LICENSE AUTHORITY FILE COPY DO NOT REMOVE

Amdt 74 to NPF-12

October 28, 1988

Docket No. 50-395

See Correction letter of 11-3-88 (Cirratta Sheet)

Mr. O. S. Bradham
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
P.O. Box 88
Jenkinsville, South Carolina 29065

Dear Mr. Bradham:

SUBJECT: ISSUANCE OF AMENDMENT NO. 74 TO FACILITY OPERATING LICENSE NO. NPF-12 - VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1, REGARDING FRESH FUEL AND SPENT FUEL STORAGE (TAC NO. 67811)

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 74 to Facility Operating License No. NPF-12 for the Virgil C. Summer Nuclear Station, Unit No. 1. The amendment consists of changes to the Technical Specifications in response to your application dated March 8, 1988. This amendment request was supplemented by submittals dated August 31, 1988 and September 30, 1988 which presented the radiological analysis results for postulated accidents at the Summer Station.

The amendment changes the Technical Specifications by revising Figures 3.9-1 and 3.9-2 of Section 3.9.12. These figures establish the minimum required fuel assembly exposure as a function of initial enrichment to permit storage of fuel assemblies in Regions 2 and 3 of the spent fuel assembly storage racks. In addition, the amendment revises Sections 5.3.1 and 5.6 of the Technical Specifications in terms of maximum initial enrichment of U-235 and minimum required burnup for Regions 2 and 3 of the spent fuel pool.

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.

Sincerely,

/s/

John J. Hayes, Jr., Project Manager
Project Directorate II-1
Division of Reactor Projects I/II

Enclosures:
1. Amendment No. 74 to NPF-12
2. Safety Evaluation

cc w/enclosures:
See next page

OFC	:LA:PD21:DRPR	:PM:PD21:DRPR	:D:PD21:DRPR	:	:	:
	: PAnderson	: JHayes:clh	: EAdensam	:	:	:
DATE	: 10/25/88	: 10/24/88	: 10/25/88	:	:	:

OFFICIAL RECORD COPY

cc:

Mr. William A. Williams, Jr.
Technical Assistant - Nuclear Operations
Santee Cooper
P.O. Box 764 (Mail Code 153)
Columbia, South Carolina 29218

J. B. Knotts, Jr., Esq.
Bishop, Cook, Purcell
and Reynolds
1400 L Street, N.W.
Washington, D. C. 20005-3502

Resident Inspector/Summer NPS
c/o U.S. Nuclear Regulatory Commission
Route 1, Box 64
Jenkinsville, South Carolina 29065

Regional Administrator, Region II
U.S. Nuclear Regulatory Commission,
101 Marietta Street, N.W., Suite 2900
Atlanta, Georgia 30323

Chairman, Fairfield County Council
P.O. Box 293
Winnsboro, South Carolina 29180

Attorney General
Box 11549
Columbia, South Carolina 29211

Mr. Heyward G. Shealy, Chief
Bureau of Radiological Health
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

South Carolina Electric & Gas Company
Mr. A. R. Koon, Jr., Manager
Nuclear Licensing
Virgil C. Summer Nuclear Station
P. O. Box 88
Jenkinsville, South Carolina 29065

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

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. 74
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 March 8, 1988 and supplemented by submittals dated August 31, 1988 and September 30, 1988, 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. 74 , 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 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/S/

Elinor G. Adensam, Director
Project Directorate II-1
Division of Reactor Projects I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: October 28, 1988

OFC	:LA:PD21:DRPR	:PM:PD21:DRPR	:OGC	:D:PD21:DRPR	:	:	:
N	: PAnderson	: JHayes:clh	:	: EAdensam	:	:	:
DATE	: 10/25/88	: 10/27/88	: 10/25/88	: 10/28/88	:	:	:

