



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

July 9, 2012

Mr. Thomas D. Gatlin  
Vice President, Nuclear Operations  
South Carolina Electric & Gas Company  
Virgil C. Summer Nuclear Station  
Post Office Box 88  
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1, ISSUANCE OF  
AMENDMENT (TAC NO. ME7343)

Dear Mr. Gatlin:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 191 to Renewed Facility Operating License No. NPF-12 for the Virgil C. Summer Nuclear Station, Unit 1, in response to your letter dated October 12, 2011. The amendment authorizes revision of the Updated Final Safety Analysis Report by deleting five high head safety injection containment isolation valves (CIVs) from the local leak rate test program, specifically CIVs XVG08801A, XVG08801B, XVG08884, XVG08885, and XVG08886.

A copy of the related Safety Evaluation is enclosed. Notice of Issuance will be included in the Commission's Biweekly *Federal Register* notice.

Sincerely,

A handwritten signature in cursive script that reads "Robert Martin".

Robert E. Martin, Senior Project Manager  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosures:

1. Amendment No. 191 to NPF-12
2. Safety Evaluation

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**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
WASHINGTON, D.C. 20555-0001

SOUTH CAROLINA ELECTRIC & GAS COMPANY

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

DOCKET NO. 50-395

VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1


AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 191  
Renewed License No. NPF-12

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by South Carolina Electric & Gas Company (the licensee), dated October 12, 2011, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, by Amendment No. 191 the license is amended to authorize revision of the Updated Final Safety Analysis Report (UFSAR) as set forth in the application for amendment by the licensee dated October 12, 2011. The licensee shall update the UFSAR to reflect that five high head safety injection containment isolation valves (CIVs), specifically CIVs XVG08801A, XVG08801B, XVG08884, XVG08885, and XVG08886, are no longer included in the local leak rate test program, as authorized by this amendment, in accordance with 10 CFR 50.71(e).
3. This amendment is effective as of its date of issuance and shall be implemented within one hundred twenty (120) days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Nancy Salgado, Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to Renewed Facility  
Operating License No. NPF-12

Date of Issuance: July 9, 2012

ATTACHMENT TO LICENSE AMENDMENT NO. 191  
TO RENEWED FACILITY OPERATING LICENSE NO. NPF-12  
DOCKET NO. 50-395

Replace the following page of the License with the enclosed page as indicated. The revised page is identified by amendment number and contains a marginal line indicating the areas of change.

Remove Page

License

License No. NPF-12, page 3

Insert Page

License

License No. NPF-12, page 3

- (3) SCE&G, pursuant to the Act and 10 CFR Part 70, to receive, possess and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Final Safety Analysis Report, as amended through Amendment No. 33;
  - (4) SCE&G, pursuant to the Act and 10 CFR Parts 30, 40 and 70 to receive, possess and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed neutron sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;
  - (5) SCE&G, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus of components; and
  - (6) SCE&G, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.
- C. This renewed license shall be deemed to contain, and is subject to, the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:
- (1) Maximum Power Level  
  
SCE&G is authorized to operate the facility at reactor core power levels not in excess of 2900 megawatts thermal in accordance with the conditions specified herein and in Attachment 1 to this renewed license. The preoccupation tests, startup tests and other items identified in Attachment 1 to this renewed license shall be completed as specified. Attachment 1 is hereby incorporated into this renewed license.
  - (2) Technical Specifications and Environmental Protection Plan  
  
The technical specifications contained in Appendix A, as revised through Amendment No. 191 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. South Carolina Electric & Gas Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 191 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-12

SOUTH CAROLINA ELECTRIC & GAS COMPANY

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1

DOCKET NO. 50-395

## **1.0 INTRODUCTION**

On October 12, 2011, (Agencywide Document Access and Management Systems (ADAMS) Accession No. ML11286A318), South Carolina Electric & Gas Company (SCE&G, the licensee), submitted a license amendment request (LAR) for the Virgil C. Summer Nuclear Station (VCSNS), Unit 1. The amendment would authorize revision of the Updated Final Safety Analysis Report (FSAR) by deleting five high head safety injection (HHSI) containment isolation valves (CIVs) from the local leak rate test (LLRT) program, specifically CIVs XVG08801A, XVG08801B, XVG08884, XVG08885, and XVG08886.

