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Docket No. 50-302

Mr. Walter S. Wilgus
Vice President, Nuclear Operations
Florida Power Corporation
ATTN: Manager, Nuclear Licensing
& Fuel Management
P. O. Box 14042, M.A.C. H-2
St. Petersburg, Florida 33733

Dear Mr. Wilgus:

By our Generic Letter 81-21, dated May 5, 1981, we initiated a review of natural circulation cooldown for the Crystal River Unit 2 station. In order to complete our review we need responses to the enclosed request for additional information.

Kindly respond by August 1, 1983, this date will give you more than sixty days to prepare a response and permit us to finish our review by September 30, 1983.

Sincerely,

"ORIGINAL SIGNED BY
JOHN F. STOLZ"
John F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing

Enclosure:
As stated

cc w/enclosure:
See next page



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Crystal River Unit No. 3
Florida Power Corporation

cc w/enclosure(s):

Mr. S. A. Brandimore
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St. Petersburg, Florida 33733

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Nuclear Plant Manager
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Tallahassee, Florida 32304

Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission, Region II
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Additional Questions for Crystal River

In response to Generic Letter 81-21 (Reference 1), all PWR licensees were required to provice the following:

(1) A demonstration (e.g., analysis and/or test) that controlled natural circulation cooldown from operating conditions to cold shutdown conditions, conducted in accordance with their procedures, should not result in reactor vessel voiding.

(2) Verification that supplies of condensate grade auxiliary feedwater are sufficient to support their cooldown method, and

(3) A description of their training program and the revisions to their procedures.

The Florida Power Corporation's response to these questions is documented in Reference 2. In your response you conclude that the B&W NSSS can perform a natural circulation cooldown without voiding because use of your procedures on the B&W simulator did not result in voiding. Your submittal further concludes the technical specification minimum of 150,000 gallons in the condensate storage tank is sufficient because only 112,000 gallons were necessary during the simulated cooldown. We cannot yet conclude that this is an acceptable demonstration of the plant's ability to cooldown without voiding or of the adequacy of your condensate supplies. This is because we are uncertain as to the ability of your plant simulator to correctly predict upper head voiding or natural circulation interruption due to hot leg voiding.

Additionally, recent analyses performed by B&W for ANO-1 and Midland (Reference 3,4) conclude that it will take between 84 and 135 hours to reach the Decay Heat Removal System entry conditions without voiding. We cannot determine if your procedures reflect this nor can we determine that 150,000 gallons of condensate water is sufficient to support a cooldown of this duration.

Your submittal indicates that your procedures contain guidance on avoiding, recognizing and properly reacting to voiding. The only details provided however, are that if void formation occurs, the operator is instructed isolate letdown flow, stop the cooldown, and energize the pressurizer heaters. When indication of voiding has ceased, pressure is to be held constant for 30 minutes before the cooldown is continued. It should be noted that the Reference 4 analysis concludes that raising RCS pressure to condense the steam bubble is not an effective mechanism for rapid steam bubble collapse. This analysis indicated it would take 30 hours to condense a 458 $ft^3$ steam bubble at 2000 psi during an isobaric process. Assuming this analysis is accurate, it would appear that following the 30 minute hold period prescribed in the Crystal River procedures, continuation of the cooldown and depressurization will result in formation of another void. In summary, we cannot conclude that your procedures reflect the fact the upper head may cool-off at a very slow rate.

With the information available, we can not evaluate your ability to to properly manage a natural circulation cooldown. Therefore, you are is recuested to provide the following

information. These questions are a restatement of the original questions posed.

1.) Provide a description of your natural circulation cooldown procedure.

2.) Demonstrate, by analysis or otherwise, that:

a) Use of procedure will not result in upper head voiding

b) If voiding occurs, your procedures will prevent voiding in the hot legs, and that if voiding in the hot legs did occur, your procedures provide adequate guidance for managing cooldown with interrupted natural circulation.

3.) An analysis that shows you have sufficient condensate supply to support a conservative estimate of the time to reach the Decay Heat Removal System entry conditions*.

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*The Reference 4 report makes the following conclusions:

a) A cooldown without voiding will take a minimum of 34-130 hours.

b) 30 hours are required to collapse a 458 $ft^3$ steam bubble at 2000 psig during an isobaric process. (Raising RCS pressure to accelerate bubble condensation is not an effective mechanism for rapid bubble collapse.)

References

1. Gereric Letter 81-21, "Natural Circulation Cooldown", May 5, 1981

2. Letter, Cross to Eisenhut, "Generic Letter 81-21-Natural Circulation Cooldown", November 18, 1981

3. Boman, B.L., "Reactor Vessel Head Cooldown During Natural Circulation Cooldown Prepared for Consumers Power Company", Babcock & Wilcox Utility Power Generation Division, February, 1983.

4. Tally, C.W., "Single Loop Natural Circulation Cooldown Prepared for Consumers Power Company", Babcock & Wilcox Nuclear Power Generation Division, August, 1982.