June 1, 2000

Mr. Stephen A. Byrne
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Post Office Box 88
Jenkinsville, South Carolina 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1 - ISSUANCE OF AMENDMENT RE: K INFINITY (TAC NO. MA8124)

Dear Mr. Byrne:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 144 to Facility Operating License No. NPF-12 for the Virgil C. Summer Nuclear Station, Unit No. 1. The amendment changes the Technical Specifications in response to your application dated January 27, 2000.

This amendment revises the spent fuel pool reactivity limit requirement by removing the value for K infinity from Specification 5.6.1.1 and replacing it with a figure of integral fuel burnable absorbers rods versus nominal Uranium-235 enrichment.

A copy of the related Safety Evaluation is enclosed. The Notice of Issuance will be included in the Commission's bi-weekly Federal Register notice. This completes the staff's efforts on TAC No. MA8124.

Sincerely,
/RA/

Karen Cotton, Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosures:
1. Amendment No. 144 to NPF-12
2. Safety Evaluation

cc w/encls: See next page

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

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Sincerely,

Karen Cotton

Karen Cotton, Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-395

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cc w/encls: See next page

cc:

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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 NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 144
License No. NPF-12

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by South Carolina Electric & Gas Company (the licensee), dated January 27, 2000, 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, the license is amended by changes to the Technical Specifications, as indicated in the attachment to this license amendment; and paragraph 2.C.(2) of Facility Operating License No. NPF-12 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 144 , and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. South Carolina Electric & Gas Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This amendment is effective as of its date of issuance and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Richard L. Emch, Jr.

Richard L. Emch, Jr., Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: June 1, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 144

TO FACILITY OPERATING LICENSE NO. NPF-12

DOCKET NO. 50-395

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages	Insert Pages
5-7	5-7
5-7a	5-8
5-8	5-9
-----	5-10

5.6 FUEL STORAGE

CRITICALITY

5.6.1.1 The spent fuel storage racks consist of 1276 individual cells, each of which accommodates a single assembly. The cells are grouped into 3 regions. The spent fuel storage racks are designed and shall be maintained with a K_{eff} less than or equal to 0.95 when flooded with unborated water, which includes conservative allowances for uncertainties and biases. This is ensured by maintaining the following for each region:

a. REGION 1 - designated for storage of fresh fuel assemblies and freshly discharged fuel assemblies.

   1. A nominal 10.4025 inch center-to-center distance between fuel assemblies placed in the storage rack.

   2. A nominal enrichment of 5.0 weight percent U-235 with a minimum number of integral fuel burnable absorbers as shown on Figure 5.6-1. The Integral Fuel Burnable Absorbers (IFBA) rod requirements shown in Figure 5.6-1 are based on a nominal IFBA linear B^{10} loading of 1.50 mg-B^{10}/inch (1.0X). For higher IFBA loadings up to 3.00 mg-B^{10}/inch (2.0X), the required number of IFBA rods may be reduced by the ratio of the increased B^{10} loading to the nominal 1.50 mg-B^{10}/inch loading. The poison length of the IFBA rods is greater than or equal to 108 inches.

b. REGION 2 - designated for storage of discharged fuel assemblies.

   1. A nominal 10.4025 x 10.1875 inch center-to-center distance between fuel assemblies placed in the storage rack.

   2. A maximum nominal enrichment of 2.5 weight percent U-235 with no burnup and up to 5.0 weight percent U-235 with a minimum burnup of up to 21,600 MWD/MTU, as specified in Figure 3.9-1.

c. REGION 3 - designated for storage of discharged fuel assemblies.