OFFICIAL RECORD COPY

ATTACHMENT TO LICENSE AMENDMENT NO. 74

TO FACILITY OPERATING LICENSE NO. NPF-12

DOCKET NO. 50-395

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

Remove Pages	Insert Pages
3/4 9-15	3/4 9-15
3/4 9-16	3/4 9-16
5-6	5-6
5-7	5-7
~~5-7a~~	~~delete~~ correction letter of 11-3-88

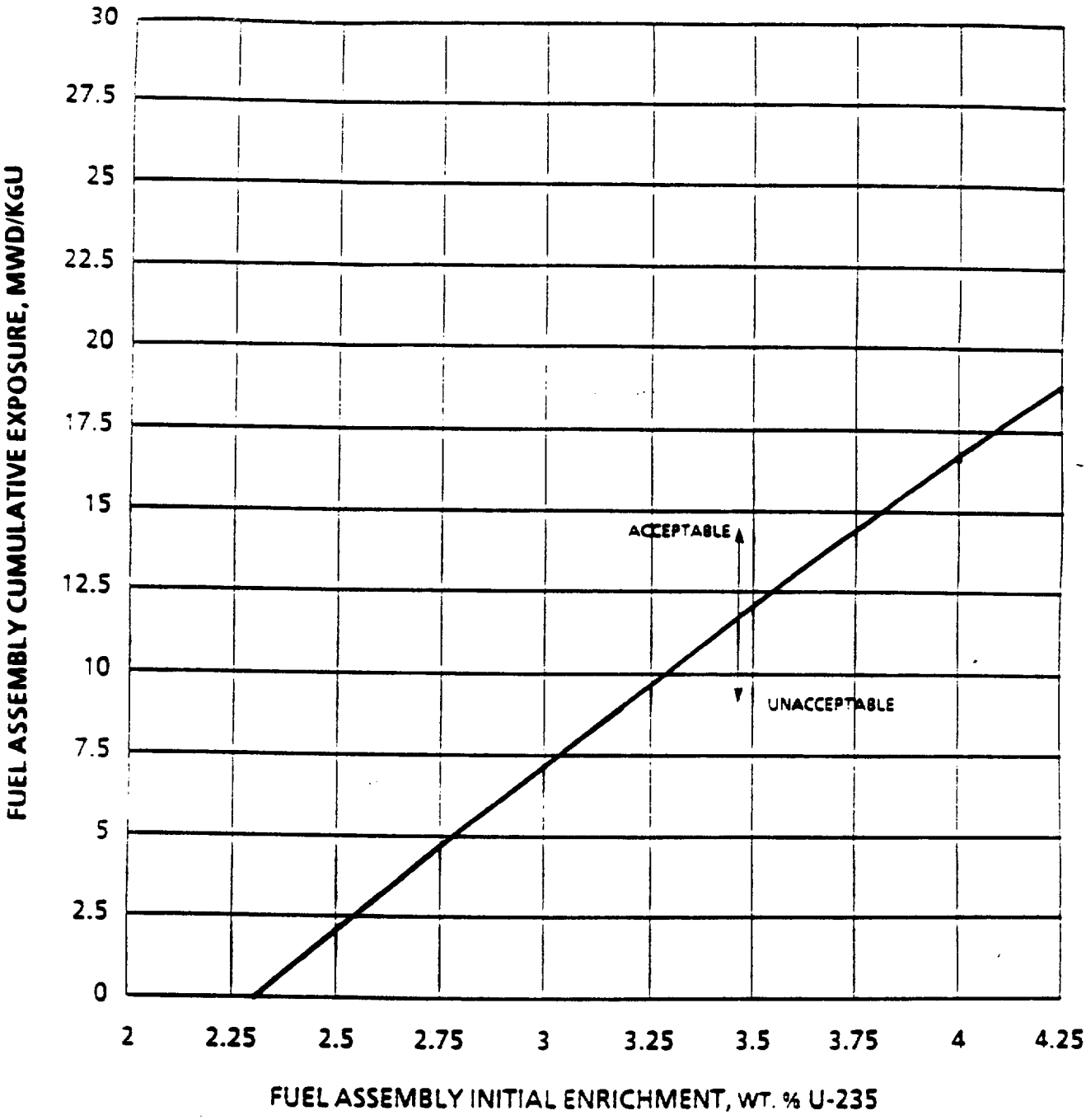

FIGURE 3.9-1 MINIMUM REQUIRED FUEL ASSEMBLY EXPOSURE AS A FUNCTION OF INITIAL ENRICHMENT TO PERMIT STORAGE IN REGION 2

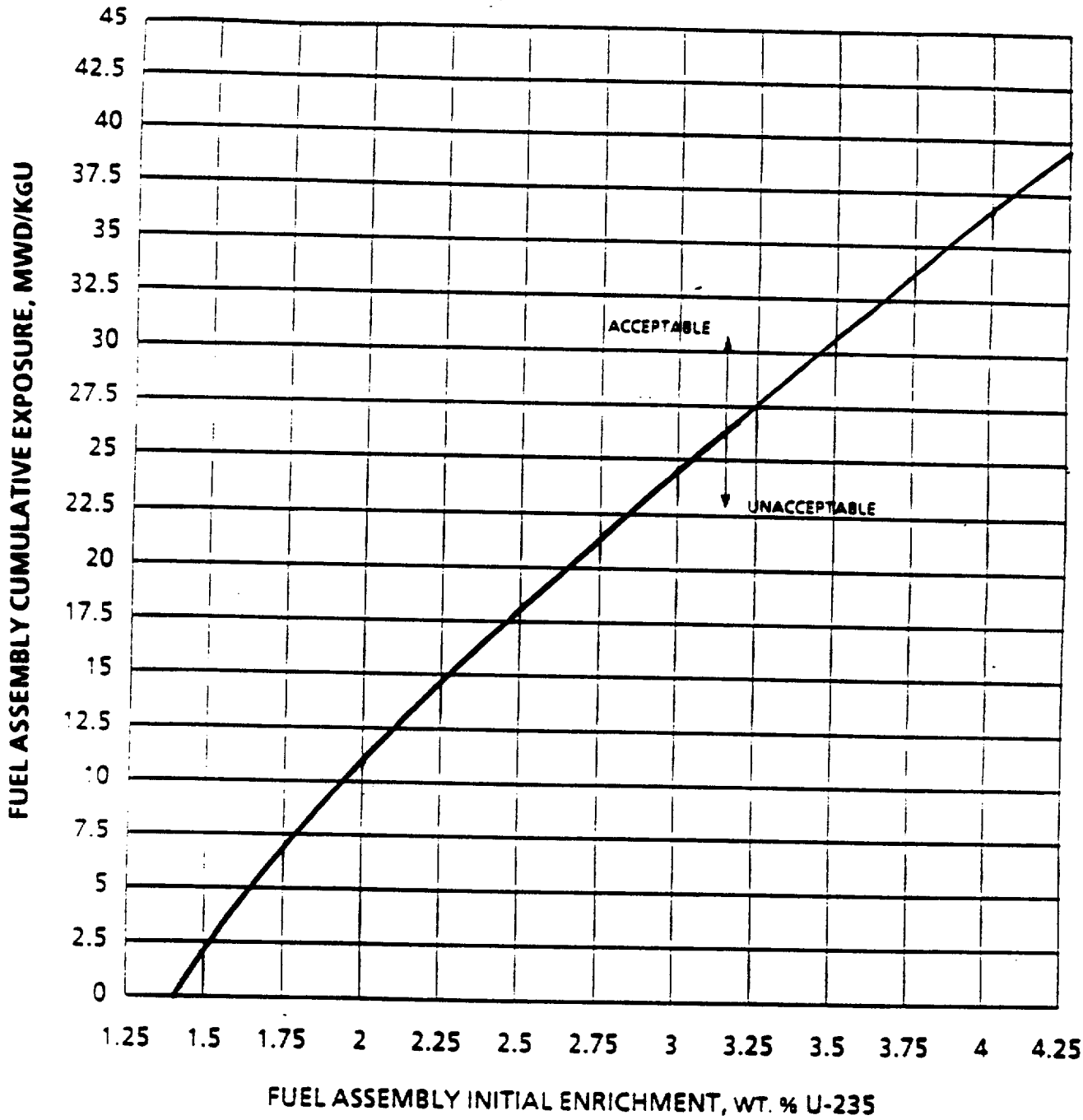

FIGURE 3.9-2 MINIMUM REQUIRED FUEL ASSEMBLY EXPOSURE AS A FUNCTION OF INITIAL ENRICHMENT TO PERMIT STORAGE IN REGION 3

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor core shall contain 157 fuel assemblies with each fuel assembly normally containing 264 fuel rods clad with Zircaloy-4, except that limited substitution of fuel rods by filler rods consisting of Zircaloy-4 or stainless steel, or by vacancies, may be made if justified by a cycle specific reload analysis. Each fuel rod shall have a nominal active fuel length of 144 inches. The initial core loading shall have a maximum enrichment of 3.2 weight percent U-235. Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum enrichment of 4.25 weight percent U-235.

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 48 full length control rod assemblies. The full length control rod assemblies shall contain a nominal 142 inches of absorber material. The nominal values of absorber material shall be 80 percent silver, 15 percent indium and 5 percent cadmium. All control rods shall be clad with stainless steel tubing.

