reviewed the differences between the CA20 module floor system and the finned floor system for the evaluation of the connection design. Because the design is consistent with ACI 349 and AISC N690 provisions, it is acceptable to the staff.

Construction Sequence

In support of the development length calculation, the staff requested the licensee provide information on the construction elements, including the seat angles and structural shapes to differentiate the design of the finned floors and CA20 module floors. In order to describe this information, the licensee provided information in UFSAR Subsection 3.8.4.4.1 to describe the construction sequence for the CA20 module floors. This subsection clarifies that the bottom plate is supported by brackets connected to the walls and the wet concrete load is carried by the steel plates stiffened by the structural tees.

The staff reviewed the construction sequence information and concluded that enough information is described to support the connection evaluation with respect to the brackets and structural tees. The construction sequence information clarifies the fabrication and installation process, and clarifies the use of shoring. Because this information clarifies information and is consistent with other construction sequence information provided in the DCD, it is acceptable to the staff.

Cast-in-place Concrete Precast Panel Design Changes

The licensee proposed three changes to the precast panel design shown in Figure 3H.5-8 and described in UFSAR Subsection 3H.5.3.1. The first change is to increase the width of the precast panels from 5'-11" to 6'-4 ½". The licensee stated that the increased panel width is necessary to fully cover the room below and that there are no changes to the dimensions of the room. The second change is to add a single stirrup to the wider panel in accordance with ACI 349, Chapter 17. The third change is to modify the orientation of the hooks at the top of the stirrups to be in the plane of the stirrup. The licensee states that this change is to facilitate fabrication of the stirrups.

The staff reviewed the licensees proposed changes to UFSAR Figure 3H.5-8 and Subsection 3H.5.3.1. The staff confirmed that the licensee considered the relevant ACI 349 provisions for the design of the cast-in-place concrete on precast panels. Specifically, the addition of a single stirrup to the wider panel design demonstrated that the licensee considered the relevant ACI 349 provisions and modified the design accordingly. The staff also confirmed that the orientation of the hooks in the plane of the stirrup are acceptable and that the stirrups continue to hook around longitudinal reinforcing bars. The staff finds the changes to be acceptable on the basis that the commitment to design the auxiliary building floor systems in accordance with ACI 349 and AISC N690 codes remains unchanged. The staff finds that there is no impact of the design change on the performance of the cast-in-place concrete on precast panel floor system.

3.1.2 Fire Protection

The NRC staff identified several documentation changes with respect to the design of fire barriers: the finned floor modules at El. 117'-6" requiring additional bottom layer reinforcement, the relocation of HVAC penetrations, and the existence of a flooring gap as shown in Figure 3H.5-9. During the public meeting on August 25, 2016 (ADAMS Accession No. ML16267A419), the staff raised several questions regarding the documentation changes and, in

its revised request for license amendment, LAR 14-14 R3, dated October 24, 2016 (ADAMS Accession No. ML16299A064), the licensee addressed these issues as follows:

- Additional reinforcement of fire barrier at El. 117'-6" (UFSAR Subsection 9.5.1.2.1.1)

The staff requested information on whether additional reinforcement is needed and whether the reinforcement is needed on the finned floor at El. 117'-6" or at any other location. In its response, the licensee stated that the reinforcement is needed only at El. 117'-6" consistent with UFSAR Subsection 9.5.1.2.1.1, which considers the thermal effects on structural members from a postulated fire in the I&C rooms below the MCR. The licensee also maintained that this documentation change is not a change in the AP1000 design since the fire barrier rating has not been changed. Since the added reinforcement bottom layer does not degrade the 3-hour fire rating of the finned floor, and the added reinforcement further ensures the fire barrier to structurally remain intact in the event of a fire, the staff concluded that the change is acceptable.

At El. 135'-3", the licensee stated that the finned floor is not subjected to the same thermal effects as in the communication and control rooms since manual fire-fighting is intended to mitigate any fire in the MCR. As such, it is anticipated that the finned floor at El. 135'-3" will not be exposed to elevated temperatures and will maintain its structural integrity. The staff considered the fact that, since the MCR is continuously manned, any fire in the MCR will likely be promptly detected and manually suppressed. Therefore, the staff concluded that the finned floor at El. 135'-3" is unlikely to be challenged by a postulated fire in the MCR, and therefore does not need the additional structural reinforcement.