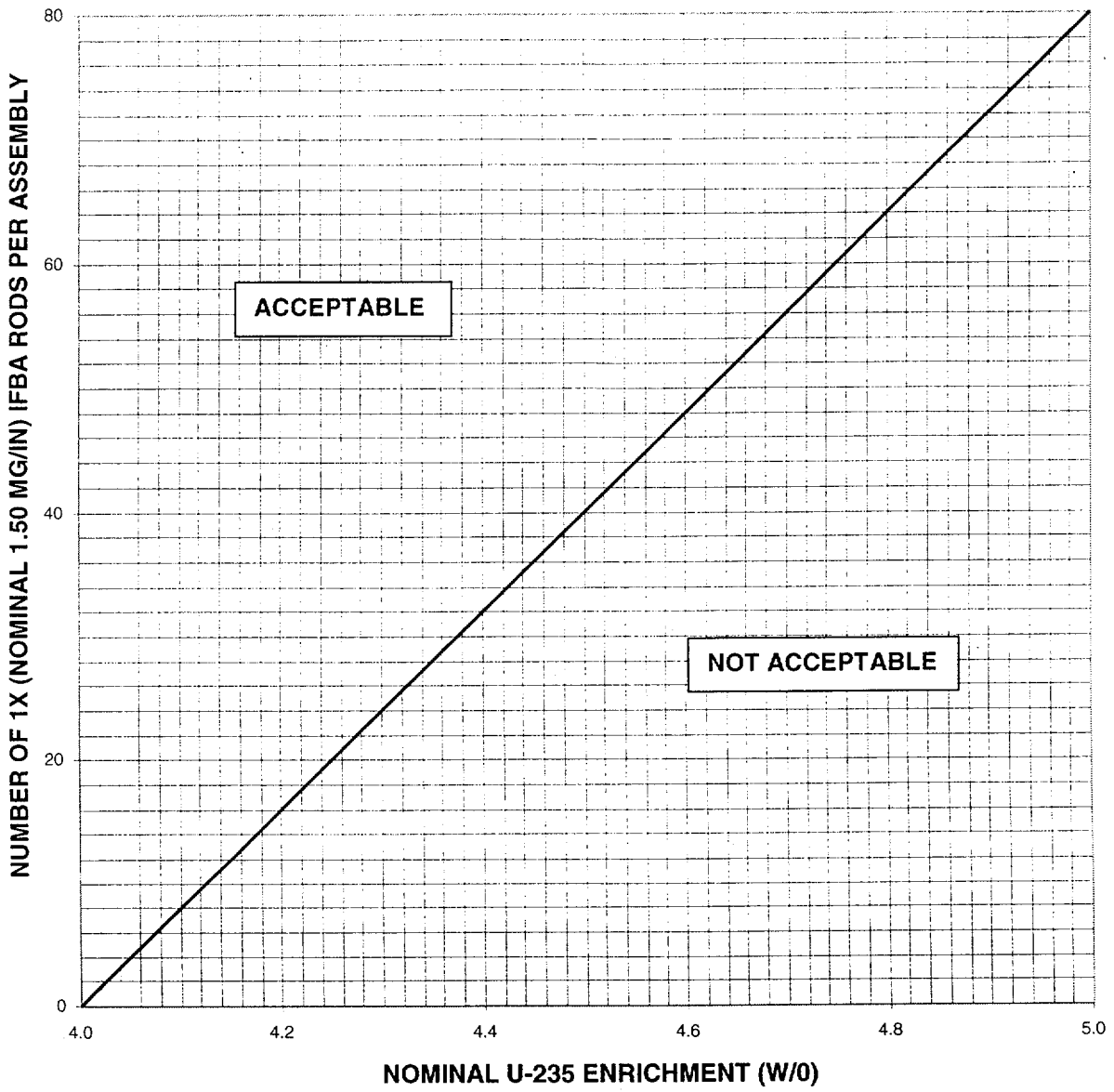
   1. A nominal 10.116 inch center-to-center distance between fuel assemblies placed in the storage rack.

   2. A maximum nominal enrichment of 1.4 weight percent U-235 with no burnup and up to 5.0 weight percent U-235 with a minimum burnup of up to 48,000 MWD/MTU, as specified in Figure 3.9-2.

