July 30, 1998

Mr. John Paul Cowan, Vice President
Nuclear Operations (NA2E)
Florida Power Corporation
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 END ANOMALIES - (TAC NO. MA2123)

Dear Mr. Cowan:

The Commission has issued the enclosed Amendment No. 169 to Facility Operating License No. DPR-72 for the Crystal River Unit 3. This amendment is in response to your exigent amendment request dated June 18, 1998, and revised by letter dated June 30, 1998, in which you proposed to revise the Improved Technical Specifications to allow operation with a number of indications previously identified as tube end anolmalies and multiple tube end anolmalies in the Crystal River Unit 3 Once Through Steam Generator tubes. Your prompt notification to the staff of the potential condition and timely submittal of a thorough request permitted this amendment request to be processed under non-emergency conditions.

The amendment approves the requested change. A copy of the related Safety Evaluation is 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
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosures: 1. Amendment No. 169 to DPR-72
2. Safety Evaluation

cc w/enclosures: See next page

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

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Docket No. 50-302

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2. Safety Evaluation

cc w/enclosures: See next page

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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. 169
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 June 18, 1998, and revised June 30, 1998, 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. 169 , 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.

FOR THE NUCLEAR REGULATORY COMMISSION

Frederick J. Hebdon

Frederick J. Hebdon, Director
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: July 30, 1998

ATTACHMENT TO LICENSE AMENDMENT NO. 169

FACILITY OPERATING LICENSE NO. DPR-72

DOCKET NO. 50-302

Revise the Appendix A Technical Specifications by removing the page identified below and inserting the enclosed page. The revised page is identified by the captioned amendment number and contains marginal lines indicating the area of change.

REMOVE	INSERT
5.0-17	5.0-17

5.6 Procedures, Programs and Manuals

5.6.2.10 OTSG Tube Surveillance Program (continued)

8. Plugging/Sleeving Limit means the extent of degradation beyond which the tube shall be restored to serviceability by the installation of a sleeve or removed from service because it may become unserviceable prior to the next inspection and is equal to 40% of the nominal tube or sleeve wall thickness. No more than five thousand sleeves may be installed in each OTSG.

9. Unserviceable describes the condition of a tube if it leaks or contains a defect large enough to affect its structural integrity in the event of an Operating Basis Earthquake, a loss-of-coolant accident, or a main steam line or feedwater line break, as specified in 5.6.2.10.3.c, above.

10. Tube Inspection means an inspection of the entire OTSG tube as far as possible.

b. The OTSG shall be determined OPERABLE after completing the corresponding actions (plug or sleeve all tubes exceeding the plugging/sleeving limit and all tubes containing through-wall cracks) required by Table 5.6.2-2 (and Table 5.6.2-3 if the provisions of Specification 5.6.2.10.2.d are utilized). Defective tubes may be repaired in accordance with the B&W process (or method) equivalent to the method described in report BAW-2120P.

There are a number of OTSG tubes that have the potential to exceed the tube plugging/sleeving limit as a result of tube end anomalies. Defective tubes will be repaired or plugged during the next outage of sufficient duration. An evaluation has been performed which confirms that operability of the CR-3 OTSGs will not be impacted with those tubes inservice.

5.6.2.11 Secondary Water Chemistry Program

This program provides controls for monitoring secondary water chemistry to inhibit steam generator tube degradation and low pressure turbine disc stress corrosion cracking. The program shall include:

a. Identification of a sampling schedule for the critical variables and control points for these variables;

b. Identification of the procedures used to measure the values of the critical variables;

(continued)

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 169 TO FACILITY OPERATING LICENSE NO. DPR-72

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

1.0 INTRODUCTION

By letter dated June 18, 1998, as supplemented on June 30, 1998, Florida Power Corporation (the licensee) submitted a request to change the Crystal River Unit 3 (CR-3) Improved Technical Specifications (ITS). The requested changes would revise ITS 5.6.2.10.4.b, "Steam Generator (OTSG [Once Through Steam Generator]) Tube Surveillance Program," to allow continued operation with certain steam generator tubes that exceed their repair limit as a result of tube end anomalies (TEAs). Defective tubes would be temporarily exempted from the plugging/sleeving limit until repaired during the next scheduled refueling outage or until an extended shutdown of sufficient duration to permit steam generator tube repairs. The June 30, 1998, supplement did not affect the original no significant hazards determination. The licensee requested that this change be reviewed on an exigent basis, and the request was noticed in the Federal Register as an exigent amendment request. Subsequent to the Federal Register notice, it was determined that exigent circumstances no longer existed, and therefore the amendment was processed under normal circumstances.

