

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS
RELATED TO LICENSING AMENDMENT NO. 27 AND EXEMPTION
TO THE COMBINED LICENSE NO. NFP-93
AND LICENSE NO. NFP-94
SOUTH CAROLINA ELECTRIC AND 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 October 30, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14303A448), the proposed license amendment request (LAR) 13-27, South Carolina Electric & Gas Company (SCE&G/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.

The proposed license amendment and exemption provides for departure from the Updated Final Safety Analysis Report (UFSAR) Tier 1 material included in Appendix C of each of the VCSNS Units 2 and 3 COLs. The proposed amendment also provides for departure from Tier 2 material which involves a departure to the associated certified Tier 1 material. SCE&G also requested an exemption from the provisions of 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," Section III.B, to allow a departure from elements of the certification information in Tier 1 of the generic design control document (DCD).

The proposed license amendment request (LAR 13-27) specifies the use of latching control relays in lieu of breakers to de-energize the control rod drive mechanism (CRDM) motor generator (MG) set generator field on a diverse actuation system (DAS) reactor trip signal. The replacement of the CRDM MG set generator field breakers with field control relays requires a UFSAR Tier 2 departure that involves changes to COL Appendix C, Tables 2.5.1-4, "Inspections, Tests, Analyses, and Acceptance Criteria," (ITAAC) and 3.7-1, "Risk-Significant Components," along with corresponding departures from plant-specific DCD Tier 1 information.

The use of generator field control relays in lieu of field breakers does not involve a change to any figures found in Tier 2, Tier 1, Technical Specification, or COL Appendix C as this component is below the level of detail in system drawings.

2.0 REGULATORY EVALUATION

Tier 1 Information is defined in 10 CFR Part 52, Appendix D Section II.D. 10 CFR Part 52, Appendix D Section II.D.3 lists the ITAAC as part of the definition for Tier 1 information. The information that the licensee is requesting to change is referenced in ITAAC Tables. Therefore, the information is considered Tier 1 information.

10 CFR Part 52, Appendix D, Section VIII.A.4 states that exemptions from Tier 1 information are governed by the requirements of 10 CFR 52.63(b)(1) and 10 CFR 52.98(f). It also states that the Commission may deny such a request if the design change causes a significant reduction in plant safety otherwise provided by the design.

10 CFR 52.63(b)(1) allows the licensee to request NRC approval for an exemption from one or more elements of the certification information. The Commission may only grant such a request if it complies 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 the potential decrease in safety due to reduced standardization. Therefore, any exemption from the Tier 1 information certified by Appendix D to 10 CFR Part 52 must meet the requirements of 10 CFR 50.12, 52.7 and 52.63(b)(1).

10 CFR 52.98(f) states that any modification to, addition to, or deletion from the terms and conditions of a COL including any modification to, addition to, or deletion from the ITAAC contained in the license is a proposed amendment to the license. Appendix C of COLs NPF-93 and NPF-94 contains tables which the licensee is proposing to modify. Therefore, the proposed change requires a license amendment.

10 CFR Part 52, Appendix D, Section VIII B.5.a requires prior NRC approval for departure from Tier 2 material, if the departure involves a change to Tier 1 information. This change affects COL Appendix C, Tables 2.5.1-4 and 3.7-1 and corresponding elements in Tier 1 material.

10 CFR 50 Appendix A General Design Criterion (GDC) 22, 10 CFR 50.62, and IEEE Std. 603 cover and specify the design attributes of independence, diversity, and defense-in depth. The proposed change maintains compliance with these requirements and standards by accomplishing the function in a similar manner as previously described.

Item II.Q, "Defense Against Common-Mode Failures in Digital Instrument and Control Systems," of the Staff Requirements Memorandum on SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs" contains the NRC position on the diversity and defense-in-depth (D3), which is fulfilled in the DAS system. The proposed change to the DAS system maintains compliance with the above D3 requirements.