5.6.1.2 The new fuel storage racks consist of 60 individual cells, each of which accommodates a single assembly. The new fuel pit storage racks are designed and shall be maintained with a K_{eff} less than or equal to 0.95 when flooded with unborated water and less than or equal to 0.98 for low density optimum moderation conditions, including conservative allowances for uncertainties and biases. This is ensured by maintaining:

a. A nominal 21 inch center-to-center distance between new fuel assemblies placed in the storage rack.

b. A nominal enrichment of 5.0 weight percent U-235.



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
Region 1 Minimum
IFBA Requirements
FIGURE 5.6-1

DRAINAGE

5.6.2 The spent fuel pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 460'3".

CAPACITY

5.6.3 The spent fuel pool is designed and shall be maintained with a storage capacity limited to no more than 1276 fuel assemblies, 242 in Region 1, 99 in Region 2, and 935 in Region 3.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

TABLE 5.7-1

COMPONENT CYCLIC OR TRANSIENT LIMITS

COMPONENT	CYCLIC OR TRANSIENT LIMIT	DESIGN CYCLE OR TRANSIENT
Reactor Coolant System	200 heatup cycles at ≤ 100°F/hr and 200 cooldown cycles at < 100°F/hr.	Heatup cycle - T_{avg} from at ≤ 200°F to ≥ 550°F. Cooldown cycle - T_{avg} from ≥ 550°F to ≤ 200°F.
	200 pressurizer cooldown cycles at ≤ 200°F/hr.	Pressurizer cooldown cycle temperatures from ≥ 650°F to ≤ 200°F.
	80 loss of load cycles, without immediate turbine or reactor trip.	≥ 15% of RATED THERMAL POWER to 0% of RATED THERMAL POWER.
	40 cycles of loss of offsite A.C. electrical power.	Loss of offsite A.C. electrical ESF Electrical System.
	400 reactor trip cycles.	100% to 0% of RATED THERMAL POWER.
	10 inadvertent auxiliary spray actuation cycles.	Spray water temperature differential > 320°F.
	50 leak tests.	Pressurized to ≥ 2485 psig.
	5 hydrostatic pressure tests.	Pressurized to ≥ 3107 psig.
	200 large stepload decrease with steam dump.	Load decreases of more than 10% RATED THERMAL POWER occurring in 1 minute or less.
Secondary System	1 steam line break.	Break in a > 6 inch steam line.
	5 hydrostatic pressure tests.	Pressurized to ≥ 1350 psig.

UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 144 TO FACILITY OPERATING LICENSE NO. NPF-12

SOUTH CAROLINA ELECTRIC & GAS COMPANY

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1

DOCKET NO. 50-395

1.0 INTRODUCTION

By application dated January 27, 2000, South Carolina Electric & Gas Company (SCE&G, the licensee) requested changes to the Technical Specifications (TS) for the Virgil C. Summer Nuclear Station (VCSNS). The proposed changes would reflect the removal of the infinite multiplication factor (K_∞) methodology for verifying the acceptability of fuel assembly storage in the spent fuel pool storage racks and in the new fuel storage vault racks. Specifically, TS 5.6.1.1 for spent fuel storage would be modified to remove the requirement for a K_∞ of less than or equal to 1.460 for acceptable fuel storage and replaced with a figure of integral fuel burnable absorber (IFBA) rods per assembly versus nominal fuel enrichment. Additionally, the TS 5.6.1.2 requirement for new (fresh) fuel storage would be revised to remove the K_∞ requirement for the new fuel storage racks.

The request is based on the Nuclear Safety Advisory Letter (NSAL) 99-003, dated February 26, 1999, issued by Westinghouse Energy Systems. The NSAL communicated information that Westinghouse had recently determined that the use of the reference K_∞ method could be non-conservative with respect to fuel storage.

