November 12, 1996

Mr. Gary J. Taylor
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Post Office Box 88
Jenkinsville, South Carolina 29065

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION - FIFTEEN-YEAR TENDON SURVEILLANCE REPORT FOR VIRGIL C. SUMMER NUCLEAR STATION (TAC NO. M96490)

Dear Mr. Taylor:

On August 8, 1996, upon request, you submitted to the NRC the fifteen-year physical surveillance report for the V.C. Summer Nuclear Station containment building. More information is needed to complete our review and a request for additional information is enclosed.

If you have any questions, please do not hesitate to contact me at (301) 415-1497.

Sincerely,

(Original Signed By)

Allen R. Johnson, Project Manager
Project Directorate II-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosure: Request for
Additional Information

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ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION

VIRGIL C. SUMMER NUCLEAR STATION FIFTEEN-YEAR TENDON SURVEILLANCE REPORT

1. In accordance with Regulatory Guide (RG) 1.35 Revision 3, Section 4.2, on retensioning the tendons, simultaneous measurement of elongation and jack force should be made at a minimum of three approximately equally spaced levels of force between 0 and lock-off force. This required information should be presented in a form with all the elements as shown below:

Actual Observed Force and Elongation Measurement for Retensioned Tendons

Force	Kips	Pressure(psi)	Elongation(in.)
PTF			
Step 1			
Step 2			
LOF			
OSF			

Total Elongation (actual) = (LOF - PTF) Elongation

PTF = Pretensioned Force is the force necessary to bring the tendon into a lightly stressed condition to remove slack and seat the buttonheads. This force establishes the base for elongation measurement.

LOF = Lock Off Force is that force at which the tendon load is transferred to the shim stack from the ram and is representative of the force at which the tendon lift-off occurred during the monitoring of tendon force.

OSF = Overstress Force is that force which maximum elongation is determined.

Step 1 and Step 2 are intermediate data required by subsection 4.2 of RG 1.35 Section 4.2.

The above information for each retensioned tendon should be plotted on a graph to show the force-elongation relationship, which should be linear. An explanation should be provided for any deviation from such a relationship. This can show if the surveillance has been properly performed. The data as provided in pages A136 to A145 of your report do not meet the RG 1.35 (Rev 3) Section 4.2 requirement.

2. In Table X of the Surveillance Report, you have columns labeled: (a) Average Lift-off, (b) Normalized Lift-off, and (c) Averaged Normalized Lift-off. Provide the rationale for your adopting such an averaging and normalizing procedure.

   Judging from the locations of the surveillance tendons in each group as shown in Precision Surveillance Corporation (PSC) Procedure SQ 2.0, there is no basis to justify use of such averaging. Even though the tendons are in the same group, they can be so far apart that the loads cannot be applied equally to all the tendons in the group. For instance, the pressure load applied to hoop tendons at the center portion of the cylinder cannot be equal to that applied to the tendons at the top and bottom of the cylinder which are restrained. Furthermore, the word "normalization" comes from the word "normal," one definition of which is "corresponding to the median or average of a large group in type, appearance, achievement, function, development, etc.," and normalization is to become normal. In the present case the normal is the average tendon force and normalization is the process to bring each tendon force for a group of tendons to the average of the group. However, tendon surveillance is basically a sample study of the tendon population force and its trend. On the basis of the preceding observation, the staff has reservations about the usefulness of the graphs shown on Data Sheet Nos. 22, 23, and 24 of the Report. Each graph does not show the distribution of the tendon lift-off forces within the tendon group for each surveillance and does not give any proper indication of the potential trend of the group. A linear regression analysis should be performed for the lift-off forces of each group of tendons using the individual lift-off forces as obtained both with and without the normalization, using all the tendon surveillance data obtained to date. Such a regression analysis gives a better representation of the variation of the tendon force with time. Also, provide the data in tables as well as the graphs.

3. Indicate how the Tech Spec Limit Value shown on each of the graphs designated as Data Sheet Nos. 22, 23, and 24 was obtained.

4. At the bottom of Table I, you listed Water Content as less than 10% Dry Weight. Explain what is meant by 10% Dry Weight. In addition the title of Table XIII is misleading. The table is a summary of data sheets SQ 6.0 and SQ 12.1 indicating, respectively, grease removal amount and grease replacement amount. The difference between the two represents the loss of grease. A review of SQ 6.0 and SQ 12.1 found the information contained therein is confusing. For instance, for Tendon No. V8 on Page A-1 for shop end and Page A-2 for field end a loss of grease of 3.5 gallons and 21 gallons respectively is indicated near the bottom of the respective pages and on Page A-147 for shop and Page 148 for field end the total grease loss of 3.5 gallon and 21 gallons is indicated at the top portion of the respective pages. A clarification of the information contained in SQ 6.0 and SQ 12.1 is in order. These quantities in gallons appear to be the amount of grease removed and not the losses.

5. In the disposition of NCN 5407, you indicated that grease leakage has no effect on tendon steel corrosion protection, because the grease is designed to adhere to the surface of tendon steel and the conduit (sheathing). This is contrary to experience especially for vertical tendons where the grease tends to flow down and leaks through cracks, if any, in the sheathing, appearing as grease stains on the surface of the containment wall. Furthermore, the conduit ends may not be sealed as tightly as expected. This can be observed from the failure of the lower anchor head of the vertical tendons of the Farley containment as a result of the presence of water leaking from the upper anchor end in the dome. On the basis of these observations, this portion of reasoning of your disposition of NCN 5407 is tenuous and should be eliminated unless substantiated otherwise.

COMMENT

In your report you have included the 279-page PSC IN-SERVICE INSPECTION MANUAL which contains mostly generic information on quality control and quality assurance together with safety measures required in performing the surveillance. In addition, you have included the 230-page surveillance data submitted by PSC to you. The surveillance should be carried out in compliance with the applicable regulatory guide (RG) and the related technical specification and under your managed supervision. You should make an analysis of the data and present the results of the tendon surveillance in a summary report which should contain all the pertinent information required by RG 1.35 Rev. 3 and the regression analysis to assure that no tendon force will go below the minimum required force before the next scheduled surveillance. You should submit only the summary report without all the background materials (the voluminous 509 page PSC report), thus reducing your effort in reproducing the report and the amount of paper. This should be followed for future tendon surveillances.