April 4, 2002

Mr. Stephen A. Byrne
Senior 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 - PROPOSED IRRADIATION OF FUEL RODS BEYOND THE CURRENT LEAD ROD BURNUP LIMIT (TAC NO. MB4474)

Dear Mr. Byrne:

By letter dated March 1, 2002, South Carolina Electric & Gas Company requested that the Nuclear Regulatory Commission provide approval for the irradiation of one fuel assembly beyond the current licensed limit for Virgil C. Summer Nuclear Station (VCSNS). This request will allow VCSNS to irradiate one fuel assembly up to 71 GWD/MTU during Cycle 14. We have reviewed your submittal and found your proposal to be acceptable. Our Safety Evaluation is enclosed.

Sincerely,

/RA/
Gordon E. Edison, Senior Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosure: As stated

cc w/encl: See next page

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

April 4, 2002

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1 - PROPOSED IRRADIATION OF FUEL RODS BEYOND THE CURRENT LEAD ROD BURNUP LIMIT (TAC NO. MB4474)

Dear Mr. Byrne:

By letter dated March 1, 2002, South Carolina Electric & Gas Company requested that the Nuclear Regulatory Commission provide approval for the irradiation of one fuel assembly beyond the current licensed limit for Virgil C. Summer Nuclear Station (VCSNS). This request will allow VCSNS to irradiate one fuel assembly up to 71 GWD/MTU during Cycle 14. We have reviewed your submittal and found your proposal to be acceptable. Our Safety Evaluation is enclosed.

Sincerely,

/RA/
Gordon E. Edison, Senior Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosure: As stated

cc w/encl: See next page

Distribution:

PUBLIC	EDunnington	UShoop
PDII-1 Reading	RidsOgcRp	RidsRgn2MailCenter
HBerkow	RidsAcrsAcnwMailCenter	
RLaufer	GHill (2)	

ADAMS ACCESSION NUMBER: ML020950445

*No major changes to SE

OFFICE	PM:PDII-1	LA:PDII-1	SC:SRXB*	(A)SC:PDII-1
NAME	GEdison:mw	EDunnington	RCaruso	RLaufer
DATE	4/04/2002	4/03/2002	3/20/2002	4/04/02

OFFICIAL RECORD COPY

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SOUTH CAROLINA ELECTRIC & GAS COMPANY

VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1

DOCKET NO. 50-395

1.0 INTRODUCTION

By letter dated March 1, 2002, South Carolina Electric & Gas Company requested that the Nuclear Regulatory Commission (NRC) provide approval for the irradiation of a limited number of fuel rods beyond their current licensed limit for Virgil C. Summer Nuclear Station (VCSNS). This request will allow VCSNS to irradiate one fuel assembly up to 71 GWD/MTU during Cycle 14. Irradiation of these rods to a higher burnup level will provide data on fuel and material performance that will support industry goals of extending the current fuel burnup limits and will provide data to address NRC questions related to fuel performance behavior at high burnups. The data will also help confirm the applicability of nuclear design and fuel performance models at high burnups.

The fuel assembly (N34) that is proposed for additional irradiation was manufactured by Westinghouse. It is a typical production fuel assembly that uses the VANTAGE+ fuel design with ZIRLO clad fuel rods. The rods in the assembly are projected to reach a peak burnup of less than 71 GWD/MTU. Prior to the cycle startup, the peak pre-cycle rod burnup is anticipated to be 53.5 GWD/MTU. This assembly is projected to be irradiated in the center core location for the additional cycle.

The proposed irradiation of these fuel rods does not require any change to the Technical Specifications. However, since the high burnup fuel rods are planned to operate to burnup levels exceeding the rod burnup limit of 62 GWD/MTU, NRC approval was requested prior to implementation of the program.

2.0 EVALUATION

The NRC has recently been working with the industry to develop guidelines for lead test assemblies (LTAs) including fuel assemblies such as the one under review. The intention is to develop a set of guidelines that provides a structured process for LTAs while maintaining safety. These guidelines will be consistent with the NRC performance goals, which are: maintain safety, maintain public confidence, improve efficiency and effectiveness of regulation, and reduce unnecessary burden. Many different aspects of fuel testing are addressed in LTA guidelines, including: characterization of the fuel assembly both pre- and post-irradiation, which pool side examinations will be performed, the number of LTAs allowed in any given core, the location or placement of LTAs within the core, what the safety analysis should cover, and reporting requirements. The evaluation of the request to irradiate the VCSNS fuel assembly has been performed with these developing guidelines in mind.

