SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS

RELATED TO EXEMPTION AND AMENDMENT NO. 47

TO THE COMBINED LICENSE NO. 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 January 14, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16015A058), the South Carolina Electric & Gas Company on behalf of itself and the South Carolina Public Service Authority (both hereafter called the licensee) requested that the U.S. Nuclear Regulatory Commission (NRC) amend the combined licenses (COLs) for Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3, COL Numbers NPF-93 and NPF-94, respectively. In a letter dated February 22, 2016 (ADAMS Accession No. ML16053A405), the licensee revised the original license amendment request (LAR). This additional information did not expand the scope of the LAR and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on March 10, 2016 (81 FR 12751).

The LAR proposes changes to COL Appendix C Plant specific Tier 1, Table 3.3-1, "Definition of Wall Thickness for Nuclear Island Buildings, Turbine Building, and Annex Building," to change the tolerance for the concrete wall thickness of the column line J-1 and J-2 walls above elevation 66 feet, 6 inches, from ±1 inch to a tolerance of -1 inch and +4 inches at the intersection of column line 4 of the CA20 module for a length of 24 inches. The remainder of the column line J-1 and J-2 wall tolerance remains the same as currently specified in Table 3.3-1, ±1 inch. The licensee stated that these proposed changes are required to facilitate construction because of misalignment discovered between the rebar in the column line J-1 and J-2 walls and the corresponding two vertical rows of rebar couplers in the CA20 module. The proposed changes to the Updated Final Safety Analysis Report (UFSAR), plant-specific Tier 1 information, and corresponding COL Appendix C information would allow an increase of the concrete wall thickness tolerances. The proposed changes would allow:

1) A new paragraph in UFSAR Tier 2, Section 3.8.4.1.2, "Auxiliary Building," which states that the connection design for the CA20 module column line 4 wall varies with alignment differences from the column line J-1 and J-2 walls. The paragraph further stated that column line J-1 and J-2 wall thicknesses have a tolerance -1" to +4" for a length of 24 inches at the interface of these reinforced concrete walls to the structural module connections at the CA20 module; and that the proposed tolerance change maintain compliance with applicable design codes.

2) COL Appendix C (and plant-specific DCD Tier 1) Table 3.3-1 is revised to include the following:

   a. A new footnote is added. It states that the J1 and J2 wall thicknesses have a tolerance of -1 inch and +4 inch for a length of 24 inches at the interface of these reinforced concrete walls to structural module connections at the CA20 module.

   b. The entry for the column line J-1 wall from column line 4 to the shield building is revised to include the new footnote for the concrete thickness of 2'-0".

   c. The entry for the column line J-2 wall from column line 4 to the shield building is revised to include the new footnote for the concrete thickness of 2'-0".

The licensee has also requested an exemption from the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, Appendix D, "Design Certification Rule for the AP1000 Design," Section III.B, "Scope and Contents," to allow a change to the corresponding portions of the certified information in Tier 1 of the generic Design Control Document (DCD).[1] The proposed Tier 1 changes related to this exemption are identical in purpose and scope to the COL Appendix C changes proposed in the license amendment described in the previous paragraph.

In order to modify the (the plant-specific DCD) Tier 1 UFSAR information, the NRC must find the licensee's exemption request, included in its submittal for the LAR, to be acceptable. The staff's review of the exemption request as well as the LAR is included in this safety evaluation.

By letter dated February 22, 2016 (ADAMS Accession No. ML16053A405), the licensee submitted a revision to the request that clarified the LAR. This additional information did not expand the scope of the LAR and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on March 10, 2016 (81 FR 12751).

2.0 REGULATORY EVALUATION

According to 10 CFR 52.63(b)(1), a licensee who references a design certification rule may request NRC approval for an exemption from one or more elements of the certification information. The Commission may grant such a request only if it determines that the exemption will comply with the requirements of 10 CFR 52.7, which in turn points to the requirements listed in 10 CFR 50.12 for specific exemptions, and if the special circumstances present outweigh any decrease in safety that may result from the reduction in standardization caused by the exemption.