The licensee indicates that it submitted the LAR based on the results of its evaluation, pursuant to the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 59, "Changes, tests, and experiments," that stated that removal of these CIVs from the LLRT program required NRC review and approval prior to implementation. The licensee is requesting approval for the FSAR change based on crediting a closed loop outside containment as an extension of the containment boundary. These valves are no longer listed directly in the Technical Specifications (TS), so a TS change is not required.

## **2.0 REGULATORY EVALUATION**

The five isolation valves constitute part of the containment boundary. Their purpose and function is explained further in NUREG-0717, "Safety Evaluation Report related to the operation of Virgil C. Summer Nuclear Station, Unit No. 1," dated February 1981. Section 6.2.3 of NUREG-0717 states the following:

### **6.2.3 Containment Isolation System**

The containment isolation system is designed to automatically isolate the containment atmosphere from the outside environment under accident conditions. Double barrier protection, in the form of closed systems and isolation valves, is provided to assure that no single active failure will result in the loss of containment

integrity. The containment isolation provisions are of safety grade design (ASME Boiler and Pressure Vessel Code, Section III, Class 2, and seismic Category I) and are protected from missiles.

The licensee also stated that these five valves are closed during normal operation. The valves are opened or closed in response to indications of a loss-of-coolant accident (LOCA) to establish flow paths for three phases of emergency core cooling system (ECCS) operation: safety injection, recirculation to the reactor coolant system (RCS) hot leg and recirculation to the RCS cold leg. The system alignments are shown by the figures in the LAR.

The NRC staff considered the following regulatory requirements and guidance in assessing the proposed change:

- 10 CFR 50, Appendix J, Option A, "Prescriptive Requirements," and Option B, "Performance-Based Requirements." The NRC staff approved the use of Option B for the VCSNS, Unit 1, by license amendment number 135 on October 2, 1996 (ADAMS ML012270146).
- Option B requires that Type C pneumatic tests (LLRT of CIVs) be conducted periodically at intervals based on the safety significance and historical performance of each CIV to ensure the integrity of the overall containment system as a barrier to fission product release to reduce the risk from reactor accidents. However, unlike Option A, Option B does not contain criteria for determining which CIVs must be tested; instead, NRC-approved guidelines, discussed below, contain criteria which allow certain CIVs to be exempt from LLRT. Option B states the following at Section V.B.3.:

The regulatory guide or other implementation document used by a licensee, or applicant for an operating license, to develop a performance-based leakage-testing program must be included, by general reference, in the plant technical specifications.

- VCSNS TS 6.8.4.a, "Containment Leakage Rate Testing Program," requires that leakage rate testing be performed as required by 10 CFR Part 50, Appendix J, Option B, as modified by approved exemptions, and in accordance with the guidelines contained in Regulatory Guide (RG) 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995, with certain exceptions listed in the TS. This RG endorses, with certain exceptions, Nuclear Energy Institute (NEI) report NEI 94-01, Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," dated July 26, 1995.

NEI 94-01 criteria establishes that an LLRT is not required for containment isolation valves that are part of a primary containment boundary that does not constitute potential primary containment atmospheric pathways during and following a Design Bases Accident (DBA).

### **3.0 TECHNICAL EVALUATION**

Appendix J to 10 CFR Part 50, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option A, Prescriptive Requirements, includes requirements for testing the leak-tight integrity of the primary reactor containment, and systems and components which

penetrate containment and establishes the acceptance criteria for these tests. HHSI CIVs XVG08801A, XVG08801B, XVG08884, XVG08885 and XVG08886 are currently subject to Type C LLRT.

Appendix J, Option A was applicable to VCSNS until Option B was approved for VCSNS by Amendment 135 on October 2, 1996. When VCSNS was originally licensed, Appendix J, Option B, was not available and VCSNS was licensed to what is now considered Option A.

