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A SCANA COMPANY

April 4, 2002
RC-02-0057

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). The analysis in question was performed using the reactivity equivalencing methodology.

As a result of discussions conducted on December 19th between the NRC and SCE&G, we are submitting the response to these questions as Attachment 1.

Additionally, another question requested clarification on the basis for establishing a new specification. This new specification, 3/4.7.13, Spent Fuel Pool Boron Concentration, meets the requirements of 10 CFR 50.36, Criterion 2, an operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

This new specification also is being established due to the need to assure compliance with the criticality analysis during fuel movement outside of refueling operations. During these operations, the Spent Fuel Pool has no interaction with the reactor core, thereby allowing the inherent design features such as geometry, materials and poisons, to provide a significant barrier to inadvertent criticality during a fuel handling accident. As a result, a reduced boric acid concentration is required to maintain the design basis. Although SCE&G has no intention of ever permitting a dilution of the Spent Fuel Pool soluble poison concentration, we do not feel it is appropriate to mandate the same levels of boric acid as required during periods when the Spent Fuel Pool and the reactor core are in direct communication. A discussion on the basis for this new specification is included in the revised Bases B3/4. 7.13, included in this letter for your information as Attachment 2.

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Administrative control over the minimum pool boron concentration has been in place at VCS for many years. The safety evaluation for Operating License amendment 116 addresses the use of 400 ppm of boron in the pool to mitigate the worst postulated accident and maintain the design limit of K_{eff} less than or equal to 0.95.

This administrative limit is also addressed in the VCSNS FSAR, section 4.3.2.7.2 and is based on the calculations performed to assure the design basis limit of K_{eff} less than or equal to 0.95 remains satisfied during all postulated or anticipated accidents.

Additionally, it was identified that a discrepancy exists between the safety evaluation and the technical report (Spent Fuel Storage Expansion Report - Attachments V and VI) provided in the above referenced letter. This discrepancy involves several statements made that pertain to "seismically qualified, safety grade instrumentation" and charcoal filters in the fuel handling building exhaust path. These discrepancies are captured in our corrective action program, CER 01-2238.

The instrumentation available to detect abnormal radiation levels in the reactor building resulting from a fuel handling accident is described in the VCSNS FSAR (Section 15.4.5.1.4) as non-nuclear safety class although power is supplied from the diesel backed bus. This information is accurately presented in the safety evaluation, but was not corrected in the report prior to submission.

Section 9.1.2.2 of the technical report states that the "charcoal filters in the fuel handling building exhaust path, which provide an iodine decontamination factor of 20, act on the iodine released in the reactor building." This was identified as an incorrect statement. By design, there is no direct communication between the reactor building and the fuel handling building atmospheres. The portion of the volatile fission gases released to the atmosphere during a fuel handling accident in the reactor building are conservatively assumed to be instantaneously released directly to the outside environment by the reactor building purge system (Section 15.4.5.1 of the VCSNS FSAR).

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,

Gregory Halnon for SAB

Stephen A. Byrne

PAR/SAB/dr

c: See Page 3 of 3

N. O. Lorick
c: 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-02-0057)

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

I hereby certify that on the 4th day of April 2002, before me, the subscriber, a Notary Public of the State of South Carolina personally appeared Gregory H. Halnon, being duly sworn, and states that he has signature authority for the 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

Recently a concern has surfaced with regard to the use of reactivity-equivalent enrichments in the evaluation of a minimum soluble boron requirement for accident conditions. In the evaluation of reactivity-equivalent enrichments, the presence of soluble boron will harden the neutron spectrum and reduce the reactivity worth of the boron (a 1/v absorber). Holtec is aware of this effect, which is addressed in NUREG/CR-6683 [1], and has been careful to properly account for these effects.

If the reactivity-equivalent enrichment is evaluated in un-borated water (as was the case in NUREG/CR-6683*), the resulting reactivity-equivalent enrichment will, of course, be too low and non-conservative for evaluating conditions with soluble boron present. However, for the V. C. Summer analyses, the spectrum effect of the soluble boron present was included in the criticality computations by evaluating the reactivity-equivalent enrichment <u>with soluble boron present</u>. This procedure assures that the soluble boron concentration calculated is correct and that the analysis has been performed with the appropriate neutron spectrum.

