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FEB 11 1977

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Docket No. 50-302

Florida Power Corporatin
 ATTN: Mr. J. T. Rodgers
 Assistant Vice President
 and Nuclear Project Manager
 P. O. Box 14042
 St. Petersburg, Florida 33733

bcc: J. R. Buchanan, NSIC
 T.B. Abernathy, TIC

Gentlemen:

RE: CRYSTAL RIVER UNIT 3 NUCLEAR GENERATING PLANT

On August 9, 1976, Westinghouse Electric Corporation presented data to the NRC staff which showed that previously developed methods for accounting for the effect of fuel rod bowing on departure from nucleate boiling may not contain adequate thermal margin when unheated rods (such as thimble tubes) are present. We have evaluated the impact of the Westinghouse data on all operating pressurized water reactors (PWR's). Models for treating the effects of fuel rod bowing on thermal-hydraulic performance have been derived for all PWR's. The models are based on the propensity of the individual fuel designs to bow and on the thermal analysis methods used to predict the coolant conditions for both normal operation and anticipated transients.

The staff has reviewed the extent of rod bowing which occurs with Babcock & Wilcox (B&W) fuel. Based on this review, an equation was derived for the clearance reduction between fuel rods due to fuel rod bowing as a function of burnup:

$$\frac{\Delta C}{C_0} = a + b \sqrt{Bu}$$

where $\frac{\Delta C}{C_0}$ is the fractional amount of closure

Bu is the bundle average burnup, and a, b are empirical constants fitted to B&W rod bow data.

The reduction in departure from nucleate boiling ratio (DNBR) due to fuel rod bowing is assumed to vary linearly with the reduction in clearance between the fuel rods (or fuel rod and thimble rod) but can never be lower than that due to the pitch reduction factor used in the thermal analysis.

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FEB 11 1977

Babcock & Wilcox claimed and the staff approved credit for the following thermal margins:

Flow Area (Pitch) reduction

Available Vent Valve credit

Densification Power Spike removal

Excess Flow over that used in safety analyses

Higher than licensed power used for plant safety analyses

Based on this review and the thermal margins presented by Babcock & Wilcox to offset the new Westinghouse rod bow data, no reduction in DNBR is required for your facility at this time. Additional information on this review procedure, as well as more extensive background information concerning rod bow, are contained in the enclosure to this letter.

Because future changes in the thermal margin credits which B&W has claimed for your facility may require commensurate changes in the DNBR penalty, you are requested to submit, within 30 days, a list of the credits applicable to your facility for future reference on your docket.

Sincerely,

Original Signed by
John F. Stolz

John F. Stolz, Chief
Light Water Reactors Branch No. 1
Division of Project Management

Enclosure:
Interim SER on Effects of
Fuel Rod Bowing on Thermal
Margin Calculations for
Light Water Reactors

cc w/enclosures: See next page

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SURNAME	JAngeTo/red	JStolz				
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Florida Power Corporation

- 3 -

FEB 11 1977

cc: Mr. S. A. Brandimore
Vice President and General Counsel
P. O. Box 14042
St. Petersburg, Florida 33733

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