The original design of the VCSNS safety injection (SI) system alternated between cold leg recirculation and hot leg recirculation. The HHSI CIVs would be opened and closed intermittently throughout long term recirculation as the system was realigned. In accordance with Appendix J, Option A, Section II.H.3, the valves were required to be in the Type C LLRT program because they were required to operate intermittently under post-accident conditions.

The licensee states that ECCS operation during long term cooling has been revised since original licensing. The long term cooling alignment is now simultaneous hot and cold leg recirculation, as discussed in further detail in the LAR. As a result of this change, Criterion H.3 mentioned above, is no longer applicable.

Notwithstanding the revision of Appendix J in 1995, the regulatory requirements as to whether or not a particular CIV must be locally leakage rate tested are otherwise unchanged. To be excluded from Type C testing, it must be shown that (a) a containment boundary does not constitute a potential containment atmospheric pathway during and following a design basis accident, or (b) that it is sealed with a qualified seal system in accordance with the guidance in NEI 94-01, Section 6.0. The staff's review of a boundary, to see if it is a potential containment atmospheric pathway, uses conservative deterministic assumptions, such as giving no credit for a component that does not meet seismic Category 1, Safety Class 2, and electrical Class 1E requirements.

### 3.1 Closed Systems Outside Containment

The staff reviewed the licensee's justification for crediting a closed system outside containment as a mechanism for precluding the leakage of containment atmosphere to the external environment, for the subject CIVs. The licensee summarized, as part of the LAR, the licensing basis for the five subject HHSI CIVs and referenced information in the licensee's FSAR and NUREG-0717 for the safety injection lines which include a check valve and an isolation valve outside containment. The licensee has shown that the safety injection system is protected from missiles, pipe whip, and jet forces from a LOCA, and that the safety injection system piping and valves are seismic Category 1, and Safety Class 2. The licensee provided information showing that the allowable system design stresses are not likely to be exceeded by inside-containment temperatures and pressures. The licensee also provided information demonstrating that system integrity is maintained during normal plant operations, via leak testing of the SI system and the chemical and volume control system (CVCS) in accordance with TS SR 4.0.5, "Surveillance Requirements for Inservice Inspection and Testing of ASME Code Class 1, 2, and 3 components," and TS 6.8.4.a, "Primary Coolant Sources Outside Containment."

The staff reviewed the licensee's justification for crediting a closed system outside containment as a mechanism for precluding the leakage of containment atmosphere to the external environment, for the subject CIVs and has found that VCSNS meets the following requirements for a closed system outside containment, in accordance with NUREG-0800, "Standard Review Plan,"



#### Section 6.2.4.

In addition to the NUREG-0737 testing (i.e., Radioactive System Leakage Inspection Program), which is discussed in Section 3.3 of this SER, the closed systems outside containment are periodically system pressure tested and inspected in accordance with ASME Section XI. All containment piping penetrations, including the closed systems outside containment, are located in radiologically controlled areas of the auxiliary, fuel, and safeguards buildings which are monitored by radiation monitors for containment leakage after a loss-of-coolant accident. The staff finds these tests and inspections meet the intent of 10 CFR Part 50, Appendix A, General Design Criterion 54 requirements for leak detection.

It is the licensee's intent, to show that leakage from the closed systems outside containment is minimized by their RSLI program through operating experience and work history, in order to demonstrate that closed systems are suitable barriers and ensures the containment isolation function is maintained. The licensee provided a detailed description of their RSLI program, which is summarized in Section 3.2 of this safety evaluation.

### 3.2 The Radioactive System Leakage Inspection (RSLI) Program

The overall objective of the RSLI program, also known as the emergency core cooling system (ECCS) Recirculation Path Management program at VCSNS, is to monitor, evaluate and reduce leakage from those portions of systems outside containment that contain highly radioactive fluids during post accident operation to levels as low as reasonably achievable (ALARA). Leakage from radioactive systems outside containment are monitored to meet the commitments in the VCSNS FSAR Section III.D.1.1 (Response to the NRC Action Plan for the Three Mile Island [TMI] Accident) and the requirements of TS Section 6.8.4, "Primary Coolant Sources Outside Containment."