According to 10 CFR 52.98(f), any modification to, addition to, or deletion from the terms and conditions of a COL is a proposed amendment to the license.

[1] While the licensee describes the requested exemption as being from Section III.B of 10 CFR Part 52, Appendix D, the entirety of the exemption pertains to proposed changes to Tier 1 information in the generic DCD. In the remainder of this evaluation, the NRC will refer to the exemption as an exemption from Tier 1 information to match the language of Section VIII.A.4 of 10 CFR Part 52, Appendix D, which specifically governs the granting of exemptions from Tier 1 information.

As stated in 10 CFR Part 52, Appendix D, Section VIII.A.4, exemptions from Tier 1 information are governed by the requirements in 10 CFR 52.63(b)(1) and 10 CFR 52.98(f). Additionally, the Commission will deny a request for an exemption from Tier 1 if it finds that the design change will result in a significant decrease in the level of safety otherwise provided by the design.

As stated in 10 CFR Part 52, Appendix D, Section VIII.B.5.a, a licensee who references this appendix may depart from Tier 2 information, without prior NRC approval, unless the proposed departure involves a change to Tier 1 information, a departure from Tier 2* information, the technical specifications, or otherwise requires a license amendment under paragraphs B.5.b or B.5.c of this section.

The NRC staff considered the following regulatory requirements in reviewing the license amendment request (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," 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.

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.

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 to be compatible with the environmental conditions associated with normal operation, maintenance, testing and postulated accidents, including loss-of-coolant accidents.

3.0 TECHNICAL EVALUATION

3.1 EVALUATION OF EXEMPTION

INTRODUCTION

The regulations in Section III.B of Appendix D to 10 CFR Part 52 require a holder of a COL referencing Appendix D to 10 CFR Part 52 to incorporate by reference and comply with the requirements of Appendix D, including certified information in Tier 1 of the generic AP1000 DCD. The proposed changes would depart from the plant-specific DCD by adding Note 12 of Tier 1, Table 3.3-1, "Definition of Wall Thickness for Nuclear Island Buildings, Turbine Building, and Annex Building." Specifically, the added note, Note 12, depicts those walls as having a tolerance of plus four inches(+4") and minus one inch (-1"). The proposed change to increase the tolerance of column line J-1 and J-2 of the UFSAR Section 3.8.4.1.2 of Tier 2 is a departure. The corresponding changes to Appendix C of the COL requires a license amendment, as well as requiring corresponding changes to the plant-specific Tier 1. As a result, an exemption is needed because Section III.B of Appendix D to 10 CFR Part 52 requires a licensee to comply with the changes to Tier 1 information of the generic AP1000 DCD.

In summary, the end result of this exemption would be that the licensee can implement changes to Tier 1 information described and justified in LAR 15-20 if and only if the NRC approves LAR 15-20. This is a permanent exemption limited in scope to the particular Tier 1 information specified.

As stated in Section VIII.A.4 of Appendix D to 10 CFR Part 52, an exemption from Tier 1 information is governed by the requirements of 10 CFR 52.63(b)(1) and 52.98(f). Additionally, the Commission will deny a request for an exemption from Tier 1 if it finds that the requested change will result in a significant decrease in the level of safety otherwise provided by the design. Pursuant to 10 CFR 52.63(b)(1), the Commission may, upon application by an applicant or licensee referencing a certified design, grant exemptions from one or more elements of the certification information, so long as the criteria given in 10 CFR 52.7 and 50.12 are met, and that the special circumstances as defined by 10 CFR 50.12(a)(2) outweigh any potential decrease in safety due to reduced standardization.

Pursuant to 10 CFR 52.7, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 52. As 10 CFR 52.7 further states, the Commission consideration will be governed by 10 CFR 50.12, "Specific exemptions," which states that an exemption may be granted when: (1) the exemptions are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security; and (2) special circumstances are present. Specifically, 10 CFR 50.12(a)(2) lists six special circumstances for which an exemption may be considered. It is necessary for one of these special circumstances to be present in order for the NRC to consider granting an exemption request. The licensee stated that the requested exemption meets the special circumstances of 10 CFR 50.12(a)(2)(ii). That subsection defines special circumstances as when "[a]pplication of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule." The staff's analysis of each of these findings is presented below.

