SCE&G
A SCANA Company

South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
P. O. Box 88
Jenkinsville, SC 29065
(803) 345-5209

S. A. Byrne
General Manager,
Nuclear Plant Operations

March 14, 1996
RC-96-0072

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

Attention: Mr. Stephen Dembek

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
ADDITIONAL INFORMATION FOR PLANT UPRATE

Reference: G. J. Taylor to Document Control Desk Letter RC-96-0027, dated February 14, 1996

South Carolina Electric & Gas Company (SCE&G), acting for itself and as agent for South Carolina Public Service Authority, hereby submits additional information to support the acceptability of the Spent Fuel Pool (SFP) peak temperatures. The results of the SF Cooling analysis for the plant uprate were presented in the above referenced letter.

Evaluations were performed on SFP cooling subsystems which provide assurance that the Spent Fuel Cooling System (SFCS) can perform its design function at worst case operating temperatures. These evaluations listed below were mentioned in the referenced letter above, but were not elaborated upon. Summaries and conclusions for each of these evaluations are attached.

1. Structural Integrity of the SFP and SFP Liner
2. SFCS Pipe Stress
3. SFCS Components
4. SFP Ventilation System
5. Margin to Localized Boiling
6. Adequacy of Net Positive Suction Head Available ($NPSH_A$) for the SFCS Pumps

These statements and matters set forth herein are true and correct to the best of my knowledge, information, and belief.

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

Very truly yours,

S. A. Byrne

PAR/SAB/dr
Attachment
c: See page 2

A001
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c: J. L. Skolds
W. F. Conway
R. R. Mahan (w/o Attachments)
R. J. White
S. D. Ebneter
NRC Resident Inspector
J. B. Knotts Jr.
M. K. Batavia
K. R. Jackson
DMS
RTS (TSP 950001)
File (813.20)

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

I hereby certify that on the 14th day of MARCH 1996, before me, the subscriber, a Notary Public of the State of South Carolina, personally appeared S. A. Byrne, being duly sworn, and states that he has signature authority as designated by the 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

1. Structural Integrity of the SFP and SFP Liner

Calculation DC0353B-029, "Spent Fuel Pool Evaluation for Increased Thermal Loads" documents the structural evaluation of the SFP and SFP liner for temperatures up to bulk boiling conditions at the bottom of the pool. The saturation temperature at the bottom of the pool is ~250°F.

A. Objectives and Scope

The scope of this calculation included a structural integrity evaluation of the as-built SFP system for effects of increased bulk water temperatures. The evaluation involved structural analysis and design check calculations to demonstrate that sufficient safety margin exists to accommodate the higher temperatures.

B. Methodology

Structural analysis computer codes, STAAD-III and RESPONSE were used in the evaluation.

C. Summary of Results and Conclusions

The SFP slab and walls possess sufficient strength to withstand the new thermal loads for steady state boiling. Integral adjacent walls are also acceptable. The stainless steel liner plate has sufficient ductility to resist rupturing under the thermal loading conditions. No modifications to the SFP or SFP liner are necessary.

2. SFCS Pipe Stress

Calculations SF-01, SFH-003, SFH-004, SFH-006, SFH-007, SF-04, SF-05, SF-07, SFH-034, and SFH-036 document the stress analysis of the SFCS piping and supports.

A. Objectives and Scope

The scope of this evaluation was to perform piping stress and support analysis in the SFCS cooling loops, and to identify modifications to piping and/or piping supports if necessary.

B. Methodology

Structural piping computer program PS+CAPIPE was used in this evaluation. The piping and support design structures located on the SFCS lines from the suction side of the spent fuel cooling pumps up to the inlet side of the SFCS heat exchanger were re-qualified for temperatures up to 200°F (previous normal operating temperature was 150°F). The piping is qualified under the Design Basis loading conditions to the requirements of the Code of Record, ASME Section III 1971 Edition through Summer 1973 Addenda. The piping re-analyzed is located between the SFP, through the SFCS pumps and up to the SFCS heat exchangers. Both loops A and B were addressed. The piping downstream of the SFCS heat exchangers is currently qualified to 150°F; this is greater than the maximum calculated downstream temperature per SCE&G Design Calculation DC04680-022.

C. Summary of Results and Conclusions

All piping and pipe supports described above are acceptable for the increased temperature; no plant modifications are necessary.

3. SFCS Components

A. Objectives and Scope

The scope of this evaluation was to evaluate the various components in the SFCS for a new design temperature of 200°F for the design flags 1, 2, 4, 5, 7, and 8 on drawing D302-651, FSAR Figure 9.1-3 (as documented in calculation DC04680-023).

B. Methodology

The system drawings were reviewed to identify the affected components. The affected components were then grouped by type and bill of material. Using ASME Design Specification, ASME Code Data Sheets, Vendor Drawings, and other design information, the following was confirmed:

1. For all components (i.e., piping, piping components, heat exchanger, pumps, etc.) except valves, the design temperature is ≥ 200°F.
2. For most valves, the design temperature is ≥ 200°F.
3. Remaining valves are B 16.5, 150 pound, pressure class valves and are considered satisfactory. These valves are nominally rated for 275 psig working pressure at 100°F. As temperature is increased, the rated working pressure value is reduced. At the 200°F design temperature, the rated working pressure still exceeds the maximum design pressures for the SFCS.
4. Diaphragm valve manufacturers elastomer ratings at 200°F were also checked and found acceptable for required design pressure.