10 CFR 50 Appendix A General Design Criterion (GDC) 13 - Instrumentation and control, states that instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges. The LAR 13-27 proposed to change the field breakers of the control rod MG set generator to control relays, which still meets the control requirements of this GDC.

3.0 TECHNICAL EVALUATION

3.1 EVALUATION OF EXEMPTION

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. Because the licensee has identified a change to the plant-specific Tier 1 information during detailed design of the CRDM MG sets, resulting in the need for a departure, an exemption from the certified design information within plant-specific Tier 1 material is required to implement it.

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 an exemption request if it finds that the requested change to Tier 1 information will result in a significant decrease in safety. 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 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.

The requirements of 10 CFR Part 52, Appendix D, and 10 CFR 50.12, 10 CFR 52.7, and 10 CFR 52.63 state that the NRC may grant exemptions from the requirements from the regulations provided six conditions are met. The staff's analysis of these six conditions is discussed below.

3.1.1 AUTHORIZED BY LAW

This exemption would allow the licensee to implement approved changes to Tier 1 information. This is a permanent exemption limited in scope to particular Tier 1 information, and subsequent changes to this Tier 1 information or any other Tier 1 information would be subject to full compliance by the licensee as specified in Section III.B 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 certification information; namely, the requirements of Section III.B of Appendix D to 10 CFR Part 52. As explained in more detail below in the context of the amendment request associated with the requested exemption, the NRC staff 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's regulations. Therefore, as required by 10 CFR 50.12(a)(1), the exemption is authorized by law.

3.1.2 NO UNDUE RISK TO THE PUBLIC HEALTH AND SAFETY

The underlying purpose of Section III.B 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 plant-specific Tier 1 DCD will continue to reflect the approved licensing basis for VCSNS Units 2 and 3 and will maintain a consistent level of detail with that which is currently provided elsewhere in Tier 1 of the plant-specific DCD. These proposed LAR changes are evaluated and found to be acceptable in Section 3.2 of this Safety Evaluation. The change would allow the licensee to implement modifications to Tier 1 information described and justified in the LAR. 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

The proposed exemption would allow the licensee to implement modifications to the Tier 1 information requested in the LAR. This is a permanent exemption limited in scope to particular Tier 1 information. Subsequent changes to this Tier 1 information or any other Tier 1 information would be subject to full compliance by the licensee as specified in Section III.B of Appendix D to 10 CFR Part 52. This LAR involves systems not related to physical security systems. 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 purposes of the rule or is not necessary to achieve the underlying purpose of the rule. The underlying purpose of Section III.B 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 licensee achieves this purpose in part when it provides ITAAC that accurately reflect the plant design and are adequate to verify the construction of the approved design. The requested exemption asks for the licensee to be allowed to implement the changes proposed in the LAR to the VCSNS Units 2 and 3, Tier 1 information. The requested change will facilitate plant construction and maintain or enhance future safe plant operation and maintenance, while supporting the ability of the diverse actuation system to perform its design functions. Accordingly, this change to the certified information will enable the licensee to safely construct, maintain, and operate the AP1000 facility consistent with the design certified by the NRC in 10 CFR Part 52, Appendix D. Therefore, special circumstances are present, because application of the current generic certified design information in Tier 1 as required by 10 CFR Part 52, Appendix D, Section III.B, in the particular circumstances discussed in this request would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule. 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 the special circumstances required by 10 CFR 50.12(a)(2)(ii) for the granting of an exemption from Section III.B of Appendix D to 10 CFR Part 52 exist.

