Florida Power
CORPORATION

February 7, 1980

File: 3-0-3-a-3

Mr. Robert W. Reid
Chief
Operating Reactors Branch #4
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
SMALL BREAK LOSS-OF-COOLANT ACCIDENT

Dear Mr. Reid:

As indicated in our letter to you, dated December 3, 1979, enclosed is our response to Question 1 of your November 21, 1979 letter concerning small break loss-of-coolant accident.

If you have any questions concerning the enclosed response, please contact this office.

Very truly yours,

FLORIDA POWER CORPORATION

Patsy Y. Baynard

P. Y. Baynard
Manager
Nuclear Support Services

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REQUEST FOR ADDITIONAL INFORMATION
SMALL BREAK LOSS-OF-COOLANT ACCIDENT

QUESTION 1

Transitions from solid natural circulation to reflux boiling and back to solid natural circulation may cause slug flow in the hot leg piping. By use of analysis and/or experiment address the mechanical effects of the induced slug flow on steam generator tubes.

RESPONSE

The loads imposed on the tubes of the OTSG during the postulated "slug flow" have been conservatively evaluated and found to be acceptable. Based on very conservative assumptions, the end loading on each tube will be 21.5 lb_f compared to a theoretical buckling load of about 700 lb_f.

It was assumed for this analysis that a water level has been established in the hot leg piping and inside the tubes of OTSG. The transient consists of a "front" of solid water impinging on the primary face of the upper tubesheet. The flow was assumed to be equal in full 100% power flow (about 70,000,000 lb/hr). The load is assumed to be a suddenly-applied load. The upper tubesheet is conservatively assumed to offer no resistance to the load and the lower tubesheet is assumed to be fixed so that the entire load is absorbed by tubes directly under the primary inlet nozzle. The flow is assumed to not follow the diffuser so that the velocity impinging on the tubesheet is the same as the velocity in the 36-inch nozzle. Hot leg temperature is assumed to be 605°F.

The velocity in the 36-inch pipe would be 64.4 ft/sec. By use of the momentum equation, the steady-state force on the upper tubesheet due to the velocity would be 16,080 lb_f. There are about 1500 tubes in a 36-inch diameter circle. Thus the 32.160 lb_f will result in 21.5 lb_f per tube. Since the cross-sectional area of each tube is 0.070 in. the momentary axial compressive stress in these tubes would be 307 psi.

STATE OF FLORIDA

COUNTY OF PINELLAS

P. Y. Baynard states that she is the Manager, Nuclear Support Services of Florida Power Corporation, that she is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission the information attached hereto, and that all such statements made and matters set forth therein are true and correct to the best of her knowledge, information and belief.

P. Y. Baynard

Subscribed and sworn to before me, a Notary Public in and for the State and County above named, this 7th day of February, 1980.

Notary Public

Notary Public, State of Florida at Large,
My Commission Expires: August 8, 1983

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