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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 117 TO FACILITY OPERATING LICENSE NO. DPR-72

FLORIDA POWER CORPORATION, ET AL.

CRYSTAL RIVER UNIT NO. 3 NUCLEAR GENERATING PLANT

DOCKET NO. 50-302

1.0 INTRODUCTION

By generic letter dated June 11, 1980 (Ref. 2), the NRC staff requested that all pressurized water reactor (PWR) licensees propose Technical Specifications (TS) changes that provide for redundancy in decay heat removal capability in all modes of operation using the NRC Standard Technical Specifications (Ref. 3). Florida Power Corporation (the licensee) responded to the NRC generic letter by letter dated February 16, 1984 (Ref. 1) in which revised TS changes were proposed to assure redundant decay heat removal capability for all modes of operation for Crystal River Unit 3. The proposed TS changes are based on the NRC Standard Technical Specifications (Ref. 3) with inclusion of plant-specific related changes. The staff has reviewed the proposed TS changes and related information (Refs. 4 and 5). As a result of the review, the staff has prepared the following evaluation.

2.0 EVALUATION

Changes to the TS were proposed to operate the Crystal River Unit 3 plant with redundant means of decay heat removal in all modes of operation except for the refueling mode when a large mass of water is above the core. The proposed changes are summarized as follows.

(1) Power Operation and Startup (Modes 1 and 2)

Both reactor coolant loops must be in operation with all four reactor coolant pumps operating except that three-pump operation is allowed if the trip setpoints are appropriately reduced.

(2) Hot Standby (Mode 3)

Both reactor coolant loops with at least one reactor coolant pump in each must be operable. However, one of the loops is required to be in operation.

(3) Hot Shutdown (Mode 4)

At least two out of various combinations of the decay heat removal means are required to be operable with one in operation. Heat removal means are two decay heat removal loops and two reactor coolant loops with at least one reactor coolant pump in each loop.

(4) Cold Shutdown (Mode 5)

The two decay heat removal loops must be operable with at least one loop in operation.

(5) Refueling With Water Level Greater Than 23 Feet Above the Core (Mode 6)

At least one decay heat removal loop is required to be in operation. The other loop need not be operable.

(6) Refueling with Water Level Less Than 23 Feet Above the Core (Mode 6)

The two decay heat removal loops are required to be operable with at least one loop in operation.

In addition to the above requirements for operability, the TS changes include surveillance requirements for heat removal systems which are consistent with the Standard Technical Specifications.

In the footnotes of Sections 3.4.1.2, 3.4.1.3 and 3.4.1.4 for operation in Modes 3 through 5, the proposed TS allow all reactor coolant pumps and decay heat removal pumps to be deenergized for up to 1 hour provided that core temperature is maintained at least 10°F below the saturation temperature. The proposed footnotes would allow operation under natural circulation conditions without the decay heat removal system available for up to 1 hour. The staff finds that 10°F subcooling at the top of the core does not necessarily ensure subcooling at the top of the cooling loops and is not adequate for subcooling margin acceptance criteria. Considering the actual physical configuration of Crystal River Unit 3, the elevation from the top of the core to the top of the hot leg U-bends is about 44 feet. At a low primary system pressure, the water at the top of the hot legs could be boiling while the core is subcooled by 10°F. Boiling at the top of the hot leg U-bends is undesirable in B&W plants during natural circulation since bubble formation can cause loss of coolant flow. In response to the staff's concern related to subcooling margin, the licensee indicated (Ref. 7), and the staff agreed, that the plant-specific subcooling margin used in its Emergency Operating Procedures (EOPs) includes the physical configuration factor discussed above and instrumentation errors and is adequate for maintaining subcooling during natural circulation conditions. The minimum required subcooling margins stated in Reference 7 are 20°F for the reactor coolant system (RCS) pressure greater than 1500 psig and 50°F for the RCS pressure less than or equal to 1500 psig. The staff therefore requires that the incorrect subcooling margin value of 10°F be removed from the footnotes in Sections 3.4.1.2 through 3.4.1.4. The footnotes should be modified for operation in natural circulation conditions as follows:

> ... (2) core temperature is maintained so as to assure subcooling throughout the reactor coolant primary system.

These modifications were discussed with and agreed to by the licensee. Based on its review, the staff finds that, with the modifications noted above, the proposed TS provide an improvement over the existing TS since redundant decay heat removal capability is now required in Modes 3, 4 and 5, and effectively in

Mode 6. In Mode 6 with more than 23 feet of water above the core, this large heat sink provides adequate time to initiate emergency cooling of the core in the event of failure of the operating DHR loop. With less than 23 feet of water above the core, both DHR loops are required to be operable. Therefore, the staff concludes that the proposed TS are more conservative than the existing TS and are acceptable.

3.0 SUMMARY

The staff concludes for reasons as set forth herein that the proposed TS, which provide redundancy in decay removal capability in all modes of operation, are acceptable for Crystal River Unit 3. However, footnotes in Sections 3.4.1.2 through 3.4.1.4 of the TS have been modified as follows for acceptance:

> ... (2) core temperature is maintained so as to assure subcooling throughout the reactor coolant primary system.

4.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes to surveillance requirements. We have 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. Accordingly, this 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 this amendment.

5.0 CONCLUSION

We have concluded, based on the 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, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Dated: May 31, 1989

Principal Contributor:
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4.0 REFERENCES

1. Letter from G. Westafer (FPC) to H. Denton (NRC), dated February 16, 1984.

2. Letter from D. Eisenhut (NRC) to All Operating Pressurized Water Reactors (PWRs), dated June 11, 1980.

3. NUREG-0103, Rev 4, Standard Technical Specifications for B&W Reactors, October 1980.

4. Letter titled "Amendment No. 119 to Facility Operating License No. DPR-50," from J. Thoma (NRC) to H. Hukill (GPU), dated August 14, 1986.

5. Letter from H. Hukill (GPU) to NRC, dated April 24, 1986.

6. Generic Letter No. 88-17, Loss of Decay Heat Removal, dated October 17, 1988.

7. Letter from FPC to NRC, dated February 17, 1985 and September 1, 1988.