Stephen A. Byrne
Senior Vice President, Nuclear Operations
803.345.4622

SCE&G®
A SCANA COMPANY

March 13, 2002
RC-02-0037

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Attention: Mr. G. E. Edison

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION
DOCKET NO. 50/395
TECHNICAL SPECIFICATION AMENDMENT REQUEST - TSP 99-0090
SPENT FUEL POOL STORAGE EXPANSION - SUPPLEMENTAL LETTER

Reference: S. A. Byrne Letter to Document Control Desk, RC-01-0135, Dated July 24, 2000

South Carolina Electric & Gas Company (SCE&G), acting for itself and as agent for South Carolina Public Service Authority, hereby submits a response to your verbal questions related to the criticality analysis performed for the above referenced amendment request. This amendment request was for the V. C. Summer Technical Specifications (TS). These questions pertain to the method used to determine the number of nodes analyzed for axial burn-up distributions.

As a result of discussions conducted on January 31, 2002, between the NRC and SCE&G, we are submitting the response to these questions as Attachment 1.

I certify under penalty of perjury that the foregoing is true and correct.

Should you have questions, please call Mr. Philip A. Rose at (803) 345-4052.

Very truly yours,

Stephen A. Byrne

PAR/SAB/dr

c: N. O. Lorick
N. S. Carns
T. G. Eppink (without attachments)
R. J. White
L. A. Reyes
NRC Resident Inspector
Paulett Ledbetter

K. M. Sutton
T. P. O'Kelley
W. R. Higgins
RTS (0-L-99-0090)
File (813.20)
DMS (RC-02-0037)

A001

STATE OF SOUTH CAROLINA :
: **TO WIT** :
COUNTY OF FAIRFIELD :

I hereby certify that on the 13th day of MARCH 2002, before me, the subscriber, a Notary Public of the State of South Carolina personally appeared Stephen A. Byrne, being duly sworn, and states that he is Senior Vice President, Nuclear Operations of the South Carolina Electric & Gas Company, a corporation of the State of South Carolina, that he provides the foregoing response for the purposes therein set forth, that the statements made are true and correct to the best of his knowledge, information, and belief, and that he was authorized to provide the response on behalf of said Corporation.

WITNESS my Hand and Notarial Seal

Notary Public

My Commission Expires

July 13, 2005
Date

RAI: * How many axial zones were used in the SFP analysis?
* How was the number of zones determined?
* How was the criteria used to arrive at an adequate number of zones for the calculation?

Response: Holtec analyzed eight different axial burnup distributions, seven of which were provided by SCE&G, one which was provided by Holtec. The results of the analysis show that the Holtec axial burnup distribution is bounding and results in the highest reactivity. The number of axial zones used in the Holtec distribution was 10, with the size of the axial zones provided in Table 1. Determination of the number of zones used - and the criteria for the selection are discussed below.

Table 1: Holtec Axial Distribution Zones

Zone	Size of Zone (inches)
1	6.0
2	6.0
3	12.0
4	24.0
5	24.0
6	24.0
7	24.0
8	12.0
9	6.0
10	6.0

The original publication that characterized the reactivity penalty due to the axial distribution in burnup (end effect) was a paper published by Turner [1] in 1988. In particular, this study showed that the end effect was dominated by the top 1 or 2 feet of the fuel assemblies and that coarse segmentation produced conservative results. The segmentation of zones in the upper 2 feet is more important than the total number of zones. This was re-enforced by an ORNL study[2] that confirmed that the number of zones used in the V. C. Summer analysis is adequate, stating, "axial-shape 7 [which consists of 7 axial zones] is sufficient to capture the end effect".

A later ORNL study [3] presented a "Representative PWR Axial Burnup Distribution" that is comparable to that used in the original Turner study and in the V. C. Summer storage rack

analysis. This study also concluded that, "Recognizing that the axial burnup profile is relatively flat in the fuel mid-section... ...the number of axial segments used to represent the axial profile may be reduced without introducing error. In particular, the axial segments or zones where the axial burnup does not vary significantly may be combined". This approach was also used in the Turner study and in the V. C. Summer rack analysis. For V. C. Summer, the 10 zone axial segmentation or zoning was selected to emphasize the ends of the assemblies to assure a conservative estimate of the reactivity effect of the axial distribution in burnup. The criteria used was that the two top and bottom zones should not exceed 6 inches in width with larger zone sizes toward the center of the assemblies. This is believed to be a conservative approach that assures the criticality safety of the V. C. Summer spent fuel storage rack. Such conservative criteria have been used by Holtec in licensing actions for some 40-50 rack installations reviewed and approved by the NRC over the past 13 or more years.

References:

[1] S. E. Turner, "An Uncertainty Analysis - Axial Burnup Distribution Effects," Proc. Workshop Use of Burnup Credit in Spent Fuel Transport Casks, Washington D. C., February 21-22, 1988, SAND89-0018, TTC-0884, UC 820, T. L. Sanders, Ed., Sandia National Laboratories, October 1989.

[2] M. D. DeHart, "Parametric Analysis of PWR Spent Fuel Depletion Parameters For Long-Term Disposal Criticality Safety", ORNL/TM-1999/99, Lockheed Martin Energy Research Corp., Oak Ridge National Laboratory, October 1999.

[3] J. C. Wagner and M. D. DeHart, "Review of Axial Burnup Distribution Considerations for Burnup Credit Calculations", Oak Ridge National Laboratories, ORNL/TM-1999/246, March 2000.