

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS

RELATED TO AMENDMENT NO. 74

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 January 20, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17020A097), South Carolina Electric & Gas Company (SCE&G) on behalf of itself and the South Carolina Public Service Authority (collectively, the licensee) 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, COL Numbers NPF-93 and NPF-94, respectively. The SCE&G proposed license amendment request (LAR) 17-01 that 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. Specifically, the amendment consists of changes to the UFSAR to provide clarification of the interface criteria for nonsafety-related instrumentation that monitors safety-related fluid systems. This was determined to result in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses, and therefore requires NRC approval.

In letter dated March 8, 2017, (ADAMS Accession No. ML17067A214), the licensee provided additional information that supplemented the application. This information did not expand the scope of the application, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on February 28, 2017 (82 FR 12130).

The staff's review of the license amendment request is included in this safety evaluation.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) 52.98(c) states that any changes to or departures from information within the scope of the referenced design certification rule are subject to the applicable change processes in that rule; and changes that are not within the scope of the referenced design certification rule are subject to the applicable change processes in 10 CFR Part 50, unless they also involve changes to or noncompliance with information within the scope of the referenced design certification rule. In these cases, the applicable provisions of this section and the design certification rule apply.

10 CFR 50.90 states, in part, that whenever a licensee desires to amend their license, they must file an application for an amendment, fully describe the requested changes, and follow as far as applicable, the form prescribed for the original application.

The regulations in Section III.B of Appendix D, "Design Certification Rule for the AP1000 Design," to 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," 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.

10 CFR Part 52, Appendix D, Section VIII.B.5.b(8) indicates that a proposed departure from Tier 2 would require a license amendment if it would result in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses. The proposed change results in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses; specifically it provides criteria for the classification and treatment of nonsafety-related instrumentation that interface with safety-related pressure boundaries. Therefore, the proposed change requires a license amendment.

General Design Criterion (GDC) 1, "Quality Standards and Records," in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," requires that structures, systems, and components (SSCs) important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. The proposed change provides criteria for the codes and standards applicable to nonsafety-related instrumentation that interface with safety-related pressure boundaries. Therefore, this criterion is considered in the evaluation.

GDC 2, "Design Bases for Protection against Natural Phenomena," requires that SSCs important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions. The proposed change involves a discussion of seismic classification - an SSC's requirement to withstand seismic events and maintain functionality and/or structural integrity; therefore, this criterion is considered in the evaluation.

10 CFR 50.55a(c)-(e) requires, in part, that components classified in accordance with the guidance of Regulatory Guide (RG), 1.26, "Quality Group Classifications and Standards For Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants" as Quality Groups A, B, and C meet the associated requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III. The proposed change addresses the treatment of components that are classified in accordance with this guidance; therefore this requirement is considered in the evaluation.

RG 1.151, Revision 0, "Instrument Sensing Lines," and its endorsed standard, International Society of America (ISA) S67.02-1980, "Nuclear-Safety-Related Instrument Sensing Line Piping and Tubing Standards for Use in Nuclear Power Plants," serve as the regulatory guidance for the design and installation of instrument sensing lines for VCSNS Units 2 and 3, and are included in VCSNS Units 2 and 3 UFSAR, Appendix 1A, which discusses conformance with RGs. The proposed change addresses design requirements for instrument sensing lines which are assessed against the criteria in this included guidance. Therefore, RG 1.151, Revision 0, and its endorsed standard, ISA S67.02-1980, are considered in the evaluation.

3.0 TECHNICAL EVALUATION

3.1 Proposed Changes

The existing licensing basis, Section 3.2 of the UFSAR describes the classification of SSCs in the AP1000 design. Components are assigned a seismic classification (described in Subsection 3.2.1) and an equipment classification (described in Subsection 3.2.2) which assigns Quality Group classification and the use of codes and standards.

The seismic classification methodology, as found acceptable in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," assigns SSCs to one of three classifications based on the requirements for the SSC's functionality and structural integrity during and after an earthquake. SSCs are classified as:

1. Seismic Category I, in the case of SSCs that are safety-related or required to support or protect safety-related SSCs;
2. Seismic Category II, for SSCs which perform no safety-related function and the continued function of which is not required, but of which failure could reduce the functioning of a safety-related SSC to an unacceptable level, or could result in incapacitating injury to occupants of the main control room; and
3. Non-Seismic, for SSCs that are not classified as seismic Category I or seismic Category II.