Pre-characterization of the fuel assembly was performed after the fuel was discharged from the

core following two cycles of irradiation in April 2001. The pre-characterization tests included: measurements of peripheral fuel rod and spacer grid oxide, fuel assembly and fuel rod growth, an overall visual examination, and rod control cluster assembly (RCCA) drag testing. In addition, the top nozzle of the fuel assembly was replaced to preclude the hold down spring screw cracking issue from preventing the reinsertion of the fuel assembly.

The fuel assembly was analyzed and evaluated against the current design criteria as specified in the approved methodologies for VANTAGE+ fuel, except for the burnup limit (62 GWD/MTU). The analysis was performed using current and/or modified fuel performance methods and codes and used pre-characterization data where it was appropriate. The evaluation demonstrated that the fuel met all the design criteria, except for the burnup limit (62 GWD/MTU), even considering a plant power uprate level of 2,900 MWt. This is consistent with the staff conditions for approval for the anticipated industry guidelines for limited-scope high-burnup LTAs.

Oxidation of the cladding and grid straps was measured during the pre-characterization of the fuel assembly. The oxidation measurement of the grid straps and the fuel cladding was performed using a detection method that produces acceptable results. The licensee inspected the fuel material characteristics to ensure that material anomalies such as blistering or spallation were not present. The licensee did not observe any anomalies during the fuel inspection. The post-irradiation oxidation of the fuel is predicted to be approximately 80 microns with no blistering or spallation. The predicted oxidation is less than the 100 micron limit and the predicted value was determined based on the maximum pre-irradiation oxidation using current approved methods for calculating the fuel oxidation; therefore, the staff considers the calculation with the current value appropriate to predict the oxidation, and the value is sufficiently below the 100 micron limit to provide margin.

The assembly and fuel rod growth were measured as part of the pre-irradiation characterization. The results demonstrated that the growth has been within the specified tolerance band. Additionally, the growth measurement showed that sufficient margin remains between the current maximum growth and the upper growth limit to permit the higher burnup.

Rod control cluster assembly drag testing was performed as part of the pre-characterization of the fuel assembly. The licensee's measurement showed that the drag resistance is significantly lower than the resistance limit. For cycle 14, the high-burnup fuel assembly will be located in the center core location. This core location is an unrodded location; therefore, the results of this test are not needed to demonstrate the safety aspects of using the fuel assembly for an additional cycle. However, the test may be used to provide data on RCCA drag resistance to support future industry goals of achieving higher licensed burnup limits.

Following irradiation for an additional cycle, VCSNS committed to perform the following post-irradiation examinations: cladding oxidation, rod/assembly growth, and visual examinations. This is the minimum examination set that they will perform, although they may elect to perform additional tests as appropriate. The staff finds the set of post-irradiation examinations an acceptable set of tests to perform because these examinations provide data on the parameters most likely to be affected by higher burnup. Additionally, this set of examinations will provide a check of the fuel performance models for higher burnup.

3.0 CONCLUSION

Based on the above evaluation, the staff agrees that it is acceptable for VCSNS to irradiate one fuel assembly (N34) during cycle 14 to 71 GWD/MTU.

Principal Contributor: U. Shoop

Date: April 4, 2002

cc:

Mr. R. J. White
Nuclear Coordinator
S.C. Public Service Authority
c/o Virgil C. Summer Nuclear Station
Post Office Box 88, Mail Code 802
Jenkinsville, South Carolina 29065

Resident Inspector/Summer NPS
c/o U.S. Nuclear Regulatory Commission
576 Stairway Road
Jenkinsville, South Carolina 29065

Chairman, Fairfield County Council
Drawer 60
Winnsboro, South Carolina 29180

Mr. Henry Porter, Assistant Director
Division of Waste Management
Bureau of Land & Waste Management
Department of Health & Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Mr. Gregory H. Halnon, General Manager
Nuclear Plant Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station, Mail Code 303
Post Office Box 88
Jenkinsville, South Carolina 29065

Mr. Melvin N. Browne, Manager
Nuclear Licensing & Operating Experience
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station, Mail Code 830
Post Office Box 88
Jenkinsville, South Carolina 29065

Ms. Kathryn M. Sutton, Esquire
Winston & Strawn Law Firm
1400 L Street, NW
Washington, DC 20005-3502