Specifically, the following addition to ITS 5.6.2.10.4.b is proposed to address potential tube end flaws in the CR-3 OTSG tubes.

> There are a number of OTSG tubes that have the potential to exceed the tube plugging/sleeving limit as a result of tube end anomalies. Defective tubes will be repaired or plugged during the next outage of sufficient duration. An evaluation has been performed which confirms that operability of the CR-3 OTSGs will not be impacted with those tubes inservice.

2.0 BACKGROUND

During the spring 1998 refueling outage at Arkansas Nuclear One Unit 1 (ANO-1), steam generator tube through-wall defects near the upper tubesheet seal welds in two tubes were identified. These affected tubes had been previously classified as containing TEAs which were indications believed to be located outside the pressure boundary of a tube. The leakage through the defective tubes during a bubble test revealed that TEAs could reside within the OTSG tube pressure boundary. Since the exact location and through-wall depth of tube end flaws could not be accurately determined using available inspection techniques, ANO-1 declared the affected tubes defective and repaired them using an approved rerolling technique.

A similar investigation of TEAs was conducted by Duke Power to evaluate TEAs in the Oconee Nuclear Station (ONS) units. TEAs located in the ONS Unit 2 OTSGs were repaired during the spring 1998 refueling outage. ONS concluded that a number of tubes containing TEAs in the ONS Units 1 and 3 OTSGs currently in service should have been repaired during previous refueling outages. Because these units were in operation at the time the assessment was completed, ONS declared the affected OTSGs inoperable and requested enforcement discretion from the NRC to prevent unscheduled shutdowns for the units on the basis of another analysis that demonstrated a low safety significance for operating with the defective tubes in service for the remainder of the units' respective operating cycles. The U.S. Nuclear Regulatory Commission (NRC) agreed with the ONS assessment of the significance of the tube end defects and issued a Notice of Enforcement Discretion to Duke Power for ONS Units 1 and 3 on June 4, 1998.

Currently at CR-3, there are 381 TEA indications in the "A" OTSG and 787 TEA indications in the "B" OTSG. The licensee initiated an analysis to determine whether any of these indications constitute tube defects based on the operating experience gained from ANO-1 and the Oconee units. The evaluation included a reanalysis of the eddy current inspection data for upper tubesheet TEAs, a determination of the pressure boundary region for OTSG tubing (the CR-3 ITS only require tubes with defects located in the pressure boundary to be removed from service), and an assessment of the significance of any defects identified during the assessment. Prior to completion of this effort, the licensee requested changes to the CR-3 ITS in the event that some of the TEAs were located in OTSG tube pressure boundary. The following summarizes the staff's assessment of the proposed changes to the ITS to address potential tube end defects at CR-3.

3.0 EVALUATION

OTSG tubing comprises a significant portion of the reactor coolant system pressure boundary. Operating experience has demonstrated that these tubes are susceptible to age-related degradation mechanisms. Periodic inspections are required of OTSG tubes to verify the structural and leaktight integrity of inservice tubing. The development of tube end flaws (previously classified as TEAs) at the hot-leg tubesheet seal welds can degrade the integrity of affected tubes. Structurally, a defective tube cannot burst as a result of tube end flaws due to the constraint provided by the surrounding tubesheet. As demonstrated during testing conducted at ANO-1, however, the development of primary-water stress corrosion cracking in the vicinity of the seal welds may degrade the leak tight barrier between the primary and secondary coolant systems. Although the primary-to-secondary leakage from a single tube end flaw is likely to be small relative to the limit specified in plant technical specifications, the combined leakage from this mode of degradation could become significant if a large number of tubes contain through-wall cracking.