- Relocation of HVAC penetrations (UFSAR various figures in Chapters 1, 3, 9, and 12)

The staff identified several changes to the HVAC penetrations, especially the relocation of the HVAC penetrations from the Main Control Area to the Operation Break Room. Since HVAC penetrations have now been relocated outside of the MCR, the staff was concerned whether this modification has any adverse impact on MCR habitability due to the potential change in airflow in the MCR. The staff also questioned whether this modification has any potential impact on the prevention of flame and smoke spread into the MCR in the event of a fire.

In its response, the licensee stated that there is no effect on the MCR habitability since the new HVAC penetrations are of the same size (approximately 8 sq. ft. each) and number as in the original design except in different locations, and that airflow is distributed throughout room 12401 (MCR) via duct routing. Since the size of the HVAC outlets have not changed and airflow distribution is maintained in the MCR, the staff concluded that MCR habitability is not adversely impacted by this modification.

The licensee also stated that ductwork penetrations are provided with combination fire/smoke dampers to prevent spread of fire and smoke into the MCR from the fire area above, consistent with the previous penetration configuration. As such, the staff concluded that the new HVAC penetrations adequately prevent flame and smoke spread into the MCR, and therefore the modification is acceptable.

- Flooring gap (Figure 3H.5-9)

The staff identified a flooring gap in Figure 3H.5-9. Since the floor shown on the drawing is a credited 3-hour rated fire barrier, the staff questioned whether the gap will be sealed with 3-hour rated fire seal to maintain the barrier's fire rating. In its response, the licensee stated that once concrete is placed, the concrete will close any gap between the floor module and the adjacent wall, and the final configuration will provide for a 3-hour rated fire barrier. The staff concluded that the final configuration, which completely seals the gap with concrete, is acceptable in ensuring the 3-hour rated fire barrier is maintained and to prevent fire and smoke propagation into other plant areas.

Based on the above discussions, the staff concludes that the proposed changes in LAR 14-14 R3 have no adverse impact on any active or passive fire protection features and, consequently, on post-fire safe shutdown capability. As such, the staff concluded that the licensee continues to meet the requirements of the 10 CFR 50.48, "Fire Protection," and 10 CFR 50, Appendix A, Criterion 3 – Fire Protection.

3.1.3 HVAC

As shown in UFSAR Figure 3H.5-9, Sheet 1, some openings for HVAC ducts in the ceiling of the MCR are moved to the floor above another room within the control room envelope. In addition, openings shown on the left side of the figure adjacent to column line 9.2 are reconfigured because of final design changes in routing. The fins and steel plate on the bottom of the floor provide a passive heat sink function for the MCR and I&C rooms as part of the MCR emergency habitability system. The heat sinks for each room are designed to limit the temperature rise inside each room during the 72-hour period following a loss of nuclear island VBS operation.

Based on its review and evaluation of the submitted information, the staff concludes that the relocated penetrations and the reconfigured openings adjacent to column line 9.2 have no adverse impact on the HVAC design or performance. Also the staff concludes that the relocation and reconfiguration of the HVAC has no effect on the performance of the thermal fins used to transfer heat from the room air to the concrete.

3.1.4 Radiation Protection

The staff evaluated the changes proposed in LAR 14-14. In the LAR, the applicant proposed making modifications to UFSAR Figure 3H.5-9 (designated as Tier 2*) and related information associated with the auxiliary building finned floors. Specific changes included moving penetrations into the MCR for the removable ducts in the VBS MCR/A&C Equipment Room (Room 12501) and modifying some of the other details and specifications for the auxiliary building finned floors.