C. Summary of Results and Conclusions

No components associated with the SFCS cooling loops are impacted by the increased temperature; no modifications or equipment upgrades are necessary.

4. SFP Ventilation System

A. Objectives and Scope

The scope of this evaluation was to determine if the SFP Ventilation System is adequate to perform its design function at worst case pool conditions after uprate.

B. Methodology

An initial determination was made that the relative humidity (RH) seen by the carbon filter banks could possibly exceed 70%. Options were explored to resolve this potential condition.

C. Summary of Results and Conclusions

This issue involved addressing the possible increase in RH in the Fuel Handling Building (FHB) due to increased thermal loads in the SFP and its impact on Fuel Handling Accident Doses. The increased temperature of the air entering the SFP Ventilation System was not a significant concern towards the operability of this system. This increased RH issue was initially determined to require resolution since no heaters or coiling coils are in the system, and testing of the carbon filters was being performed at 25°C, 70% RH.

During the evaluation, several resolutions were proposed and accepted. The first was to replace the carbon in the filter banks with new carbon that had passed more stringent testing requirements (35°C and 95°RH). This would preclude having to control RH while maintaining the operability of these carbon filter units.

Concurrent with this decision, a separate calculation using the new source terms from NUREG 1465 (Accident Source Terms for Light-Water Nuclear Power Plants) was performed. This calculation shows that there is no need for carbon filters in the SF ventilation system, since offsite doses are well within the acceptance limits as defined in Standard Review Plan (NUREG 0800), Section 15.7.4. No action was pursued for this resolution, other than the performance and review of the calculation due to time and resource restraints. The implementation of the revised source terms will be addressed through license amendment requests during the next cycle.

During this evaluation period, a concern about the testing methodology was raised, resulting in Amendment 131 to the VCSNS Operating License. This amendment changed the charcoal testing requirements from Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978 to ANSI N509-1980. This test specifies 95% RH (essentially saturated air/water vapor mixture) and 30°C. Given these new stringent testing requirements, the filter efficiencies assumed in the Fuel Handling Accident remain valid.

Increased SFP heat loads do not impact the Fuel Handling Accident Dose assessment.

5. Margin to Localized Boiling

A. Objectives and Scope

The scope of this evaluation was to determine if localized boiling would occur if the SFP bulk temperature was held at 200°F (maximum calculated SFP temperature per DC04680-022). This evaluation is documented in SCE&G Technical Work Record, Serial # 14331, Tab 96-3.

B. Methodology

The ΔT from the bulk water temperature to the peak local water temperature from the original thermal hydraulic analysis (submitted to the NRC in 1984) was compared using new peaking factors and decay heat values to find the ΔT for up-rated conditions. This ΔT was added to the peak bulk temperature to determine the peak local temperature (PLT). This PLT was compared to the saturation temperature at the top of the active fuel to determine if localized boiling would occur.

C. Summary of Results and Conclusions

Localized boiling was found not to occur in any case.

6. Adequacy of Net Positive Suction Head Available ($NPSH_A$) for the SFCS pumps.

A. Objectives and Scope

The scope of this evaluation was to determine if the SFCS pumps would have sufficient $NPSH_A$ to preclude pump cavitation. This evaluation is documented in SCE&G Technical Work Record, Serial #14331, Tab 96-9.

B. Methodology

Standard engineering practice was used to determine the head losses from the suction of the pool to the centerline of the SFCS pumps. Large margins to NPSH Required were found even when assuming bulk boiling conditions.

C. Summary of Results and Conclusions

$NPSH_A$ was found to be much greater than NPSH Required, therefore pump cavitation will not occur even under bulk boiling conditions.

The system drawings were reviewed to identified the affected components. The affected components were then grouped by type and bill of material. Using ASME Design Specification, ASME Code Data Sheets, Vendor Drawing, and other design information, the following was confirmed:

1. For all components (i.e., piping, piping components, heat exchanger, pumps, etc.) except valves, the design temperature is ≥ 200°F.
2. For most valves, the design temperature is ≥ 200°F.
3. Remaining valves can be considered satisfactory based on their B16.5 150 pound pressure class rating which bounds the new design temperature at the pressures of interest.
4. Diaphragm valve manufacturers elastomer ratings at 200°F were also checked and found acceptable for required design pressure.

Remaining valves, all of which are B16.5 150 pound pressure class rating, are considered satisfactory since they are rated for pressure and temperature conditions which exceed their respective SFC system design pressure and temperature.

Remaining valves are B16.5 150 lb pressure class valves and are considered satisfactory. These valves are nominally rated for 275 psig working pressure at 100°F. As temperature is increased, the rated working pressure value is reduced. At the 200°F design temperature, the maximum working pressure still exceeds the maximum design pressure for the SFCS.

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