3.1.5 SPECIAL CIRCUMSTANCES OUTWEIGH REDUCED STANDARDIZATION

This exemption would allow the implementation of changes to VCSNS Units 2 and 3, Tier 1 information proposed in the LAR. Based on the nature of the proposed changes to the generic 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 departure from the standard DCD determined that even if other AP1000 licensees and applicants do not request this same departure, the special circumstances will continue to outweigh any decrease in safety from the reduction in standardization because the key design functions of the diverse actuation system associated with this request will continue to be maintained. This exemption request and the associated changes to VCSNS Units 2 and 3, Tier 1 information demonstrate that there is a minimal change from the standard information

provided in the generic AP1000 DCD, which is offset by the special circumstances identified above. The changes have no effect on any systems, structures or components meeting their design function. Based on this, as required by 10 CFR 52.63(b)(1), the staff finds that the special circumstances outweigh the potential decrease in safety due to reduced standardization of the AP1000 design.

3.1.6 NO SIGNIFICANT REDUCTION IN SAFETY

This exemption proposes to revise the plant-specific DCD Tier 1 information by departing from the certified design in allowing the use of field control relays in lieu of field breakers to de-energize the CRDM MG set excitation field. The CRDM MG Sets and the field control relays continue to meet the design function to remove power from the generator, allowing the control rods to drop into the reactor. The proposed change does not adversely affect any system, structure, or component (SSC) design function described in the UFSAR. 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

3.2.1 TECHNICAL EVALUATION FROM THE INSTRUMENTATION AND CONTROL PERSPECTIVES

Non-safety-related reactor trip functions implemented in the DAS for VCSNS Units 2 and 3 are identified in their COL Appendix C, Subsection 2.5.1 and UFSAR Subsection 7.7.1.11. The DAS accomplishes these reactor trip functions through the actuation of the CRDM MG sets. The MG sets provide electrical power to the CRDMs through the reactor trip switchgear. These MG sets are included in the non-safety-related plant control system and the safety-related reactor trip switchgear is included in the plant protection and monitoring system.

The VCSNS UFSAR, COL Appendix C and plant-specific Tier 1 currently specify that MG set generator field breakers open on a reactor trip signal demand from the DAS to de-energize the CRDM MG set generator field and then drop the control rods. In LAR 13-27, the licensee proposed to change the MG set generator field breakers to field control relays because it was found during the detailed design that the 480 Vac voltage rating of the field breaker was incompatible with the voltage of the MG set generator excitation field, which is a low level dc voltage. Hence, the breaker was not the correct device to de-energize the MG set generator excitation field. The specific instrumentation and control (I&C)-related changes resulting from this proposed replacement of the CRDM MG set field breakers with field control relays are reflected in VCSNS COL Appendix C, Table 2.5.1-4, "Inspections, Tests, Analyses, and Acceptance Criteria" for the DAS. Specifically only acceptance criteria for ITAAC Nos. 2.5.01.02(a) and 2.5.01.02(c.i) in Table 2.5.1-4 need to be revised by just replacing the "field breakers" with "generator field control relays."

In the final safety evaluation report related to Certification of the AP1000 Standard Plant Design, the staff found that the current design of the DAS system was evaluated to be acceptable based on the design attributes and compliance with regulatory requirements. The acceptability of the DAS is not explicitly based on the specific use of field breakers for MG set trip and control functions.

The acceptance criteria for ITAAC Nos. 2.5.01.02(a) and 2.5.01.02(c.i) in Table 2.5.1-4 was proposed to be revised by just replacing the “field breakers” with “generator field control relays” in their context. The staff found that the ITAAC acceptance criteria for ITAAC Nos. 2.5.01.02(a) and 2.5.01.02(c.i) in Table 2.5.1-4 will continue to be met with implementation of the proposed changes.

Field breakers are typically designed for over-current protection and should not normally be used as switches for a control function. As stated in LAR 13-27, field control relays are more appropriate as switches for the DAS control functions as a reliable type of control device designed to repeatedly open and close contacts. There is no change proposed for the approach on how the DAS system is designed to provide required control functions. So, the control relays will continue to meet the switching requirements for the DAS control functions in a functionally similar manner to the field breakers. The staff found that the proposed change will maintain the CRDM MG set trip functions used to mitigate an accident and the accidents evaluated in the UFSAR are not affected. The change proposed will also not affect any safety-related design code, function, design analysis, safety analysis input or result, or design/safety margin.