The equipment classification methodology, as found acceptable in NUREG-1793, assigns an equipment classification to each SSC. This equipment classification directly compares to the Quality Group classification system given in RG 1.26 and the associated ASME Code, Section III requirements, as shown in Table 3.2-1 of the UFSAR. Safety-related SSCs are assigned equipment Classes A, B, or C; and SSCs that are nonsafety-related but subject to additional requirements on procurement, inspection, or monitoring are assigned equipment Class D. Equipment Class E, as defined in UFSAR Subsection 3.2.2.7, is used for nonsafety-related SSCs not classified as equipment Class D and do not have a specialized industry standard or classification. Additional equipment classes are used, but are not within the scope of the proposed change.

The current licensing basis for the instrumentation and control line interface criteria is provided in UFSAR Subsection 3.2.2.8:

Class C instrumentation, as defined in Subsection 3.2.2.5 have a safety-related equipment class pressure boundary including the sensing line, valves and instrument sensor. The pressure boundary is the same safety-related equipment class as the systems or components it is connected to. Sensing lines connected to the reactor coolant system pressure boundary are Class B if a suitable flow restrictor is provided.

The parts of the sensor, outside the pressure boundary, are designated Class C (1E) if they provide a safety-related function per Subsection 3.2.2.1. They are Class D if the instrument supports Class D functions per Subsection 3.2.2.6. Otherwise the parts are Class E.

The language above provides classification requirements for safety-related (Class C) instrumentation monitoring a safety-related pressure boundary (Classes A, B, or C). There is no discussion of the classification requirements for nonsafety-related instrumentation monitoring a safety-related pressure boundary. Therefore, the applicant proposed in LAR 17-01 to add requirements for this circumstance.

The proposed change to UFSAR Subsection 3.2.2.8 adds discussion of the requirements for nonsafety-related instruments interfacing with safety-related pressure boundaries. Specifically, the proposed change adds:

Nonsafety-related instrumentation that monitors safety-related fluid systems is Class D, as defined in Subsection 3.2.2.6. The instrument sensing line is safety-related, seismic Category I from the connected fluid system to the instrument manifold. The instrument, manifold, and impulse line (interconnecting tubing between the manifold and instrument) are Class D, seismic Category II, as defined in Subsection 3.2.1.1.2. The Class D quality requirements include a pressure test at 1.5 times design pressure and a requirement for certified material test reports.

3.2 Evaluation of Proposed Changes

To perform the technical review of the proposed changes, the NRC staff considered sections of the VCSNS Units 2 and 3 UFSAR, as well as portions of the AP1000 Design Control Document, Revision 19, NUREG-1793 "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design" and its supplements, and the "Final Safety Evaluation Report for the Virgil C. Summer Nuclear Station Units 2 and 3 Combined License Application," documenting the staff's technical evaluation of those aspects of the AP1000 DCD and VCSNS Units 2 and 3 COL application, respectively. The staff reviewed the licensee's proposed change to evaluate the impact on the overall safety of the plant and conformance with 10 CFR 50.55a and GDC 1 and GDC 2. The following paragraphs describe the staff's review.

The NRC staff reviewed UFSAR Appendix 1A, which lists RG 1.151, Revision 0 and the endorsed standard ISA-S67.02-1980 as the basis for the design and installation of instrument sensing lines and compared the proposed change to this standard. As the licensee stated in the LAR, for nonsafety-related instruments interfacing with safety-related pressure boundaries without penetrating containment, RG 1.151, Revision 0, and ISA S67.02-1980 state that the sensing lines and isolation valve are safety-related, seismic Category I, ASME Code Section III piping and the tubing from the isolation valve to the inboard connection with the instrument manifold is safety-related seismic Category I, American National Standards Institute (ANSI) B31.1 piping. There are no specific requirements beyond this connection in RG 1.151, Revision 0 and ISA S67.02-1980. For nonsafety-related instruments connecting to ASME Section III piping or vessels, no requirement is specified in RG 1.151, Revision 0 and ISA S67.02-1980 regarding the safety classification for the pressure boundary components outboard of the connection to the instrument manifold.