Regarding the changes to the penetrations for the removable ducts, the LAR included proposed revisions to UFSAR Figure 12.3-2, "Radiation Zones, Post-Accident Nuclear Island, Elevation 135'-3"," to show the revised locations of the penetrations and the new access routes to the penetrations to perform required manual actions following an accident. Removal of duct sections is required to provide an outside air ventilation pathway for the MCR and divisions A&C equipment room cooling at 64 hours after an accident. This is a vital function to maintain control room habitability following certain design basis accidents. Therefore, the staff evaluated this change in accordance with the requirements of 10 CFR 50.34(f)(2)(vii) and the guidance of

NUREG-0737, “Clarification of TMI Action Plan Requirements,” which specifies that the dose to personnel preforming vital functions should not exceed 5 rem.

The LAR specified that the relocation of the duct sections requires an individual to travel approximately an additional 100 feet beyond that required by the original analysis and that the additional travel distance results in a small dose increase of less than 20 mrem. The LAR also specifies that there is more than 1 rem of margin between the original dose calculations and the 5 rem limit, and therefore, the licensee specified that the change is acceptable. Since the maximum accident radiation zone for the room is 10 rem/hour, the staff confirmed that based on an assumed average adult walking speed of about 4 feet per second that the total added dose to access and egress the area based on the added distance of approximately 100 feet, would be less than 20 mrem. However, the changes not only increase the walking distance for personnel but also moves one of the work location near the Upper MSIV Compartment B Room (Room 12504). Room 12504 is Zone VIII (between 100 rem/hour and 500 rad/hour) during an accident and while this is not the dose rate present in Room 12501, due to the proximity to the wall of Room 12504, the new location in Room 12501 could have a higher dose rate in the area where the work would now occur. This could, therefore, result in a higher dose to the individual performing this work, compared to when the penetration was at the original location. However, the LAR did not provide any information regarding the additional dose personnel would receive in working at this potentially higher dose rate location. Likewise, the LAR did not provide any information regarding the potential for additional radiation streaming through the penetrations into the MCR, due to the proposed changes in penetration locations. As a result, the staff requested that the licensee provide this information by RAI on November 1, 2016 (ADAMS Accession No. ML16306A309).

In LAR 14-14, R3 S1 (ADAMS Accession No. ML16357A257), the licensee indicated that the dose rate calculations explicitly consider the potential for radiation streaming at the relocated penetrations from adjacent areas into Room 12501. In addition, the licensee indicated that the dose to personnel in the room is conservatively calculated based on the location with the maximum dose rate in the room and as if the person were exposed to that dose rate the entire time that they are within the room. The staff agrees that this is a conservative assumption. As a result, while the dose at the new location would be higher than at the original location, the dose received while working at the location need not be recalculated since the calculation is already conservatively based on the highest dose rate location in the room. Therefore, the changes made in this LAR only result in the insignificant increase on the calculated dose, due to the added travel time to reach the penetrations at the new location. Since the applicant specified that there was more than a 1 rem margin available before reaching the 5 rem limit, the staff finds the change in the penetration location to be acceptable, as it relates to the mission dose for accessing and working in Room 12501.

The change in the penetration locations would also likely result in an increase in the dose to the MCR due to the potential for additional radiation streaming through the new penetration locations, which are closer to Room 12504. It was unclear from reviewing the LAR if the applicant had evaluated the dose to MCR operators in accordance with GDC 19. Therefore, the staff, in an RAI dated November 1, 2016 (ADAMS Accession No. ML16306A309), asked the applicant to specify in the LAR how the change impacts the dose in the MCR. In LAR 14-14, R3 S1, the licensee specified that the updated penetration locations were evaluated by explicitly including the penetrations in the direct dose calculation models and recalculating dose rates in the MCR envelope and that it does not impact the reported, conservative dose accumulated by operators in the MCR following a design basis accident. During a January 12, 2017, meeting (ADAMS Accession No. ML17046A362), the applicant verified that the new penetration

locations were explicitly modeled in calculations to determine the dose to MCR operators. Therefore, the staff finds the response to be acceptable.