3.1.1 AUTHORIZED BY LAW

This exemption would allow the licensee to implement approved changes to Tier 1 Table 3.3-1. This is a permanent exemption limited in scope to particular Tier 1 information, and subsequent changes to Tier 1 Table 3.3-1 or any other Tier 1 information, would be subject to the exemption process specified in Section VIII.A.4 of Appendix D to 10 CFR Part 52. As stated above, 10 CFR 52.63.b(1) allows the NRC to grant exemptions from one or more elements of the Tier 1 information. The NRC staff has determined that granting of the licensee's proposed exemption will not result in a violation of the Atomic Energy Act of 1954, as amended, or the Commission regulations, as stated above. Therefore, as required by 10 CFR 50.12(a)(1), the exemption is authorized by law.

3.1.2 NO UNDUE RISK TO PUBLIC HEALTH AND SAFETY

The underlying purpose of Appendix D to 10 CFR Part 52 is to ensure that the licensee will construct and operate the plant based on the approved information found in the DCD incorporated by reference into the licensee's licensing basis. The changes to the design details for the structural wall modules do not have an adverse impact on the response of the nuclear island structures to safe shutdown earthquake ground motions, loads due to anticipated transients, or postulated accident conditions, nor do they change the seismic Category I classification. These changes will not impact the ability of the structures to perform their design

function. Because the changes will not alter the operation of any plant equipment or systems, these changes do not present an undue risk from existing equipment or systems. These changes do not add any new equipment or system interfaces to the current plant design. The changes do not introduce any new industrial, chemical, or radiological hazards that would represent a public health or safety risk, nor do they modify or remove any design, operational controls, or safeguards intended to mitigate any existing onsite hazards. Furthermore, the proposed changes would not allow for a new fission product release path, result in a new fission product barrier failure mode, or create a new sequence of events that would result in significant fuel cladding failures. Accordingly, these changes do not present an undue risk from any new equipment or systems. Therefore, as required by 10 CFR 50.12(a)(1), the staff finds that there is no undue risk to public health and safety.

3.1.3 CONSISTENT WITH COMMON DEFENSE AND SECURITY

This exemption would allow changes to elements of Tier 1 of the plant-specific DCD, specifically to implement approved changes to Tier 1, Table 3.3-1. This is a permanent exemption limited in scope to particular Tier 1 information. Subsequent changes to Table 3.3-1 or any other Tier 1 information would be subject to Appendix D to 10 CFR Part 52. The change does not alter or impede the design, function, or operation of any plant structures, systems, or components (SSCs) associated with the facility's physical or cyber security, and therefore does not affect any plant equipment that is necessary to maintain a safe and secure plant status. In addition, the change has no impact on plant security or safeguards. Therefore, as required by 10 CFR 50.12(a)(1), the staff finds that the common defense and security is not impacted by this exemption.

3.1.4 SPECIAL CIRCUMSTANCES

Special circumstances, in accordance with 10 CFR 50.12(a)(2)(ii), are present whenever application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule. The underlying purposes of the Tier 1 information is to ensure that the licensee will safely construct and operate the plant based on the certified information found in the AP1000 DCD that was incorporated by reference into the licensee's licensing basis. The changes to the design details for the structural wall modules maintain the design margins of the internal containment structures. These changes are necessary to enhance the ability of the licensee to construct the plant based on the information in the certified design, by clarifying the information found in Table 3.3 1. If this exemption is not granted and the proposed changes in the LAR are not allowed to be implemented, then the Tier 1 ITAAC would not conform to the UFSAR Tier 2 design descriptions, and the performance of the Tier 1 ITAAC would not accurately verify construction of the proposed design. Therefore, because the application of Section III.B of Appendix D to 10 CFR Part 52 in this circumstance does not serve the underlying purpose of the rule, the staff finds that the special circumstances required by 10 CFR 50.12(a)(2)(ii) for the granting of an exemption from the Tier 1 information exist.