5.4 REACTOR COOLANT SYSTEM

DESIGN PRESSURE AND TEMPERATURE

5.4.1 The reactor coolant system is designed and shall be maintained:

a. In accordance with the code requirements specified in Section 5.2 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,

b. For a pressure of 2485 psig, and

c. For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 9407 ± 100 cubic feet at a nominal T_{avg} of 586.8°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

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 fuel assembly. The cells are grouped into 3 regions. Region 1 is designated for storage of freshly discharged fuel assemblies with enrichments up to 4.25 weigh percent U-235. The cells in Region 2 are reserved for accommodating fuel assemblies with initial enrichments of 4.25 weight percent U-235 and a minimum burnup of 19,000 MWD/MTU. Both Regions 1 and 2 are poisoned. Region 3 cells are capable of accommodating fuel assemblies with initial enrichments of 4.25 weight percent U-235 and a minimum burnup of 39,750 MWD/MTU. The spent fuel storage racks are designed and shall be maintained with:

a. A K_{eff} equivalent to less than or equal to 0.95 when flooded with unborated water, which includes a conservative allowance for uncertainties as described in Section 4.3 of the FSAR.

b. Nominal center-to-center distance between fuel assemblies of 10.4025" in Region 1, 10.4025" x 10.1875" in Region 2, and 10.116" in Region 3.

5.6.1.2 The new fuel storage racks are designed and shall be maintained with a nominal 21 inch center-to-center distance between new fuel assemblies such that K_{eff} will not exceed 0.98 when fuel having a maximum enrichment of 4.25 weight percent U-235 is in place and various densities of unborated water are assumed including aqueous foam moderation. The K_{eff} of $\leq$0.98 includes the conservative allowance for uncertainties described in Section 4.3 of the FSAR.

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".

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 74 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

In a letter dated March 8, 1988, South Carolina Electric & Gas Company (the licensee) submitted a request for changes to the Virgil C. Summer Nuclear Station, Unit No. 1, Technical Specifications (TS), Section 3.9.12, "Spent Fuel Assembly Storage," Section 5.3.1, "Fuel Assemblies," and Section 5.6, "Fuel Storage." The changes to these TS Sections were submitted as a result of the proposed changes in reactor fuel from Westinghouse's LOPAR (low parasitic) fuel to Westinghouse's enhanced burnup fuel (Vantage 5).

By letters dated August 31, 1988 and September 30, 1988, the licensee provided revised source term inputs and radiological analyses of postulated accidents to support the utilization of the Vantage 5 fuel.