As discussed above, LAR 14-14 also made changes to Figure 3H.5-9, beyond just changing the penetration locations. The staff evaluated the other changes to Figure 3H.5-9 including the addition of 15 notes to the figure. The added note 1, indicates that the details shown in the figure are specific to the floor at elevation 135'-3", while prior to the LAR there was no such stipulation on the figure, indicating that it only applied to one elevation. Therefore, the staff was unsure if the steel for the finned floor below the MCR would be ½" thick, as is specified in Figure 3H.5-9, and if the applicant had evaluated potential changes in the thickness to the steel below the MCR, as it relates to the dose to the MCR operators. As a result, the staff requested in the November 1, 2016, RAI (ADAMS Accession No. ML16306A309) that the applicant address whether the steel thickness below the MCR would still be ½" thick and that they clarify that this thickness remains Tier 2*.

In LAR 14-14, R3 S1, which contained changes associated with the November 1, 2016, RAI, the licensee indicated that the licensing basis still requires the plates to be ½" for the finned floor below the MCR and that this is not being changed in the LAR. The applicant also proposed adding note 16 to Figure 3H.5-9 to specify that the information on Sheet 3 of UFSAR Figure 3H.5-9 applies to all finned floors and not just those for the floor at elevation 135'-3", except for near openings, penetrations, embedments, and other obstructions. Sheet 3 shows the thickness of the steel plate to be ½". Since the proposed added note 16 clarified that the plate below the MCR would remain ½" thick. The staff found the added note 16 to be acceptable, as it clarified that there would be no change to the thickness of the plate.

The staff also reviewed the proposed note 13 which specifies that the gap between the steel plate and wall and the use of construction joints varies based on fabrication and construction needs. The staff had a concern about there being no limit on the acceptable maximum gap between the plate and the wall and how it could affect the dose in the MCR. Based on a discussion with the applicant during the January 12, 2017, meeting (ADAMS Accession No. ML17046A362) and internal staff review, the staff determined that due to structural and heat load requirements for the finned floors, the maximum that the gap between the steel and the wall could be is only several inches, which the staff believes would have an insignificant impact on dose rates to personnel in the MCR following an accident.

As a result of the above and the complete staff review, the radiation protection staff determined that the changes proposed in the LAR were acceptable and in accordance with GDC 19 and 10 CFR 50.34(f)(2)(vii).

3.1.5 Licensing Basis

In Enclosures 9 and 10 (designated as SUNSI) of the LAR, the licensee proposed licensing basis changes to the UFSAR. The changes to the UFSAR in Enclosure 9 are listed below. The changes to the UFSAR in Enclosure 10 are SUNSI and will not be discussed in detail in this evaluation but are broadly characterized below.

Enclosure 9

1. In the seventh paragraph, Subsection 3.8.4.1.2, the licensee incorporated additional information to clarify Figure 3H.5-9.

2. In the first paragraph and before the second paragraph, Subsection 3H.5.4, the licensee incorporated additional information to be consistent with Subsection 3.8.4.1.2 and the revised Figure 3H.5-9. The licensee also included a description of the construction sequence for the finned floors.

3. In the last paragraph, Subsection 3.8.4.4.1, the licensee incorporated information to clarify the design of the CA20 module floors. The licensee also included a description of the construction sequence for the CA20 module floors.

4. In the last paragraph, Subsection 3H.5.3.1, the licensee revised the panel width dimension for the precast panels.

5. In the third paragraph, Subsection 3H.5.4, the licensee added information on additional bottom layer reinforcing steel in the finned floors at El. 117'-6" needed to maintain the structural integrity of the fire barrier during a fire event.

6. In Table 3H.5-13, the licensee modified the provided design summary information. The licensee also corrected the title of the table.

7. In Figure 3H.5-8, the licensee revised the panel width dimension for the precast panels, and modified the orientation of the hooked ends of the stirrups for Section C and Section F.

8. In Figure 3H.5-9, Sheet 1, the licensee modified the number of steel plates (panels) shown between column lines 9.2 and 11 and I through L.

9. In Figure 3H.5-9, Sheet 1, the licensee added 15 notes related to the design of the auxiliary building finned floor and the variations applicable to the design of auxiliary building finned floors and CA20 module floors.