Determining the reactivity-equivalent enrichment with non-borated water (as in NUREG/CR-6683 procedure) would result in an equivalent-enrichment of 1.77 wt% U-235. However, in the V. C. Summer analysis, the reactivity-equivalent enrichment is 1.86 wt% U-235 in water with 200 ppm soluble boron and 1.94 wt% U-235 in 400 ppm boron water. Both of these cases give a higher and more accurate evaluation than the procedure in NUREG/CR-6683. As further confirmation of the validity of the V. C. Summer calculations, an independent method of analysis was used, incorporating the specific actinide and fission product nuclides comparable to the methodology of NUREG/CR-6683 (the so-called "actual SNF Inventory"). This calculation gave a k_{inf} of 0.9226 compared to the interpolated k_{inf} value of 0.9251 in the criticality analysis results reported in HI-2012624 with 347 ppm soluble boron. Thus, the independent calculation, which is comparable to the "actual SNF Inventory" methodology of NUREG/CR-6683, confirms the reference calculation and validates the reactivity-equivalent enrichment methodology, when used properly.

* See middle of 3rd paragraph in the Introduction to NUREG/CR-6683, which states that the calculations were made "in unborated water".

The condition being evaluated above is an accident condition. Under the NRC guidelines of the Grimes letter [2] and the Kopp Memorandum [3], credit for the presence of the normal soluble boron concentration (nominally 2000 ppm) is allowed under the Double Contingency Principle. Thus, the calculation of the minimum soluble boron concentration (347 ppm) is an interesting result but is not significant to the criticality safety of the V. C. Summer racks. Furthermore, 10CFR 50.68 requires that the racks remain sub-critical even for the loss of all soluble boron. For the V. C. Summer racks, the reported k_{eff} value is 0.9882 in the absence of all soluble boron even for the accident condition under consideration. This conforms to the requirements of 10CFR 50.68. Thus, for both the NRC Regulations and for the NRC guidelines, there are ample reasons to conclude that a criticality accident is not a credible event in the V. C. Summer spent fuel storage racks. Furthermore, there is credible evidence (calculations) that the reactivity-equivalent enrichment methodology remains a reliable and accurate methodology when applied correctly (as is the case for any method of analysis) and that NUREG/CR-6683 is applicable only in certain limited circumstances.

[1] Wagner, J.C., Parks, C.V., "A Critical Review of the Practice of Equating the Reactivity of Spent Fuel in Burnup Credit Criticality Safety Analyses for PWR Spent Fuel Pool Storage", NUREG/CR-6683, September 2000.

[2] USNRC letter of April 14, 1978, to all Power Reactor Licensees - OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications, including modification letter dated January 18, 1979.

[3] L.I. Kopp, "Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light-Water Reactor Power Plants," NRC Memorandum from L. Kopp to T. Collins, August 19, 1998.

3/4.7.13 SPENT FUEL POOL BORON CONCENTRATION

A minimum boron concentration is required in the spent fuel pool, fuel transfer canal, or cask loading pit whenever new 4.95 W/0 fuel is being moved to ensure K_{eff} remains less than 0.95 during this normal condition of fuel movement.

The minimum boron concentration in the spent fuel pool, fuel transfer canal, or cask loading pit also is sufficient to maintain K_{eff} less than 0.95 for postulated accident condition consisting of a dropped or a mispositioned fuel assembly. This requirement is a direct result of the analysis performed for pool criticality during evolutions performed while the Spent Fuel Pool is isolated from the reactor cavity and is due to geometry, materials and poisons being different in the spent fuel pool than those in the reactor. During periods of direct communication between the pool and the reactor, Specification 3.9.1 shall be followed when the refueling cavity is filled and the transfer canal blind flange is removed.

Sampling to determine boron concentration is required only for those specific areas where fuel is being moved, e.g. in the spent fuel pool, in the fuel transfer canal, or in the cask loading area.

3/4.7.12 SPENT FUEL ASSEMBLY STORAGE

The restrictions placed on spent fuel assemblies in Region 2 of the spent fuel pool ensure K_{eff} remains less than 0.95. The minimum burnup bounds the use of Burnable Poison Rod Assemblies (BPRA), Wetted Annular Burnable Absorbers (WABA), Integral Fuel Burnable Absorbers (IFBA), and Erbia.

An axial burnup shape penalty is also included in the burnup requirement.

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