May 5, 1999

Mr. John Paul Cowan
Vice President, Nuclear Operations
Florida Power Corporation
ATTN: Manager, Nuclear Licensing (SA2A)
Crystal River Energy Complex
15760 W. Power Line Street
Crystal River, Florida 34428-6708

SUBJECT: CRYSTAL RIVER UNIT 3 - ISSUANCE OF AMENDMENT REGARDING STEAM GENERATOR TUBE SURVEILLANCE PROGRAM INSPECTION INTERVAL (TAC NO. MA4702)

Dear Mr. Cowan:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 176 to Facility Operating License No. DPR-72 for Crystal River Unit 3 (CR-3). By letter dated January 27, 1999, Florida Power Corporation submitted a proposed change to the Improved Technical Specifications (ITSs) for CR-3. The change would allow a one-time extension of the steam generator tube inspection interval specified in ITS 5.6.2.10 to allow the inspection to coincide with a planned refueling outage.

A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

Original signed by:

Leonard A. Wiens, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosures: 1. Amendment No. 176 to DPR-72
2. Safety Evaluation
cc w/enclosures: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

FLORIDA POWER CORPORATION
CITY OF ALACHUA
CITY OF BUSHNELL
CITY OF GAINESVILLE
CITY OF KISSIMMEE
CITY OF LEESBURG
CITY OF NEW SMYRNA BEACH AND UTILITIES COMMISSION,
CITY OF NEW SMYRNA BEACH
CITY OF OCALA
ORLANDO UTILITIES COMMISSION AND CITY OF ORLANDO
SEMINOLE ELECTRIC COOPERATIVE, INC.
CITY OF TALLAHASSEE

DOCKET NO. 50-302

CRYSTAL RIVER UNIT 3 NUCLEAR GENERATING PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. **176**
License No. DPR-72

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Florida Power Corporation, et al. (the licensees), dated January 27, 1999, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C(2) of Facility Operating License No. DPR-72 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 176, are hereby incorporated in the license. Florida Power Corporation shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Sheri R. Peterson, Chief, Section 2
Project Directorate II
Division of Project Licensing Management
Office of Nuclear Reactor Regulation

Date of Issuance: May 5, 1999

ATTACHMENT TO LICENSE AMENDMENT NO. 176

TO FACILITY OPERATING LICENSE NO. DPR-72

DOCKET NO. 50-302

Replace the following page of the Appendix "A" Technical Specifications with the enclosed page. The revised page is identified by amendment number and contains a vertical line indicating the area of change.

Remove Page	Insert Page
5.0-15	5.0-15

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Tube Surveillance Program (continued)

3. The above-required inservice inspections of OTSG tubes shall be performed at the following frequencies except, a one-time change for Cycle 11 is granted to modify the scheduled inspection frequency from a calendar-based interval to an interval of up to 21.6 months of operating time at a temperature of 500°F or above (measured at the hot leg side). This will allow the OTSG tube inspection to coincide with Refuel Outage 11R:

   a. Inservice inspections shall be performed at intervals of not less than 12 nor more than 24 calendar months after the previous inspection. If two consecutive inspections following service under all volatile treatment (AVT) conditions, not including the preservice inspection, result in all inspection results falling into the C-1 category, or if two consecutive inspections demonstrate that previously observed degradation has not continued and no additional degradation has occurred, the inspection interval may be extended to a maximum of once per 40 months.

   b. If the inservice inspection of an OTSG, conducted in accordance with Table 5.6.2-2 or Table 5.6.2-3 requires a third sample inspection whose results fall in Category C-3, the inspection frequency shall be reduced to at least once per 20 months. The reduction in inspection frequency shall apply until a subsequent inspection demonstrates that a third sample inspection is not required.

   c. Additional unscheduled inservice inspections shall be performed on each OTSG in accordance with the first sample inspection specified in Table 5.6.2-2 or Table 5.6.2-3 during the shutdown subsequent to any of the following conditions:

      1. Primary-to-secondary tube leaks (not including leaks originating from tube-to-tube sheet welds) in excess of the limits of Specification 3.4.12,

      2. A seismic occurrence greater than the Operating Basis Earthquake,

      3. A loss-of-coolant accident requiring actuation of the engineered safeguards, or

      4. A main steam line or feedwater line break.

(continued)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 176TO FACILITY OPERATING LICENSE NO. DPR-72

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

1.0 INTRODUCTION

By letter dated January 27, 1999, Florida Power Corporation (the licensee) submitted for U. S. Nuclear Regulatory Commission (NRC) staff review a request for an amendment to the Crystal River Unit 3 Improved Technical Specifications (ITS). The requested change would revise ITS 5.6.2.10 to allow a one-time (cycle 11) extension of the specified steam generator tube inspection interval.