The CR-3 ITS require those steam generator tubes with defects located in the tube pressure boundary that exceed 40-percent of the nominal tube wall thickness in depth to be removed from service. The licensee initiated an evaluation based on experience gained from ANO-1 and the Oconee units regarding TEAs. This assessment is currently ongoing to determine whether any of the known TEA indications reside within the pressure boundary of the steam generator tube. The licensee determined in a previous inservice inspection that a number of tubes in the "A" and "B" OTSGs contained TEAs. It is unlikely that all of these indications would be classified as tube defects; however, the licensee has evaluated the safety significance for these indications on a worst-case basis. The assessment conservatively assumed that all flaws in the limiting steam generator (i.e., "B") are through-wall and have the potential for leakage.

The assessment of the cumulative potential accident-induced leakage concluded that the total leak rate would be approximately 0.030 gallons per minute (gpm) from tubes containing assumed tube end flaws located in the pressure boundary and known intergranular attack degradation in the lower bundle region. The majority of the leakage, 0.029 gpm, was due to postulated tube end flaws. The leakage from intergranular attack degradation was determined in a previously completed operational assessment to evaluate this mode of degradation. The leak rate assumed from each tube end flaw was based on operating experience and results from testing of artificial tube end flaws inserted in a mock-up developed to assess TEAs.

ITS 3.4.12 contains the reactor coolant system operational leakage limits and surveillance requirements. During normal operation, OTSG primary-to-secondary leakage is limited to 150 gallons per day (gpd). The Bases for ITS 3.4.12 states that the primary-to-secondary leakage assumed for main steam line break scenarios is 1 gpm. The calculated leakage for tube end flaws is well below the value assumed in design basis accidents evaluated in the Final Safety Analysis Report (FSAR). In addition, the total accident leakage from tube end flaws and other degradation mechanisms postulated to occur in the CR-3 OTSGs is also below 1 gpm.

Steam generator tube degradation is managed through a combination of several defense-in-depth measures. Inservice inspections during plant outages are only one of these measures. Other steps taken by licensees to manage the potential for age related degradation of steam generator tubing include limitations on the amount of primary-to-secondary leakage during operation, control of secondary water chemistry, and reactor operator training and plant procedures to assess and respond to events involving a loss of steam generator tube integrity. The potential impact on safety due to operation of CR-3 with defective tubes for the remainder of the operating cycle can be mitigated through other means. Leak rate monitoring is the primary vehicle by which licensees can assess steam generator tube integrity during operation. Should elevated leakage above the 150 gpd limit be detected in either OTSG from any mode of tube degradation, the licensee would be required to shut down the unit and complete inspections of the CR-3 steam generators. This requirement will ensure that the leakage from any source, including tube end flaws, is limited to acceptable levels during normal operation. At present, the measured primary-to-secondary leak rate in each OTSG at CR-3 is below 1 gpd which is well below levels requiring compensatory actions by the licensee. Therefore, any contribution to the operational leak rate from known tube end flaws is minimal.

The staff has reviewed the licensee's assessment of potential tube end flaws currently in service in the CR-3 OTSGs. The existence of cracking near the hot-leg end of a limited number of steam generator tubes will have a minimal impact on the postulated steam line break primary-to-secondary leak rate and is bounded by the value assumed in steam line break accident analyses. Leak rate monitoring will ensure acceptable leakage from tube end flaws and other sources of primary-to-secondary leakage during normal operation. The constraint provided by the surrounding tubesheet precludes structural failure initiating from any tube end flaw. Therefore, there is no potential for steam generator tube burst as a result of these indications. Based on these factors and the existence of other defense-in-depth measures to manage steam generator tube degradation, the staff concludes that potential tube end defects in the CR-3 OTSGs would have a negligible impact on the structural and leakage integrity of the steam generators for the remainder of the current operating cycle. Therefore, the proposed revision to the CR-3 ITS is acceptable.

4.0 STATE CONSULTATION

Based upon written notice of the proposed amendment, the Florida State official had no comments.

5.0 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 (63 FR 35615). 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.

6.0 CONCLUSION

The Commission has concluded, based on considerations discussed above, 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.

Principal Contributor: Phillip J. Rush, DE

Date: July 30, 1998