LAR 17-01 states, in part, that the changes proposed to the AP1000 classification methodology for the 50 nonsafety-related instruments interfacing with safety-related ASME Section III systems will transition the instrument sensing lines from safety-related, seismic Category I to nonsafety-related, seismic Category II at the inboard connection to the instrument manifold. As the licensee stated in the LAR, an acceptable orifice is used when nonsafety-related instruments interface with AP1000 equipment Class A systems, which will transition the tubing and isolation valve to AP1000 equipment Class B, such that there is no direct connection

between a Class A system and a nonsafety-related instrument. The LAR indicates that this provides additional assurance that the maximum allowable reactor coolant system operational leakage rates specified in the Technical Specifications will not be adversely affected. The LAR also states that the manifold, instrument, and impulse line are all mounted on the same seismic Category I mounting plate. Additionally, consistent with ISA S67.02-1980, the isolation valves for non-class 1E instrumentation affected by the proposed changes are available to personnel during normal plant operation. Finally, the LAR states that there are no nonsafety-related instruments with sensing lines that penetrate the containment.

The proposed changes are bounded by the guidance provided in ISA-S67.02-1980, in that the standard prescribes seismic Category I classification from the process connection up to the instrument manifold, and nothing beyond, but the proposed change additionally calls for seismic Category II classification for the manifold, instrument, and impulse line. As stated in the LAR, seismic Category II classification applies to SSCs only required to maintain integrity. AP1000 DCD, Revision 19, Subsection 3.2.1.1.2 provides the definition for seismic Category II. The staff found that designating the instrument manifold, instrument, and impulse line as seismic Category II provides assurance that these items will maintain integrity following an earthquake and will not result in structural failure or a loss of process fluids. Additionally, ISA-S67.02-1980 permits a transition from ASME Section III to ANSI B31.1 for those components located beyond the root valve that isolates the instrument sensing lines from the process piping (which would be equivalent to Class D in this case); however, the proposed change maintains ASME Section III jurisdiction up to the instrument manifold, which meets the requirements of 10 CFR 50.55a(d)(1) and 10 CFR 50.55a(e)(1) that the components be designed to ASME Section III criteria. The staff found that extending the ASME Section III jurisdiction beyond the guidance of the standard is a conservative decision, as this designates SSCs to a higher classification than they would otherwise be assigned through the guidance. Therefore, the staff finds that this proposed change continues to meet the requirements in GDC 1 by establishing quality standards commensurate with the safety function to be performed and GDC 2 by demonstrating that SSCs will be designed to withstand the effects of earthquakes.

Section 4.2.2 of ISA-S67.02-1980 provides requirements for instrument sensing lines identified as ANSI B31.1 that are interconnected with seismic Category I ASME Classes 1, 2, or 3 piping. The licensee notes that their proposed changes conform to all four elements listed in Section 4.2.2. The licensee's proposed Class D quality requirements impose a pressure test at 1.5 times design pressure and a requirement for certified material test reports. The licensee also imposes requirements for design and service limits and for connections between ASME Section III and ANSI B31.1 to be in compliance with ASME Section III requirements.

In the initial submittal of this LAR, the licensee stated that the proposed changes meets or exceeds the requirements in RG 1.151, Revision 1, "Instrument Sensing Lines" and its endorsed standard ISA S67.02.01-1999, "Nuclear Safety-Related Instrument-Sensing Line Piping and Tubing Standards for Use in Nuclear Power Plants." In ISA S67.02.01-1999, instrument manifolds for nonsafety-related instruments connected to safety-related process systems are classified as ASME Section III Class 3 and seismic Category I; the classification for the tubing between the instrument and manifold is ANSI B31.1 and seismic Category I. For the proposed changes in LAR 17-01, the instrument manifold has a classification of ANSI B31.1, seismic Category II and the tubing between the instrument and manifold has classification of ANSI B31.1, seismic Category II.