2.0 EVALUATION

The NRC has previously accepted either of two separate methods for verifying the acceptability of storage of Westinghouse 17x17 reactor fuel with nominal enrichments between 4.0 and 5.0 weight percent (w/o) U-235 in Region 1 of the VCSNS spent fuel storage racks. For the first method, a minimum number of IFBA rods are required dependent on initial enrichment. In this method, credit is taken for the reactivity decrease due to the neutron absorber material coated on the outside of the fuel pellet. For the alternative method, a maximum assembly reference K_∞ of 1.460 must be met. This second method is based on calculations which show that a fuel assembly which has a K_∞ of no greater than 1.460 in the VCSNS core geometry will meet the NRC subcriticality acceptance criterion of K_{eff} no greater than 0.95 in the spent fuel storage rack. Fuel storage in Regions 2 and 3 of the spent fuel pool is based on minimum burnup requirements and not on K_∞ or IFBA considerations.

On February 26, 1999, Westinghouse issued NSAL 99-003 to all plants with Westinghouse fuel storage criticality analyses stating that the use of the reference K_∞ method could lead to IFBA requirements that are less conservative than those determined using the IFBA versus enrichment methodology. Westinghouse further stated that licensees should only use the IFBA versus enrichment curve for compliance with the 0.95 K_{eff} fuel storage limit. Based on this, Westinghouse recommended that those plants whose TS only contain the value for K_∞ should delete it and replace it with the IFBA versus enrichment curve previously provided in the spent fuel pool rack criticality analysis reports. Therefore, SCE&G has proposed removing the K_∞ methodology from the VCSNS TS and replacing it with proposed TS Figure 5.6-1, which gives the number of IFBA rods per assembly versus nominal U-235 enrichment required to maintain at least a 5% subcriticality margin in Region 1 of the VCSNS spent fuel pool. Since the NRC staff has previously reviewed and approved this figure when it was submitted in Attachment IV to a letter from J. L. Skolds (SCE&G) to the NRC dated December 13, 1993, the proposed TS change is acceptable.

The new fuel storage racks have been previously approved for storage of fresh Westinghouse 17x17 fuel assemblies with enrichments up to 5.0 w/o U-235. The analyses for the new racks did not require credit for IFBA rods because of the large 21-inch center-to-center spacing between assemblies. Therefore, an IFBA versus enrichment curve is not required for fresh fuel storage in the new fuel racks. However, the IFBA versus enrichment requirements of TS Figure 5.6-1 are, of course, applicable to fresh fuel assemblies once they are placed in the spent fuel pool before being loaded into the reactor core.

All fuel utilized in previous reload cores at VCSNS was reviewed by SCE&G for impact with respect to this change in fuel storage requirements and was found to be acceptable. In addition, all fuel stored in the VCSNS storage racks will continue to meet the NRC subcriticality acceptance criteria specified in TS 5.6.1.1 and 5.6.1.2, "Fuel Storage-Criticality." Therefore, the proposed TS changes are acceptable.

The NRC staff has reviewed the proposed changes that would remove the K_∞ methodology for fuel storage from the VCSNS TS and replace it with an NRC-approved IFBA versus enrichment requirement. The proposed changes remove a non-conservative methodology for determining acceptable fuel storage at VCSNS and conform to the Westinghouse recommendation in NSAL 99-003. All fuel utilized in previous reload cores at VCSNS was reviewed by SCE&G for impact with respect to this change in fuel storage requirements and was found to be acceptable. In addition, all fuel stored in the VCSNS new and spent fuel storage racks will continue to meet NRC subcriticality storage requirements defined by TS 5.6.1.1 and 5.6.1.2. Therefore, we find the proposed changes acceptable.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the State of South Carolina official was notified of the proposed issuance of the amendment. The State official had no comments.

4.0 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 amendment involves no significant hazards consideration, and there has been no public comment on such finding (65 FR 9011). 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.

5.0 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) 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.

Principal Contributor: Laurence Kopp

Date: June 1, 2000