The purpose of the proposed amendment is to modify Figures 3.9-1 and 3.9-2 of Section 3/4.9.12. These figures depict the acceptable and the unacceptable values of fuel assembly exposure (i.e., burnup), as a function of fuel enrichment, to permit storage in Regions 2 and 3 of the spent fuel pool. The proposed changes to Technical Specifications 5.3.1 and 5.6.1.1 limit the maximum enrichment to 4.25 weight percent (w/o) U-235 and require a minimum burnup of 19,000 MWD/MTU (megawatt-days per metric ton uranium) for fuel stored in Region 2 of the spent fuel pool and 39,750 MWD/MTU for fuel stored in Region 3 of the spent fuel pool. The proposed changes to TS 3.9.12, 5.3.1, and 5.6 are to reflect revised storage limitations for the mix of LOPAR and the Westinghouse Vantage 5 fuel to be utilized in the core during the fifth cycle at the Summer Station and for the Vantage 5 fuel that will be used in all subsequent cycles.

2.0 EVALUATION

The licensee has proposed that fresh fuel racks used for Vantage 5 fuel assemblies be limited to a maximum enrichment of 4.25 w/o U-235. The present TS allow fuel with an enrichment of 4.3 w/o U-235. The spent fuel racks are divided into three regions. All regions contain stainless

steel cells, one for each stored assembly. The licensee has proposed that Region 1 accept freshly discharged fuel assemblies with enrichments up to 4.25 w/o U-235 while Regions 2 and 3 accept assemblies with up to 4.25 w/o U-235 initial enrichment provided they have burnups sufficient to meet criticality limits. These burnups are proposed as 19,000 MWD/MTU and 39,750 MWD/MTU for Regions 2 and 3, respectively. Regions 1 and 2 are poisoned, i.e., contain fixed boron absorbers. Present TS Section 5.6 allows fuel with an enrichment of 4.3 w/o U-235 and requires a minimum burnup of 20,000 MWD/MTU for Region 2 and 42,000 MWD/MTU for Region 3 of the spent fuel pool.

The licensee has performed criticality analyses for Regions 1, 2 and 3 for standard Westinghouse and Vantage 5 fuel assemblies using approved computer codes. The results meet the NRC criteria of a spent fuel peak of k_{eff} less than 0.95 (for unborated water) including uncertainties.

The licensee also performed criticality analysis of fresh fuel racks in a full range of moderator densities using approved computer codes. The results show that rack k_{eff} values are less than 0.95 including uncertainties.

The staff has reviewed the criticality analyses for both the spent fuel racks of Regions 1, 2 and 3 and for the fresh fuel racks. Since the results meet the staff's criteria for a spent fuel peak of k_{eff} less than 0.95 (for unborated water) including uncertainties and the staff's criteria for fresh fuel racks (k_{eff} less than or equal to 0.98 in the low density moderator region and k_{eff} less than or equal to 0.95 in the high density region), the staff concludes that the proposed changes to Figures 3.9-1 and 3.9-2 of TS 3.9.12 and the proposed changes to TS 5.3.1 and 5.6 are acceptable.

3.0 DESIGN BASIS ACCIDENT ANALYSIS RELATIVE TO EXTENDED FUEL BURNUP

The licensee's intent to utilize Vantage 5 fuel will result in the lead fuel rod having an average burnup as high as 60,000 MWD/MTU. In an August 31, 1988 submittal, the licensee provided their evaluation of the reactor coolant and core source terms for the Vantage 5 fuel. In the licensee's September 30, 1988 submittal, they provided their assessment of the radiological consequences, based upon the utilization of Vantage 5 fuel, for the design basis accidents presented in Chapter 15 of the licensee's FSAR. The licensee concluded that the radiological consequences of postulated accidents as a result of the utilization of the Vantage 5 fuel, when compared to operation with the present LOPAR fuel, would result in a decrease in the gamma and beta skin doses but an increase in the thyroid dose.