3.1.5 SPECIAL CIRCUMSTANCES OUTWEIGH REDUCED STANDARDIZATION

This exemption would allow the implementation of changes to Table 3.3-1, in Tier 1 of the plant-specific DCD, as proposed in the LAR. Based on the nature of the proposed changes to the plant-specific Tier 1 information and the understanding that these changes were identified during the design finalization process for the AP1000, this exemption may be requested by other AP1000 licensees and applicants. However, a review of the reduction in standardization

resulting from the change from the standard DCD determined that even if other AP1000 licensees and applicants do not request this same change, the special circumstances will continue to outweigh any decrease in safety from the reduction in standardization because the key design functions of the containment internal structural wall modules associated with this request will continue to be maintained. While the text in the Table 3.3-1 may be changed, the changes have no effect on any SSCs meeting their design function. Therefore, as required by 10 CFR Part 52.63(b)(1), the staff finds that the special circumstances outweigh the effects the change has on the standardization of the AP1000 design.

3.1.6 NO SIGNIFICANT REDUCTION IN SAFETY

This exemption would allow the implementation of changes to Table 3.3-1 proposed in the LAR. The proposed changes to the design details for the structural wall modules maintain the design margins of the internal containment structures. The proposed changes to Table 3.3-1 will not adversely affect the ability of the SSCs to perform their design functions and the level of safety provided by the SSCs is unchanged. Therefore, as required by 10 CFR Part 52, Appendix D, Section VIII.A.4, the staff finds that granting the exemption would not result in a significant decrease in the level of safety otherwise provided by the design.

3.2 EVALUATION OF PROPOSED CHANGES

INTRODUCTION

To perform the technical evaluation, the NRC staff considered UFSAR Tier 1 Section 3.3, "Buildings," and Tier 2 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 portions of NUREG-2153, Volume 1, "Final Safety Evaluation Report for Combined Licenses for Virgil C. Summer Nuclear Station, Units 2 and 3," (ADAMS Accession No. ML13275A125) documenting the staff's technical evaluation of those aspects of the AP1000 DCD and Summer COL applications, respectively. The NRC staff reviewed the licensee's proposed UFSAR changes to walls thickness tolerances to confirm that the safety function of the affected walls is not compromised by the proposed increase in tolerance. UFSAR Subsection 3.8.4.1.2 states that the Auxiliary Building walls are designed using reinforced concrete and structural steel. The Auxiliary Building south side used structural modules. These modules include the spent fuel pool module CA20. The module walls are a mix of steel-concrete (SC) composite modules and reinforced concrete walls.

The SC wall modules and composite sections are designed in accordance with the provisions of the American Concrete Institute (ACI) Code, ACI 349-01, "Building Code Requirements for Nuclear Safety Related Structures" and the American Institute of Steel Construction (AISC) Standard Specification, AISC N690-1994, "Specification for the Design, Fabrication, and Erection of Steel Safety Related Structures for Nuclear Facilities." The column line J1 and J2 concrete walls are designed in accordance with ACI 349-01 building code.

Under this LAR, the licensee proposed to depart from Tier 1 material in UFSAR Table 3.3-1, "Definition of Wall Thicknesses for Nuclear Island Buildings, Turbine Building, and Annex Building." As mentioned in Section 1.0 of this safety evaluation, the proposed changes to Section 3.8.4.1.2, "Auxiliary Building," of the UFSAR along with the added footnote in Tier 1 Table 3.3-1, indicate an increase thickness tolerances for walls J-1 and J-2 to -1" to +4" for a length of 24 inches at the interface of these reinforced concrete walls and at the connections of

the CA20 structural module. The original wall thickness tolerance for the walls (as certified in the AP1000 DCD) is ±1". The licensee further stated that the increased tolerance and connection designs maintain compliance with applicable design codes. The staff's evaluation of these design changes are summarized below.

