

**Florida
Power**
CORPORATION

Crystal River Unit 3
Docket No 50-302

April 24, 1991
3F0491-05

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

Subject: Natural Circulation Cooldown

References: A. FPC to NRC letter dated January 15, 1987

B. NRC to FPC letter dated March 25, 1988

C. NRC to FPC letter dated June 6, 1986

Dear Sir:

Florida Power Corporation (FPC) is advising the NRC of a change to the estimated emergency feedwater (EFW) quantity and time necessary to complete a natural circulation cooldown at Crystal River Unit 3 (CR-3). This notification is necessary because some of the information provided in Reference A has changed and the NRC used Reference A to prepare the safety evaluation report (SER) discussed in Reference B.

A natural circulation cooldown from hot standby conditions to the decay heat cut-in conditions is expected to use 735,000 gallons of water and will take 150 hours using conservative licensing basis assumptions. While these values have increased above those provided in Reference A (344,000 gal and 45 hrs, respectively), these changes do not affect the capability of CR-3 to perform a natural circulation cooldown since the Crystal River site has substantial quantities of condensate-grade water available to mitigate this postulated event. The development of this revised information is provided in the Background, Present Status, and Conclusions sections of this letter.

BACKGROUND

During a loss of off-site power the plant operating procedures direct the operators to maintain the plant at hot standby until off-site power is restored. However, in response to Generic Letter 81-21, FPC made several submittals in the early 1980's which assessed the capability of CR-3 to handle reactor vessel upper head steam formation during a natural circulation cooldown. These submittals

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showed that, even though the CR-3 licensing basis is hot standby ($K_{eff} < 0.99$, 0% power, and $T_{ave} \geq 280^\circ\text{F}$), CR-3 had sufficient condensate capacity and other capabilities to respond to such an event. Based upon these submittals, the NRC issued a SER in Reference C which concluded that CR-3 had sufficient condensate inventory.

Following the issuance of the 1986 SER, FPC developed a new analytical model for decay heat removal via the Atmospheric Dump Valves during a natural circulation cooldown. FPC determined that a natural circulation cooldown from hot standby to decay heat cut-in conditions using conservative licensing assumptions would require 344,000 gallons of water to be available to the Emergency Feedwater (EFW) System and it would take approximately 45 hours to complete. The conservative licensing assumptions included, for example, decay heat generation in accordance with NUREG-0800, Branch Technical Position ASB 9-2, and infinite irradiation of the core.

As a result of this revised analysis, FPC concluded that various statements in docketed correspondence, the Final Safety Analysis Report (FSAR), and the Technical Specifications bases required clarification to clearly indicate the conservative water quantity and cooldown time. The results and clarifications are discussed in Reference A. In Reference B, the NRC agreed with FPC. The NRC concluded that the results of the analysis, and the submitted statements and clarifications, were acceptable based upon the substantial amount of water available on-site.

PRESENT STATUS

As part of its continuing Configuration Management (CM) Program, FPC was validating the assumptions used in the new model to perform the 1987 analyses. During the validation process, FPC determined that existing documentation did not adequately describe the as-installed operating conditions of the Atmospheric Dump Valves (MSV-25 & MSV-26). When the earlier analyses were performed, FPC used flow rate data obtained from Fisher, the valve manufacturer. However, the CM validation process revealed evidence of a modification to the valves in 1979 or 1980 that reduced the flow capacity. After researching its records, the valve manufacturer confirmed that the modification had been made to the CR-3 valves, and updated valve information was provided in late 1989. FPC performed revised analyses to reflect the reduced valve flow.

These atmospheric dump valves are the primary means for the removal of energy from the secondary system for this postulated event. The capacity of the atmospheric dump valves is the controlling variable in the natural circulation cooldown because the steaming rate is limited by the differential pressure across the valve. Below 350°F , the rate of cooldown diminishes rapidly because the decreasing differential pressure across the dump valves reduces the steam mass flow rate through the valves. Conservative licensing basis analysis with the reduced valve flow rate shows that the cooldown uses up to 735,000 gallons of

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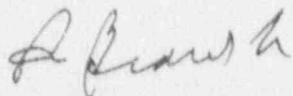
water and takes up to 150 hours to reach decay heat cut-in conditions of 284 psig and 280°F RCS pressure and temperature, respectively.

CONCLUSIONS

While these values are an increase from the earlier estimates, they do not represent a safety concern for CR-3, or conflict with the conclusions of Reference B. There is sufficient condensate-grade water available for use in this postulated event. As tabulated in FSAR Table 10-2, CR-3 has preferred EFW sources which total 1,304,000 gallons of which 990,000 gallons are controlled as Technical Specification requirements. In addition to these preferred sources, the Crystal River site also maintains over 3 million gallons of water which could be available to the CR-3 EF System, if it were necessary. The change in valve flow characteristics does not impact the licensing basis. The quantity of EFW required to maintain hot standby for 18 hours remains 150,000 gallons as stated in FSAR Section 10.5.3 (page 10-21).

These factors allow FPC to conclude that the increase in water quantity and time can be accommodated by CR-3 without an impact on the public health and safety. These conclusions also do not conflict with the intent of the earlier Safety Evaluation Reports.

Sincerely,



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

PMB/JWT/wla

xc: Regional Administrator, Region II
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