



# Florida Power

CORPORATION

Crystal River Unit 3  
Docket No. 50-302

August 12, 1993  
3F0894-03

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Subject: Fifth Tendon Surveillance, Evaluation

Reference: FPC to NRC letter, 3F0294-02, dated February 4, 1994

Dear Sir:

Attached please find a Summary of results and an Engineering Evaluation Report for the Crystal River Unit 3 (CR-3) Fifth Tendon Surveillance Inspection Period. This report is submitted to fulfill Florida Power Corporation's (FPC) commitment contained in the reference document to provide the results of the inspection. The attached report describes details of the inspection such as sample selection, individual tendon's liftoff forces, tendon elongation, testing of the corrosion protection system and concrete inspection. The results and the conclusions drawn from those results are also included. A trending analysis of the tendon liftoff forces revealed the projected trend of prestress forces for each of the three tendon groups shows adequate margin availability for the remaining plant life.

The surveillance was performed from November 1, 1993 through January 4, 1994. FPC performed the surveillance to the acceptance criteria contained in the Technical Specifications applicable at the beginning of the inspection.

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Anticipation of the Improved Technical Specification implementation for CR-3, prompted FPC to evaluate the results of the inspection to the criteria of Regulatory Guide 1.135, Revision 3. The evaluation demonstrated the integrity of the CR-3 Prestressed Tendon System under the scrutiny of both sets of criteria.

Sincerely,

A handwritten signature in dark ink, appearing to read "P. M. Beard, Jr.", written in a cursive style.

P. M. Beard, Jr.  
Senior Vice President  
Nuclear Operations

PMB/LVC

xc: Regional Administrator, Region II  
Senior Resident Inspector  
NRR Project Manager

## SUMMARY

The following information briefly summarizes some of the considerations, results and conclusions addressed in the Engineering Evaluation Report prepared by Gilbert/Commonwealth, Inc. for FPC.

### Sample Selection

Sample selection was consistent with the guidance of Regulatory Guide 1.35, Revision 3 and in accordance with the requirements of the CR-3 Technical Specifications. The number of tendons selected was 11 (3 dome, 3 vertical and 5 hoop). This number represented 2% of the total tendon population. Page 6 of the Gilbert report provides additional details. During the selection process, five tendons were initially deferred because those were located in the steam area. Three other tendons were later deferred because of interferences and proximity to the steam vent area. This location was a concern because the surveillance was being performed with the plant on-line.

### Tendons Liftoff forces

All tendons' liftoff forces were within the Technical Specifications liftoff forces acceptance criteria. Because of the transition to the Regulatory Guide (RG), revision 3 criteria, all the liftoff forces were also evaluated by RG criteria. Page 14 of the Gilbert report describes that evaluation. Since one of the tendons' liftoff force was below the 90% predicted base force (46H29), the following actions were taken to address the low prestress. Those actions were also consistent with the guidance of the RG.

Measure liftoff forces of adjacent tendons. One of these adjacent tendons (46H30) presented a large deviation between the liftoff force at the field end and the liftoff force at the shop end. Due to the deviation of forces between ends, additional liftoff data was taken for tendons 46H29 (initially selected tendon) and 46H30 (adjacent tendon). From this data, it was determined that the liftoff force was 95.3% of the base force and therefore, acceptable. Table 5.2 of the Gilbert report provides the additional liftoff data.

Detension the initial tendon (46H29) and perform a push/pull drag test to determine if there was any obstruction or cause for the disparity. No obstruction was determined by that test.

Select an additional tendon to be checked for liftoff. The liftoff force of this tendon was found to be 95.3% of the predicted base force and therefore acceptable.

Based upon all data gathered which included additional inspections and testing on wires and grease samples, it is concluded that there is no evidence of wire failure or problems with the corrosion protection system and the tendons are still performing their intended function.

### **Tendon Elongation**

Tendon elongation was taken for all detensioned tendons during the retensioning process. Differences of plus or minus 10% elongation were investigated. The elongation measurements did not meet the criteria of the RG. However, the negative value of the wires' elongation indicates that the elongation measurements taken during the fifth surveillance were actually less than the elongations taken at the initial stressing process. Based on the smaller elongation and on results of wire inspection and testing, it was determined that the 10% difference in elongation did not present an adverse effect on the integrity of the post tensioning system.

### **Corrosion Protection System**

The method to evaluate the corrosion protection system included laboratory testing of grease samples. Results of that testing are provided in page 33 of the Gilbert report. The report concludes that the grease samples met the acceptance criteria of RG 1.135 for contents of Chlorides, Nitrates and moisture. The values of reserve alkalinity were investigated further because two samples presented reserve alkalinity values less than 30. The investigation revealed that the lower reserve alkalinity values were indicative of a type of grease that was previously used at CR-3. For that type of grease the alkalinity values found are considered acceptable. The Gilbert report concluded that based on the visual inspections performed and the results of sample testing of the bulk filler material, the corrosion protection system is performing its protective function with no abnormal degradation.

Grease replacement quantities for individual tendons were monitored during the surveillance. All tendons presented values of the replacement grease which exceed the 5% replacement allowable value contained in the RG. A review of previous surveillance reports revealed that this exceedance has occurred in previous surveillances and has previously been evaluated. The previous evaluations were updated to account for the current grease replacement data. The evaluation of replaced bulk filler is provided in Appendix D of the Gilbert report. Inspections of the Reactor Building have not located any grease seepage or tendon leakage problems. The inspection of bottom end caps of vertical tendons was performed with no leaks found. The Gilbert report concluded that the overall condition of the tendon wires is satisfactory and the corrosion protection system is performing its intended function of maintaining the integrity of the tendons.

### **Concrete Inspections**

The surveillance included visual inspection of the concrete immediately adjacent to each tendon area (Gilbert report, page 31). Additionally, a general inspection of the exterior of the containment was performed. No cracks were found that were greater than the 0.040 inches threshold. The inspection revealed no significant concrete problems. Cosmetic spalling of the corners of buttress No. 1, similar to the previously evaluated concrete spalling of buttress No. 2 is being further investigated.

### **Trending Analysis**

The average normalized force for each tendon group was calculated, the calculation of these averages as well as the normalization factors are provided in Appendix B of the Gilbert report. The group averages then was compared to the design basis group values. Section 6.0 of the Gilbert report discusses the trend of losses for each group. The report shows the hoop group has the lowest margin (6.6%). The available margin represents a positive indication of the overall condition of the prestressing system.