

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS

RELATED TO EXEMPTION AND AMENDMENT NO. 44

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 October 30, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14303A635), the South Carolina Electric and Gas Company on behalf of 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 letters dated July 13, 2015 (ADAMS Accession No. ML15194A314), and April 21, 2016, (ADAMS Accession No. ML16112A272), the licensee supplemented 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 February 17, 2015 (80 FR 8361).

The proposed amendment (LAR 14-15) would revise the updated final safety analysis report in the form of departures from the plant-specific licensing basis documents, regarding removing an air supply line from the compressed and instrument air system to the generator breaker package as a result of the change from an air-blast type generator circuit breaker (GCB) to a sulfur hexafluoride gas type GCB. 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 departure from the corresponding portions of the certified information in Tier 1 of the generic Design Control Document (DCD).¹ In order to modify the UFSAR (the plant-specific DCD) Tier 1 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.

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 departures from 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.

2.0 REGULATORY EVALUATION

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 or departure from Tier 1 information, Tier 2* information, or the technical specifications (TS), or requires a license amendment under paragraphs B.5.b or B.5.c of this section.

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.

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. 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).

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.

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 17, "Electric power systems," requires, in part, that an onsite electrical power system and an offsite electric power system be provided to permit functioning of structures, systems, and components important to safety. The safety function for each system shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.

Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants (NUREG-0800), Chapter 8.2, "Offsite Power System," Appendix A, "Guidelines for Generator Circuit Breakers/load break Switches." Appendix A provides guidelines on the ratings, capabilities, and testing of the GCB. The specific guidelines are based on the Institute of Electrical and Electronics Engineers Standard (IEEE Std.) C37.013, "IEEE Std. for AC High Voltage Generator Circuit Breakers Rated on a Symmetrical Current Basis."

3.0 TECHNICAL EVALUATION

3.1 EVALUATION OF EXEMPTION

INTRODUCTION

Section III.B of Appendix D to 10 CFR Part 52 requires a licensee referencing Appendix D to 10 CFR Part 52 to incorporate by reference and comply with the requirements of Appendix D, including Tier 1 information contained in the generic AP1000 DCD. As defined in Section II of Appendix D to 10 CFR Part 52, Tier 1 information includes inspection, test, analysis, and

acceptance criteria (ITAAC) and design descriptions, among other things. Therefore, a licensee referencing Appendix D incorporates by reference Tier 1 information contained in the generic DCD. The Tier 1 ITAAC and design descriptions, along with the plant-specific ITAAC, were included in Appendix C of the COL at its issuance.

The licensee requests changes to be made to Section 2.3.15 in Tier 1 of the plant-specific DCD. An exemption is needed because Section VIII.A.4 of Appendix D to 10 CFR Part 52 requires a licensee to obtain an exemption to depart from the Tier 1 information of the generic AP1000 DCD.

The Tier 1 information for which a plant specific departure and exemption was requested includes changes to remove a supply line from the Compressed and Instrument Air System (CAS) to the generator breaker package. The end result of this exemption would be that the licensee can implement modifications to Tier 1 information described and justified in LAR 14-15 if and only if the NRC approves LAR 14-15. This is a permanent exemption limited in scope to the particular Tier 1 information.

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's 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 of the plant-specific DCD, specifically Section 2.3.15. This is a permanent exemption limited in scope to particular Tier 1 information, and subsequent changes to Tier 1 Section 2.3.15, 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. 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 because, as stated above, 10 CFR Part 52, Appendix D, Section

VIII.A.4 allows the NRC to grant exemptions from one or more elements of the Tier 1 information. Therefore, as required by 10 CFR 50.12(a)(1), the staff finds that the exemption is authorized by law.

3.1.2 NO UNDUE RISK TO PUBLIC HEALTH AND SAFETY

Appendix D to 10 CFR Part 52 requires that the licensee 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 proposed in the licensee's amendment request will not impact any design function. There is no change to plant systems or the response of systems to postulated accident conditions. There is no change to the predicted radioactive releases due to postulated accident conditions. Furthermore, the plant response to previously evaluated accidents or external events is not adversely affected, and the change described does not create any new accident precursors. Therefore, as required by 10 CFR 50.12(a)(1), the staff finds that the exemption poses no undue risk to the public health and safety.