In Spring 1996, Crystal River completed Cycle 10 operation, and the licensee performed routine inspection of steam generator tubes during refueling outage 10R. The licensee started Cycle 11 on May 15, 1996. After brief operation, the unit was shut down on September 2, 1996, to repair equipment and resolve design margin issues. On August 1, 1997, while the unit was still shut down, the licensee completed a baseline inspection of all steam generator tubes using a bobbin coil probe. The upper tubesheet roll joints were inspected using a rotating pancake coil and a +point coil. The licensee resumed Cycle 11 on February 5, 1998 and has operated the unit continuously since that time. The licensee plans to complete Cycle 11 on or about October 1, 1999, and to inspect steam generator tubes during the subsequent refueling outage.

The Crystal River ITS requires that steam generator tube inspection be performed at intervals of not more than 24 calendar months after the last inspection. On the basis of the August 1, 1997, inspection and ITS required intervals, the next tube inspection must be performed on or before August 1, 1999. If the next scheduled inspection is performed in August 1999, the licensee would shut down Crystal River Unit 3 approximately 2 calendar months before the completion of Cycle 11 and a refueling outage currently scheduled for October 1999. The licensee, therefore, proposed this one-time extension of about 2 calendar months to permit it to perform the required inspection after the completion of Cycle 11 during the refueling outage. It should be noted that the unit will have operated only 21.6 months between the August 1, 1997, inspection and the scheduled October 1999 refueling outage.

2.0 EVALUATION

The staff focused its evaluation on the licensee's assessment of structural and leakage integrity of the steam generator tubes, the primary-to-secondary leakage limits, and steam

generator wet lay-up practices to ascertain that the tubes are acceptable for continued operation during the extended inspection interval, an extension of approximately 2 calendar months, until the end of Cycle 11.

Steam generator tube integrity is demonstrated by condition monitoring and operational assessments. NRC Regulatory Guide (RG) 1.121 recommends certain analytical and experimental justifications for tube integrity. RG 1.121 recommends that the tubes maintain a minimum safety margin of 3 against rupture under normal operating conditions (i.e., the tubes will not burst under differential pressure equal to 3 times that of normal operating differential pressure). In addition, RG 1.121 recommends a safety margin consistent with Section III of American Society of Mechanical Engineers Code against failure under postulated accidents throughout the operating cycle. In addition, steam generator tube degradation is managed through a combination of several approaches to provide defense-in-depth. These approaches include inservice inspections, technical specification limits on primary-to-secondary leakage, control of secondary water chemistry, leakage monitoring, and operator actions.

The dominant tube degradation mechanisms in Crystal River steam generators "A" and "B" are (1) volumetric "pit-like" intergranular attack (IGA) in the first span of the tubes above the lower tubesheet, (2) outside diameter stress corrosion cracking (ODSCC) and/or IGA in the upper bundle free span region, (3) primary water stress corrosion cracking (PWSCC) at the roll transition region in the upper tubesheet, and (4) upper tubesheet tube end anomalies. These degradation mechanisms have been addressed in several previously-submitted assessments, which the staff has reviewed. The January 27, 1999, submittal contains an update of the assessments and they are discussed below.

The licensee has detected volumetric IGA in the first span of the steam generator tubes since 1990. In a May 18, 1998, submittal, the licensee provided an operational assessment of the volumetric IGA that used a safety factor of 1.4 for accident conditions and a safety factor of 3.0 for normal operation. The largest indication returned to service was determined to satisfy the 3 times differential pressure criterion at the end of Cycle 11 based on projected flaw growth rates and consideration of inspection measurement uncertainty. The licensee projected a zero leakage rate for normal and accident conditions at the end of Cycle 11. The licensee also performed in situ pressure tests of the bounding IGA indications in 1996, and destructive tests on removed tubes in 1992 and 1994. The tests showed that the bounding indications satisfied the 3 times differential pressure criterion. In a letter to the licensee dated November 17, 1998, the staff concluded that the limiting volumetric IGA flaw is projected to remain within safety margins consistent with Regulatory Guide 1.121.