The licensee described their RSLI program as follows:

VCSNS's management of ECCS Recirculation Path leakage includes:

- a. Preventive maintenance and periodic visual inspection requirements; and
- b. Integrated leak test requirements for each system at refueling cycle intervals or less.

Leakage action levels for ECCS Recirculation Path leakage at VCSNS are administratively controlled via [plant procedure] ES-529 as follows:

- |                 |  |
|-----------------|--|
| Action Level 1: | Cumulative leakage is between 3,570 cc/hr and 6,000 cc/hr. The 6,000 cc/hr leak rate is the conservative operational leakage rate based on FSAR 15.4.1.4.2.  |
| Action Level 2: | Cumulative leakage exceeds the 6,000 cc/hr operational leakage rate. Operability may be impacted by the elevated leakage, condition report (CR) generation is required, and a design engineering evaluation must be completed. |

The current VCSNS leakage assumptions are conservatively established at 12,000 cc/hr, which is more than 2 times the operational leakage estimated for the RHR and RB Spray systems per FSAR Tables 6.3-4 and 6.2-52b.

All abnormal leakage is evaluated and corrected under the Appendix B corrective action program in accordance with NRC Generic Letter 91-18, Revision 1. For the HHSI/charging pump discharge headers, leakage rates are adjusted to a pressure of 2664 psig.

Tracking of leakage locations for comparison against action level limits is maintained electronically in a "living document" per ES-529 requirements. Leakage locations are compared against pre-calculated correction factors which account for variance in the system.

Operations, engineering, quality assurance, and maintenance personnel perform integrated system walkdowns, boric acid program walkdowns, tests, and observations which identify/quantify leakage. These visual indications are documented in the corrective action program and addressed via condition reports and maintenance work requests.

System engineers review ECCS Recirculation Path Management test data and other significant leakage data and applicable corrective action documents on ECCS Recirculation Path Management system components to maintain a ECCS Recirculation Path Management program leakage table. This will ensure that the cumulative leakage for portions of systems covered by this program remain within the leakage criteria.

Maintenance work request are prioritized and scheduled appropriately in accordance with a 12 week planning process. This process allows for replacement and/or repair of O-rings, diaphragms, gaskets, valves, fittings, and/or seals.

The present leakage value for the ECCS Recirculation Path is 0.0003 gpm (60 cc/hr), which is significantly below the programmatic thresholds set forth within procedure ES-529.

The staff reviewed the licensee's RSLI program, and concluded that the information provided by the licensee above has demonstrated an acceptable program that monitors and reduces leakage from those portions of systems outside containment. As a result, the staff believes that there is reasonable assurance that leakage from the pertinent closed systems outside containment will be minimized by the RSLI program, and accordingly, these closed systems will maintain containment isolation functions.

Based on the requirements of Appendix J, Option B and the foregoing evaluation, the staff finds that the closed systems outside containment will preclude leakage of containment atmosphere to the environment through the subject CIVs (XVG08801A, XVG08801B, XVG08884, XVG08885 and XVG08886) during a loss-of-coolant accident. Therefore, the staff finds that these CIVs do not constitute potential containment atmospheric pathways during and following a design basis accident, and that continued testing of the subject CIVs does not provide a significant additional safety benefit. Accordingly, local leak rate tests under Appendix J, Option B, are not required.

Therefore, the licensee's proposed UFSAR change to delete the five CIVs from the LLRT program is acceptable.

#### **4.0 STATE CONSULTATION**

In accordance with the Commission's regulations, 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. 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 amendments involve no significant hazards consideration, and there has been no public comment on such finding ( 76 FR 77570). 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 amendments.

#### **6.0 CONCLUSION**

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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Brian Lee

Date: July 9, 2012

July 9, 2012

Mr. Thomas D. Gatlin  
Vice President, Nuclear Operations  
South Carolina Electric & Gas Company  
Virgil C. Summer Nuclear Station  
Post Office Box 88  
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1, ISSUANCE OF  
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Sincerely,

/RA/

Robert E. Martin, Senior Project Manager  
Plant Licensing Branch II-1  
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Office of Nuclear Reactor Regulation

Docket No. 50-395

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