3.1.3 CONSISTENT WITH COMMON DEFENSE AND SECURITY

The proposed exemption would allow changes to elements of Tier 1 of the plant-specific DCD. This is a permanent exemption limited in scope to particular Tier 1 information. Subsequent changes to Section 2.3.15; or any other Tier 1 information would be subject to the exemption process in Section VIII.A.4 of Appendix D to 10 CFR Part 52. The proposed changes do not alter the design, function, or operation of any structures or plant equipment that is necessary to maintain a safe and secure plant status. In addition, the changes have 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 purpose 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, which was incorporated by reference into the licensee's licensing basis. The proposed changes in Tier 1 of the plant-specific DCD to remove the air supply line to the GCB maintains the design functions of the CAS and the Main Generation System (ZAS). This change does not impact the ability of any structures, systems, or components to perform their functions or negatively impact safety. These changes will enable the licensee to safely construct and operate the AP1000 facility consistent with the design certified by the NRC, by updating Section 2.3.15 in Tier 1 of the plant-specific DCD. Therefore, because the application of the specified Tier 1 information 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 Section 2.3.15 in Tier 1 of the plant-specific DCD, as proposed in the LAR. The design functions of the systems associated with this request will continue to be maintained. Therefore, the standardization inherent in the systems within scope of the certified design is not affected. Based on this, as required by

10 CFR Part 52.63(b)(1), the staff finds that the special circumstances outweigh the effects the departure has on the standardization of Tier 1 documentation associated with the AP1000 design.

3.1.6 NO SIGNIFICANT REDUCTION IN SAFETY

This exemption would allow the implementation of changes to Section 2.3.15 in Tier 1 of the plant-specific DCD, as proposed in the LAR. The changes do not affect any safety-related equipment or function, and the design function of the CAS and ZAS (including the GCB) continue to be met; therefore, as required by Section VIII.A.4 of Appendix D to 10 CFR Part 52, 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

GDC 17 requires, in part, that an onsite electric power system and an offsite electric power system, each system having sufficient capacity and capability, be provided to permit functioning of structures, systems, and components important to safety. GDC 17 also requires electric power from the transmission network to be supplied by two physically independent circuits designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. The AP1000 passive reactor design has an exemption to the requirement of GDC 17 for two physically independent offsite circuits, by providing passive safety-related systems for core cooling and containment integrity. However, one offsite power source with sufficient capacity and capability from the transmission network must be provided to power the safety-related systems and all other auxiliary systems under normal, abnormal, and accident conditions.

In Section 8.2 of the VCSNS, Units 2 and 3, UFSAR, it states that the offsite power system is connected to the generator bus through the main step-up transformers (MSTs). The main generator is connected to the generator bus through the GCB. The plant auxiliary alternating current (AC) systems are connected to the generator bus through the unit auxiliary transformers (UATs). During normal plant operation, the main generator supplies power to the generator bus to feed the plant auxiliary systems through the UATs and the grid through the MSTs. In the event of a loss of the main generator, the GCB automatically trips, and auxiliary power is provided from the switchyard by back-feeding offsite power through the MSTs and the UATs.

In the LAR, the licensee stated that the main generation system, which includes the GCB, is designed to allow the use of an air-blast type GCB or a sulfur hexafluoride (SF6) gas type GCB. The air-blast type GCB uses compressed air and requires an onsite backup compressed air source. The SF6 gas type GCB uses SF6 gas to quench and cool the arc as well as prevent flashover. The GCB and its associated equipment are referred to as the generator breaker package. The CAS, which contains a high-pressure (HP) air subsystem, was designed to support the possibility of the existence of an air-blast type GCB. The HP air subsystem would supply air to the generator breaker via a supply line from the CAS to the generator breaker package. The CAS HP air support line is no longer needed to support GCB operation because the GCB is to be an SF6 gas type. The licensee proposed to remove a supply line from the CAS to the generator breaker package as a result of the change of the GCB to be an SF6 gas type.

STAFF EVALUATION

The staff reviewed the portion of the LAR pertaining to the GCB. In the LAR, the licensee stated that the GCB is capable of carrying and interrupting the normal load current and interrupting the maximum available root mean square symmetrical and asymmetrical fault current produced by the main generator or the sum of the bolted three-phase fault currents associated with the plant motor house loads and the switchyard. The licensee also stated that the change in the GCB type from an air-blast to a SF6 gas type does not adversely affect any GCB function.