10. In Figure 3H.5-9, Sheets 2 and 3, the licensee modified the figures to incorporate the 15 notes added to Sheet 1.

Enclosure 10

1. In Figure 1.2-10, the licensee relocated and reconfigured the openings for HVAC ducts in Room 12501.

2. In Figure 9A-1, Sheet 7, the licensee relocated and reconfigured the openings for HVAC ducts in Room 12501.

3. In Figure 12.3-1, Sheet 8, the licensee relocated and reconfigured the openings for HVAC ducts in Room 12501.

4. In Figure 12.3-2, Sheet 8, the licensee relocated and reconfigured the openings for HVAC ducts in Room 12501 and revised the access route to the HVAC ducts.

5. In Figure 12.3-3, Sheet 8, the licensee relocated and reconfigured the openings for HVAC ducts in Room 12501.

1. In Figure 3H.5-9, Sheet 1, the licensee added note 16 related to the design of the auxiliary building finned floor.

The staff reviewed the proposed changes and finds them acceptable on the basis that the additions provide clarity, and consistency to the licensing basis. Moreover, the changes are acceptable because the licensee remains committed to codes and standards acceptable to the staff.

3.2 Summary of Technical Evaluation

The staff reviewed the licensee's proposed changes provided in the LAR. Based on the staff's technical evaluation, the staff finds:

(1) The proposed changes to the design of the finned floors are acceptable because the design conforms to ACI 349 and AISC N690 requirements. The licensee provided sufficient justification for variations in the design of the reinforcing bars and dowels. The licensee additionally provided sufficient justification for the methodology used to fully develop the connecting dowels and transfer the load from the dowel to the steel bottom plate. The changes are acceptable as they are in compliance with 10 CFR 52.79(a)(41) and meet the structural acceptance criteria in Section 5 of SRP Section 3.8.4.

(2) The proposed changes to the design of the CA20 module floors are acceptable because the design conforms to ACI 349 and AISC N690 requirements. The licensee provided sufficient justification for the orientation of hooked reinforcing bars using the guidance in RG 1.142 for concrete structures. The changes are acceptable as they are in compliance with 10 CFR 52.79(a)(41) and meet the structural acceptance criteria in Section 5 of SRP Section 3.8.4.

(3) The proposed changes to the cast-in-place concrete on precast panel floors are acceptable because they are in compliance with ACI 349 and AISC N690 requirements. The licensee provided sufficient justification for increasing the width of the precast panels and orienting the stirrup hooks in the plane of the stirrup. The changes are acceptable as they are in compliance with 10 CFR 52.79(a)(41), and meet the structural acceptance criteria in Section 5 of SRP Section 3.8.4.

For the reasons specified above, the NRC staff finds that the proposed UFSAR changes to Subsections 3.8.4.1.2, 3.8.4.4.1, 3H.5.3.1, 3H.5.4; Table 3H.5-13; and Figures 3H.5-8 and 3H.5-9 are acceptable.

The staff reviewed the licensee's proposed changes to fire protection. Based on the staff's technical evaluation, the staff finds:

The staff identified several documentation changes with respect to the design of fire barriers: the finned-floor modules at El. 117′-6″ requiring additional bottom layer reinforcement, the relocation of HVAC penetrations, and the existence of a flooring gap as shown in Figure 3H.5-9. Since the added reinforcement bottom layer does not degrade the 3-hour fire rating of the finned floor, and the added reinforcement further ensures the fire barrier to structurally remain intact in the event of a fire, the staff concluded that the change is acceptable. On the HVAC

penetrations, that are provided with combination fire/smoke dampers, the staff reviewed the submitted information and concluded that the new HVAC penetrations adequately prevent flame and smoke spread into the MCR, and therefore the modification is acceptable. On the flooring gap, the staff reviewed the information submitted and concluded that the final configuration, which completely seals the gap with concrete, is acceptable in ensuring the 3-hour rated fire barrier is maintained and to prevent fire and smoke propagation into other plant areas.

The staff reviewed the licensee's proposed changes affecting HVAC. Based on the staff's technical evaluation, the staff finds:

The staff reviewed the relocated penetrations and the reconfigured openings adjacent to column line 9.2 and concluded that the relocations and reconfigurations have no adverse impact on the HVAC design or performance. Also, the staff also concludes that the relocation and reconfiguration of the HVAC has no effect on the performance of the thermal fins used to transfer heat from the room air to the concrete.

