January 7, 1977

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Docket No. 50-261

Carolina Power & Light Company
ATTN: Mr. J. A. Jones
Senior Vice President
336 Fayetteville Street
Raleigh, North Carolina 27602

Gentlemen:

RE: H. B. ROBINSON UNIT NO. 2

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 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 less than that due to the pitch reduction factor used in the thermal analysis. The maximum value of DNBR reduction (at contact), obtained from the experimental data was used to calculate the DNBR reduction vs the clearance reduction between fuel rods. Adjustments were made for heat flux and coolant pressure differences between the data and plant conditions in some cases.

The clearance reduction is conservatively assumed to be given by the following equation.

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

where $\frac{\Delta C}{Co}$ is the % reduction in clearance

Bu is the region average or bundle average burnup and a,b are empirical constants fitted to data from similarly designed fuel rods.

These reductions in DNBR may be treated on a region by region basis. Credit may be taken for the margin between the actual reactor coolant flow rate and the flow rate used in safety calculations. Credit may also be taken for a difference between the actual core coolant inlet temperature and that assumed in safety analyses. In taking credit for coolant flow or inlet temperature margin, the associated uncertainties in these quantities must be taken into account.

Additional information on the derivation of the above reductions, as well as more extensive background information concerning rod bow, are contained in the enclosure to this letter.

Based on our review of the new rod bow data and the thermal margins available to offset the DNBR reduction, no change to the plant technical specifications is required for your facility at this time.

Because future changes in the thermal margin credits which you have claimed to offset the DNBR reduction for your facility may require commensurate changes in the DNBR penalty, you are requested to provide, within 30 days, a list of the credits applicable to your facility for future reference on your docket.

Sincerely
Original Signed by

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Enclosures:
1. Interim SER on Effects of Fuel Rod Bowing on Thermal Margin Calculations for Light Water Reactors
2. Sample Technical Specifications

OFFICE	ORB#4:DOR	ORB#2:DOR	C-ORB#4:DOR			
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DATE	1/4/77	1/4/77	1/7/77			

Carolina Power & Light Company

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