Per Section 8.2 of the SRP, the GCB should meet the following guidelines: 1) the GCB should be capable of interrupting the system maximum available fault current to isolate the unit generator from the offsite power system in order to allow access to the offsite source for the onsite AC power systems in accordance with GDC 17, 2) the GCB should be designed to perform its intended function during steady-state operation, power system transients and major faults, 3) the required ratings and capabilities of the GCB should be based on specific conditions as defined in IEEE Std. C37.013, and 4) specific design tests from IEEE Std. C37.013 should be performed to demonstrate the ability of the GCB to meet its assigned ratings when operating at rated maximum voltage and power frequency.

The staff requested the licensee to provide a summary of the evaluation that shows that the ratings and capabilities of SF6 gas type GCB are consistent with the conditions as defined in IEEE Std. C37.013 and meet the performance tests and capabilities as listed in Section 8.2, Appendix A of the SRP. In its July 13, 2015 supplement, the licensee stated that the GCB is designed and tested in accordance with IEEE C37.013, and no change in compliance with NUREG-0800 is made with the change from an air-blast to a SF6 technology breaker. The licensee further stated that calculations for determining the required ratings of the GCB and the design specifications for the GCB can be made available for NRC review. The staff conducted an audit on June 10, 2015, for the similar LAR review related to the Vogtle electric generating plant to review the methodology of the calculations and verify that the design tests performed demonstrate the ability of the GCB to meet its assigned ratings when operating at rated maximum voltage and power frequency. In its letter dated April 21, 2016, the licensee confirmed that calculations and design specifications audited by the staff for the Vogtle LAR are identical to those used to support this LAR for VCSNS. Based on the licensee confirmatory letter, the staff concludes that the audit findings for the Vogtle LAR is applicable to this VCSNS LAR. Therefore, based on the audit findings for the Vogtle LAR, the staff concludes that the methodology for determining the VCSNS GCB required current ratings and capabilities is in conformance with the guidance in IEEE Std. C37.013, and the design tests expected to be performed for the VCSNS GCB are conformed to the guidelines in Section 8.2 of the SRP. The audit report, which is applicable to this VCSNS LAR, is provided in letter dated September 8, 2015 (ADAMS Accession No. ML15246A370)).

The staff also requested the licensee to describe the functional and operational requirements, including surveillance and maintenance, that are in place to ensure that the SF6 type GCB and its support systems will perform their intended design functions. In its July 13, 2015, letter, the licensee stated that the design functions of the GCB are not impacted by the change in the arc extinguishing medium, and as such the new GCB design performs the intended design functions of the GCB. The licensee also stated that maintenance strategies will be established consistent with the vendor recommendations. Based on its review of the information provided by the licensee, the staff finds that the functional requirements of the SF6 gas GCB remain the same, and the GCB will be adequately maintained.

SUMMARY

The staff reviewed the proposed changes pertaining to the GCB in the LAR. The changes would replace an air-blast type GCB with an SF6 gas type GCB. The staff evaluated the ratings and capabilities of the SF6 GCB in accordance with the guidance in the SRP and IEEE Std. C37.013, and the SF6 GCB's ability to perform its design functions. Based on the above evaluation and findings as described in the audit report, the staff concludes that the change in the GCB type from an air blast to an SF6 gas type will not impact the licensee's ability to continue to comply with the requirements of GDC 17. Therefore, the staff finds the proposed changes to the GCB 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 (80 FR 8361, February 17, 2015). 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: Compressed and Instrument Air System High Pressure Air Subsystem Changes, letter from SCE&G, dated October 30, 2014 (ADAMS Accession No. ML14303A635).
2. Supplement to Request for License Amendment and Exemption: Compressed and Instrument Air System High Pressure Air Subsystem Changes, letter from SCE&G, dated July 13, 2015 (ADAMS Accession No. ML15194A314).
3. Audit Report, Vogtle Electric Generating Plant Units 3 and 4, Methodology of Calculations Supporting the Design of the Main Generator Circuit Breaker, dated September 8, 2015 (ADAMS Accession No. ML15246A370).
4. V. C. Summer Nuclear Power Station, Updated Final Safety Analysis Report, Revision 3, dated July 1, 2015 (ADAMS Accession No. ML15196A214).
5. AP1000 Design Control Document, Revision 19, dated June 13, 2011 (ADAMS Accession No. ML11171A500).
6. V. C. Summer Nuclear Station, Final Safety Evaluation Report dated August 17, 2011 (ADAMS Accession No. ML110450305).
7. 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).
8. Virgil C. Summer Nuclear Station Units 2 and 3, letter dated April 21, 2016 (ADAMS Accession No. ML16112A272)