STAFF EVALUATION

In the LAR, the licensee stated that the proposed changes to the Tier 1 table are required as a result of a misalignment discovered during construction between the wall J-1 and J-2 reinforcement bars and the corresponding couplers locations on CA 20 structural module. For the proposed changes, the licensee stated that it maintains the design requirements described in applicable portion of the ACI-349-01 code and the AWS D1.4-1998, and the ANSI/AISC N690-94 as per Section 3.8.4 of the UFSAR.

The NRC staff reviewed the LAR and observed that the proposed tolerance exceeds the specified tolerance in Table 3.3-1 for the wall thickness. The staff notes that the affected walls (J-1 and J-2) are not characterized as critical sections as defined in Appendix 3H, "Auxiliary and Shield Building Critical Sections;" of the UFSAR and are not Tier 2* sections. Therefore, the staff focused its review of the proposed increase tolerance (from +1" to 4") on the design commitments and the safety function of the affected walls. The staff considers the proposed increase in tolerance from +1 inch to +4 inches to be acceptable because the design of the affected walls is in accordance with ACI 349-01, which is consistent with the current approved design method in the certified AP1000 design; and the design change did not impact the safety function of the affected walls. For the reasons stated above, the staff concludes that the proposed changes to Tier 1, COL Appendix C, Table 3.3-1 and Section 3.8.4.1.2 of the UFSAR are acceptable.

EVALUATION CONCLUSION

The staff reviewed the licensee's proposed changes provided in the LAR. Based on the staff's technical evaluation, the staff finds that the proposed change to include Note 12 in Tier 1 Table 3.3-1 and the new paragraph added to Section 3.8.4.1.2 of the UFSAR provides wall thickness tolerance deviations which do not affect the structural integrity of the affected walls and the structural module CA20; and that the safety margin is adequate by following design bases codes requirements. For the reasons specified above, the staff finds that the proposed UFSAR amendments to Tier 1 Table 3.3-1 and Tier 2 Subsection 3.8.4.1.2 of the UFSAR are acceptable.

Based on these findings, the NRC staff concludes that there is reasonable assurance that the requirements of General Design Criterion (GDC) 1, GDC 2, and GDC 4 of 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A ("General Design Criteria for Nuclear Power Plants"), and Appendix D ("Design Certification Rule for the AP1000 Design") to 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," 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)(2), the designated South Carolina State official was notified of the proposed issuance of the amendment. The State of South Carolina 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, "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 (March 10, 2016 (81 FR 12751)). 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.

Because the exemption is necessary to allow the changes proposed in the license amendment, and because the exemption does not authorize any activities other than those proposed in the license amendment, the environmental consideration for the exemption is identical to that of the license amendment. Accordingly, the exemption meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of the exemption.

6.0 CONCLUSION

The NRC staff has determined that pursuant to Section VIII.A.4 of Appendix D to 10 CFR Part 52, the exemption (1) is authorized by law, (2) presents no undue risk to the public health and safety, (3) is consistent with the common defense and security, (4) is a special circumstance that outweighs the reduction in standardization, and (5) does not significantly reduce the level of safety at the licensee's facility. Therefore, the staff grants the licensee an exemption from the Tier 1 information specified by the licensee.

The Commission has concluded, based on the considerations discussed in Section 3.2 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 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.

7.0 REFERENCES

1. Request for License Amendment and Exemption 15-20, Revision 1, Increased Concrete Thickness Tolerance for Column line J-1 and J-2 Walls above 66'-6", letter from South Carolina Electric & Gas (SCE&G), dated February 22, 2016 (ADAMS Accession No. ML16015A058)

2. AP1000 Design Control Document, Revision 19, dated June 13, 2012 (ADAMS Accession No. ML11171A500).

3. 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).

4. U.S. Nuclear Regulatory Commission, “Final Safety Evaluation Report for Combined Licenses for Virgil C. Summer Nuclear Station, Units 2 and 3,” Volume 1, NUREG 2153, dated September 2013 (ADAMS Accession No. ML13275A125).

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

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