The staff reviewed the licensee's proposed changes affecting radiation protection. Based on the staff's technical evaluation, the staff finds:

The staff evaluated the changes proposed in LAR 14-14. In the LAR, the applicant proposed making modifications to UFSAR Figure 3H.5-9 (which is designated as Tier 2*) and related information associated with the auxiliary building finned floors. The staff reviewed the impact of the proposed changes on the MCR dose that reactor operators would receive in accordance with GDC 19. Based on information provided in the LAR, the staff determined that the changes proposed in the LAR were acceptable and in accordance with GDC 19, 10 CFR 50.34(f)(2)(vii) and conforms to the guidance of NUREG-0737, "Clarification of TMI Action Plan Requirements," which specifies that the dose to personnel preforming vital functions should not exceed 5 rem.

Based on these findings, the staff concludes that there is reasonable assurance that the requirements of GDC 1, GDC 2, GDC 3, GDC 4, and GDC 19 in Appendix A to Title 10 CFR 50, Appendix D Section VIII.B.5.a and VIII.B.6 to Title 10 CFR Part 52, 10 CFR Part 50.34(f)(2)(vii), 10 CFR Part 50.48, and 10 CFR Part 52.79(a)(41) will continue to be met. Therefore, the staff finds the proposed changes to be acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission regulations in 10 CFR 50.91(b), the designated South Carolina State official was notified of the proposed issuance of the amendment. The State of South Carolina official had no comment.

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, "*Standards for Protection Against Radiation.*" The NRC 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 (*Federal Register,* 81 FR 50729 (August 2, 2016) and *Federal Register,* 81 FR 60749 (September 2, 2016)). 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.

6.0 CONCLUSION

The staff has concluded, based on the considerations discussed in Section 3 of this safety evaluation, and confirming that these changes do not change an analysis methodology, assumptions, or the design itself, that: (1) there is reasonable assurance that 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 to be acceptable.

7.0 REFERENCES

South Carolina Electric & Gas Company (SCE&G), LAR 14-14: Request for License Amendment: Structural Design of Auxiliary Building Floors, dated June 16, 2016 (ADAMS Accession No. ML16168A282).

South Carolina Electric & Gas Company (SCE&G), LAR 14-14 R1: Revision 1 to Request for License Amendment: Structural Design of Auxiliary Building Floors, dated July 7, 2016 (ADAMS Accession No. ML16189A453).

South Carolina Electric & Gas Company (SCE&G), LAR 14-14 R2: Revision 2 to Request for License Amendment: Structural Design of Auxiliary Building Floors, dated August 16, 2016 (ADAMS Accession No. ML16230A179).

South Carolina Electric & Gas Company (SCE&G), LAR 14-14 R3: Revision 3 to Request for License Amendment: Structural Design of Auxiliary Building Floors, dated October 24, 2016 (ADAMS Accession No. ML16299A064).

South Carolina Electric & Gas Company (SCE&G), LAR 14-14 R3 S1: Supplement 1 to Revision 3 of Request for License Amendment: Structural Design of Auxiliary Building Floors, dated December 21, 2016 (ADAMS Accession No. ML16357A257).

Southern Nuclear Operating Company, "Structural Design of Auxiliary Building Floors" (LAR 16-009, R3S, dated December 16, 2016 (ADAMS Accession No. ML16351A487).

VCSNS Updated Final Safety Analysis Report (UFSAR), Revision 3, dated July 1, 2015 (ADAMS Accession No. ML15196A214).

Final Safety Evaluation Report for Combined Licenses for Virgil C. Summer Nuclear Station Units 2 and 3, dated August 2011 (ADAMS Accession No. ML110450305).

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

Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design, NUREG-1793, Supplement 2, dated August 5, 2011 (ADAMS Accession No. ML112061231).

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

American Institute of Steel Construction (AISC), Specification for the Design, Fabrication and Erection of Steel Safety Related Structures for Nuclear Facilities, AISC-N690-1994.