The staff reviewed the licensee's submittals and also reviewed a publication which was prepared for the NRC entitled, "Assessment of the Use of Extended Burnup Fuel in Light Water Reactors," NUREG/CR 5009, February 1988. The NRC contractor, the Pacific Northwest Laboratory (PNL) of Battelle Memorial Institute, examined the changes that could result in the

NRC Design Basis Accident (DBA) assumptions, described in the various Standard Review Plan (SRP) sections and/or Regulatory Guides, that could result from the use of extended burnup fuel (up to 60,000 MWD/MT). The staff agrees that the only DBA that could be affected by the use of extended burnup fuel, even in a minor way, would be the potential thyroid doses that could result from a fuel handling accident. PNL estimates that I-131 fuel gap activity in the peak fuel rod with 60,000 MWD/MT burnup could be as high as 12%. This value is approximately 20% higher than the value normally used by the staff in evaluating fuel handling accidents (Regulatory Guide 1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facilities for Boiling and Pressurized Water Reactors").

PNL concluded in their report that for fuel damage accidents, "The percentage of fission-product inventory released from the fuel would not likely change as a result of the extended burnup; however, the fission-product inventory in the fuel would change for the long half-life fission products and actinides ...." PNL also concluded that the actinides would only minimally contribute to doses compared to the fission products and that the main concern for the actinides would be from the long-term effects of inhalation (lung dose) and ingestion of food products (vegetables, milk, and meat) raised in, or fed on food grown in, contaminated soil. PNL concluded that the inventory of fission products, cesium-137 and strontium-90 would increase by a factor of almost 2 in the extended burnup fuel. However, the staff has concluded that their contribution to dose would be minimal.

For the fuel handling accident, PNL concluded that the use of Regulatory Guide 1.25 procedures for the calculation of accident doses for extended burnup fuel may be utilized. These procedures give conservative estimates for noble gas release fractions that are above calculated values for peak rod burnups of 60,000 MWD/MTU. Iodine-131 inventory, however, may be up to 20% higher than that predicted by Regulatory Guide 1.25 procedures.

The staff, therefore, reevaluated the fuel handling accidents for the Summer Station assuming an increase in iodine gap activity in the fuel damaged in a fuel handling accident which was 20% higher than that assumed using Regulatory Guide 1.25. Table 1 presents the fuel handling accident thyroid doses. The assumptions, which were utilized in the staff's evaluation, were the same as those presented in Table 15-5 of the V. C. Summer Nuclear Station, Unit No. 1 Safety Evaluation Report (NUREG-0717), February 1981, with the following exceptions:

Power Peaking Factor = 1.68

Number of fuel rods assumed failed = 264

Table 1

Thyroid Doses as a Consequence of DBA Fuel Handling Accidents

	Exclusion Area	Low Population Zone
	Thyroid Dose (Rem)	Thyroid Dose (Rem)
Fuel Handling Accident		
In Fuel Building	17	2.1
In Reactor Building	115	14

The staff concludes that the only potential increased doses potentially resulting from DBA with extended fuel burnup to 60,000 MWD/MT is the thyroid dose resulting from fuel handling accidents and these doses remain well within the 300 Rem thyroid exposure guideline values set forth in 10 CFR Part 100 and that this small calculated increase above the present calculated dose presented in Table 15-4 of the V. C. Summer SER (NUREG-0717) is not significant.

4.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact have been prepared and published in the Federal Register (53 FR 43486) on October 27, 1988. Accordingly, based upon the environmental assessment, the Commission has determined that the issuance of this amendment will not have a significant effect on the quality of the human environment.

5.0 CONCLUSION

The Commission has issued a "Notice of Consideration of Issuance of Amendment to Facility Operating License and Proposed No Significant Hazards Consideration Determination and Opportunity for Hearing" which was published in the FEDERAL REGISTER on June 1, 1988 (53 FR 20046) and consulted with the State of South Carolina. No public comments or requests for hearing were received, and the State of South Carolina did not have comments.

The staff 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, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: John J. Hayes, Jr.
Shi Liang Wu

Dated: October 28, 1988