The NRC staff found that the proposed changes did not conform to RG 1.151, Revision 1 and its endorsed standard ISA S67.02.01-1999 for classification of the tubing between the instrument

and manifold. Hence, the NRC staff asked the licensee to clarify how the classification methodology proposed in this LAR meets or exceeds the requirements in RG 1.151, Revision 1 and its endorsed ISA S67.02.01-1999 standard. Because RG 1.151, Revision 0 and ISA S67.02-1980, instead of RG 1.151, Revision 1 and ISA S67.02.01-1999, serve as the licensing basis for instrument lines for VCSNS Units 2 and 3, the licensee removed the statement about meeting or exceeding the requirements in RG 1.151, Revision 1 and its endorsed ISA S67.02.01-1999 standard in a supplemental submittal dated March 8, 2017 (ADAMS Accession No. ML17067A214).

By following the guidance of ISA-S67.02-1980, which is endorsed by RG 1.151, Revision 0, the licensee has provided reasonable assurance that the instrument sensing lines will be designed and installed in an acceptable manner, and that GDC 1, GDC 2, and 10 CFR 50.55a will continue to be met after incorporating the change proposed in LAR 17-01.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations in 10 CFR 50.91(b) (4), the South Carolina State official was notified of the proposed issuance of the amendments. The State official had no comment.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change 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 amendments involve 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 amendments involve no significant hazards consideration, and there has been no public comment on such finding (*Federal Register*, 82 FR 12130 (dated February 28, 2017)). Accordingly, the amendments meet 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 amendments.

6.0 CONCLUSION

The NRC staff reviewed the licensee's proposed changes provided in LAR 17-01. Based on the staff's technical evaluation described in this safety evaluation, the staff found that:

- (1) The proposed changes did not adversely affect the function of previously reviewed and approved systems, in that the design of the tubing, manifold, instrument, and impulse lines will maintain adequate integrity and not impact the operation of safety-related systems during design basis conditions, including safe shutdown earthquakes.
- (2) The proposed changes provided additional clarity to existing documentation.

Based on these findings, the staff concludes that there is reasonable assurance that the requirements of GDC 1, GDC 2; 10 CFR 50.55a, and Appendix D to 10 CFR Part 52 continue to be met with the changes described in LAR 17-01. Therefore, the staff finds the proposed changes provided in LAR 17-01 to be acceptable.

The Commission has concluded, based on the considerations discussed above, 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.

7.0 REFERENCES

1. Request for License Amendment (LAR 17-01): Classification of Nonsafety-Related Instrumentation, letter from South Carolina Electric & Gas Company, dated January 20, 2017 (ADAMS Accession No. ML17020A097).
2. Voluntary Supplement to Request for License Amendment: Classification of Nonsafety-Related Instrumentation (LAR 17-01S1), letter from South Carolina Electric & Gas Company, dated March 8, 2017 (ADAMS Accession No. ML17067A214)
3. ISA-67.02-1980, "Nuclear-Safety-Related Instrument Sensing Line Piping and Tubing Standards for Use in Nuclear Power Plants, Instrument Society of America," dated 1980.
4. ISA-67.02.01-1999, "Nuclear Safety-Related Instrument-Sensing Line Piping and Tubing Standards for Use in Nuclear Power Plants, Instrument Society of America," dated November 15, 1999.
5. Regulatory Guide 1.151, "Instrument Sensing Lines," Revision 0, dated July 1983.
6. Regulatory Guide 1.151, "Instrument Sensing Lines," Revision 1, dated July 2010.
7. Virgil C. Summer Nuclear Station, Updated Final Safety Analysis Report, Revision 4, dated July 1, 2015 (ADAMS Accession No. ML16193A096).
8. AP1000 Design Control Document, Revision 19, dated June 13, 2011 (ADAMS Accession No. ML11171A500).
9. NUREG-2153, Volumes 1 and 2 Final Safety Evaluation Report for Virgil C. Summer Nuclear Station, Units 2 and 3, dated September, 2013 (ADAMS Accession Nos. ML13275A125 and ML13275A126).
10. NUREG-1793, Volume 1, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design," September, 2004 (ADAMS Accession No. ML043450344).
11. NUREG-1793, Supplement 1, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design," dated December 31, 2005 (ADAMS Accession No. ML060330557).
12. NUREG-1793, Volume 1, Supplement 2, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Plant Design," dated August 5, 2011 (ADAMS Accession No. ML11293A120).