The licensee detected two free span axial ODSCC/IGA indications in a tube in the "A" steam generator during the 1997 inspection. The tube was plugged. Similar axial ODSCC/IGA indications have been found in other Babcock & Wilcox (B&W) steam generators. B&W plant owners have performed laboratory examinations on more than 12 tube sections and over 20 in situ pressure tests of tubes containing free span axial IGA indications. The examinations and in situ tests showed that the tubes did not burst or leak at three times normal operating differential pressure. The licensee's operational assessment showed that the limiting ODSCC/IGA flaw depth at the end of Cycle 11 will satisfy the 3 times differential pressure criterion. The assessments showed that leak rates through these indications are projected to

be minimal at the end of Cycle 11 (i.e., less than 1 gallon per minute [gpm]) and will not exceed radiological dose limits.

The licensee detected axial PWSCC indications in the roll transition region of the tubes in the upper tubesheet during the 1997 inspection. The affected tubes were plugged. In the May 18, 1998, submittal, the licensee's operational assessment of the PWSCC indications showed that the tube leakage rate would be below the allowable limit of 1 gpm under accident conditions. The NRC staff believes that the likelihood of tube rupture as a result of PWSCC indications in the roll transition region of the upper tubesheet is minimal because of the restraint imposed on the tubes by the tubesheet.

The licensee detected tube end anomalies, which are indications at the seal welds at the end of steam generator tubes. By a letter dated June 18, 1998, the licensee submitted an amendment request to allow steam generator tubes having tube end anomalies to remain in service for a limited time. The licensee demonstrated that the tube end anomalies will have a minimum impact on the primary-to-secondary leak rate under postulated steam line break conditions. The tubesheet provides constraint that will preclude tube rupture initiated from any tube end anomalies. In a letter dated July 30, 1998, the staff issued amendment No. 169 to allow the tube end anomalies to remain in service for the remainder of Cycle 11.

Crystal River ITS limits the primary-to-secondary leakage for normal operation to 150 gallons per day per steam generator. This is a restrictive leakage limit and is consistent with the recommended leakage limit in NRC Generic Letter 95-05. The primary-to-secondary leakage is monitored by gamma detectors located in the condenser vacuum pump exhaust with indicators in the control room. The leakage limit and monitoring system will ensure that the operator has sufficient time to take appropriate actions should leakage occur.

During the extended shutdown, the licensee placed the steam generators in wet lay-up to minimize steam generator tube corrosion. The licensee followed, and in some areas exceeded, the wet lay-up program specified in Electric Power Research Institute (EPRI) Report, "PWR Secondary Water Chemistry Guidelines," TR-102134, Revision 4, November 1996. The EPRI guidelines on water chemistry and associated monitoring system were established to reduce steam generator tube corrosion.

The staff has determined that the structural integrity of the steam generator tubes is acceptable for continued operation until the end of Cycle 11 because the tubes at the end of Cycle 11 will satisfy the safety margins of Regulatory Guide 1.121. The licensee has demonstrated that tube degradation in Crystal River is managed consistent with generally accepted industry practices and ITS requirements. Since there is reasonable assurance that the structural integrity of the steam generator tubes will be maintained until the end of Cycle 11, it is acceptable to extend the inspection interval by approximately 2 months to coincide with the end of the operating cycle.

Proposed Change to Improved Technical Specifications

The licensee proposed to include the following paragraph in ITS 5.6.2.10.3

> The above required inservice inspections of OTSG tubes shall be performed at the following frequencies except, a one-time change for Cycle 11 is granted to modify the scheduled inspection frequency from a calendar-based interval to an interval of up to 21.6 months of operating time at a temperature of 500° F or above (measured at the hot leg side). This will allow the OTSG tube inspection to coincide with Refuel Outage 11R[.]

The staff finds that the proposed change is acceptable on the basis of its review of the information submitted by the licensee, as set forth above.

3.0 STATE CONSULTATION

Based upon a letter dated March 8, 1991, from Mary E. Clark of the State of Florida, Department of Health and Rehabilitative Services, to Deborah A. Miller, Licensing Assistant, U.S. NRC, the State of Florida does not desire notification of issuance of license amendments.

4.0 ENVIRONMENTAL CONSIDERATIONS

The amendment changes requirements with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding (64 FR 11962). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

Based on its review of the licensee's proposal, the staff has determined that the proposed change to the Crystal River, Unit 3, ITSs will continue to provide adequate assurance that the steam generator tubes will maintain adequate structural and leakage integrity for the remainder of Cycle 11. The licensee has implemented restrictive primary-to-secondary leakage limits and has a leakage monitoring system. The licensee has followed EPRI guidelines on wet lay-up of steam generators during extended shutdown. The proposed changes to ITS 5.6.2.10 are acceptable and they may be incorporated into Crystal River Unit 3 ITSs. The staff concludes that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date: May 5, 1999

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