Except for the word changes to the acceptance criteria in ITAAC Nos. 2.5.01.02(a) and 2.5.01.02(c.i) in Tier 1 Table 2.5.1-4, the staff found that the proposed change of field breakers to control relays does not cause any change to any figures and other I&C related subsections found in Tier 2, Tier 1, the Technical Specifications, or COL Appendix C. In LAR 13-27, the licensee also made similar changes to Tier 1, Table 3.7-1 and Tier 2, Tables 16.3-2, 17.4-1, and 19.59-18. All changes proposed in LAR 13-27 will not impact the function of any SSC.

The staff found that the proposed design change to the generator field control relays from field breakers for the CRDM MG set trip functions continues to provide an adequate level of safety and will not result in a decrease in the level of safety provided by the certified design. Changes proposed in LAR 13-27 would not change any equipment qualification or fission product barrier. The proposed change will not result in a new failure mode or malfunction that could impact safety-related equipment or system.

The staff found that the proposed change in LAR 13-27 to use control relays, instead of field breakers for the CRDM MG set generator will not have adverse effects on the performance of the DAS system and will continue to satisfy the existing design basis and compliance with the regulatory requirements as specified in GDC 13, 10 CFR 50.62, SECY 93-087 Item II.Q, and other regulatory requirements. Based on the above technical evaluation, the staff has concluded from I&C perspectives that the changes requested in LAR 13-27 as a licensing amendment are acceptable.

3.2.2 Technical Evaluation from a Risk Perspective

Tier 2 Table 17.4 1 lists components within the scope of the design reliability assurance program (D RAP). Tier 1 Table 3.7 1 lists risk-significant components that are subject to D RAP ITAAC. The licensee amended these tables to reflect the effect of the proposed change on components that may be risk significant. This is consistent with the purpose of the D RAP as described in the staff requirements memorandum related to SECY-95-132, dated June 30, 1994. Therefore, these changes are acceptable to the staff.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations in 10 CFR 50.91(b)(2), the South Carolina State official was notified of the proposed issuance of the amendment. 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, "Standards for Protection Against Radiation." The NRC staff has determined that the amendment does not involve: (1) a significant hazards consideration, (2) a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, or (3) a 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* (FR) notices published on January 6, 2015 (80 FR 525). 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 is required for the proposed amendment.

6.0 CONCLUSION

The staff has determined that pursuant to 10 CFR Part 52, Appendix D, Section VIII.A.4, and 10 CFR 50.12, 10 CFR 52.7, and 10 CFR 52.63, 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) has special circumstances present, (5) has special circumstances that outweigh the potential decrease in safety due to reduced standardization, and (6) does not significantly reduce the level of safety at the licensee's facility. Therefore, the staff grants the licensee an exemption from the requirements of 10 CFR Part 52, Appendix D, Section III.B.

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) 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 request acceptable.

7.0 REFERENCES

1. Request for License Amendment and Exemption - Control Rod Drive Mechanism Motor Generator Set Field Relay Change (LAR 13-27) letter from South Carolina Electric & Gas Company dated October 30, 2014 (ADAMS Accession No. ML14303A448).
2. Virgil C. Summer Nuclear Station - Updated Final Safety Analysis Report, Revision 2, dated June 26, 2014 (ADAMS Accession No. ML14183B195).
3. Virgil C. Summer Nuclear Station Final Safety Evaluation Report dated August 17, 2011 (ADAMS Accession No. ML110450305).
4. Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design, Supplement 2, NUREG-1793, August 5, 2011 (ADAMS Accession No. ML112061231).
5. AP1000 Design Control Document, Revision 19, June 13, 2011 (ADAMS Accession No. ML11171A500).