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CLARK,R.A. Operating Reactors Branch 3

SUBJECT: Forwards responses to Questions 9,10,16,17 & 19 re stretch power application for CEN-126 (F),per NRC 810428 request. Question 11 will be answered by 810710.

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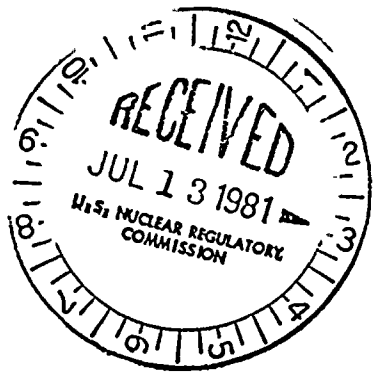
July 6, 1981
L-81-279

Office of Nuclear Reactor Regulation
Attention: Mr. Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing
United States Nuclear Regulatory Commission
Washington, D. C. 20555



Dear Mr. Clark:

Re: St. Lucie Unit 1
Docket No. 50-335
Stretch Power Application
CEAW Topical Report CEN-126 (F)

In response to the information request of your letter dated April 28, 1981, we have enclosed answers to questions 9, 10, 15, 16, 17 and 19. This leaves qustion 11 as the only question still outstanding. Our NSSS vendor advises us that they will be able to respond to that question by July 10, 1981. We will forward it to you shortly thereafter.

Very truly yours,

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/JEM/ras

cc: Mr. J. P. O'Reilly, Region II
Harold F. Reis, Esquire

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ATTACHMENT

QUESTION #9

Demonstrate that the selection of the parameters listed in Table 4-1, together with the ranges in gap thermal conductivity, moderator temperature coefficient, and CEA worth investigated, leads to the required absolute minimum DNBR.

RESPONSE

The parameters listed in Table 4-1, together with the ranges in gap thermal conductivity, moderator temperature coefficient and CEA worth investigated in the topical report, result in the maximum DNB margin degradation (i.e., maximum required overpower margin) during a CEA withdrawal event. The minimum initial DNBR is that associated with operation at the Technical Specification DNB LCO's. Thus, the CEA withdrawal event initiated from the Technical Specifications DNB LCO's, along with the maximum DNB margin degradation calculated in the topical report, results in the absolute transient minimum DNBR.

QUESTION #10

In the calculation of time of minimum DNBR with TORC, are the initial integrated radial and axial power distributions used? If so, what error is introduced by this approximation?

RESPONSE

The time of minimum DNBR occurs at the time at which the NSSS achieves a new steady state condition (i.e, when coolant inlet temperature, RCS pressure, core average heat flux, and axial power distribution reach their new equilibrium conditions). The value of each of these variables is then used to determine the value of the minimum DNBR. Consequently using initial values of the integrated radial and axial power distributions and their adjustments for the effects of CEAW withdrawal affects the value of the minimum DNBR but not the evaluation of the time of MDNBR.

QUESTION #15

In determining B_3, what specific axial shape index shift and radial peak decrease is used? For example, is the axial shape index shift determined from QUIX calculations at initial and minimum DNBR state points?

RESPONSE

The axial shape index shift and the integrated radial peak decrease were obtained from QUIX calculations at the initial condition and the conditions at the time of minimum DNBR.

QUESTION #16

There seems to be inconsistentency in the expression giving ROPM (item 8, page 5-3): B_2 is in units of power while B_3 is OPM (a ratio of powers). Please explain.

RESPONSE

The terms power to DNBR SAFDL (B_2, item 4 on page 5-2) and over power margin (B_3, item 8 on page 5-3) are used interchangeably in the topical report. Both terms have units of percent of full power. It should be noted that only Required Overpower Margin (Item 8 on page 5-3) is expressed in terms of ratio of powers.

QUESTION #17

This analysis assumes first order perturbation theory in the calculation of the net penalty factor, B_3. Demonstrate that the anticipated perturbed reactor conditions will result in a relatively small (much less than unity) value of B_3/B_2. If during operation, this assumption is violated and B_3 approaches B_2, how will the RPS sense this condition and prevent violation of safety limits?

RESPONSE

The calculated value of B_2 was in the range of 100% to 115%. The maximum value of B_3 calculated is 5.8% (see Table 6.1-4 page 6-13). Thus the maximum ratio of B_3/B_2 is .058, whch is much less than unity. As seen from the example given above, the calculated value of B_3 never approaches the calculated value of B_2.

QUESTION #19

Significant sources of uncertainty include instrument responses, calculational uncertainities in shape annealing, rod shadowing factors, the components of the penalty factor B_3, and the calculational uncertainties implicit in the use of CESEC. How are these uncertainties accounted for in the analysis?

RESPONSE

This analysis was performed by selecting the most adverse values of parameters and intial conditions as input. The most adverse parameters and initial conditions were determined from consideration of the limiting value of each variable after accounting for that variable's uncertainty. For example, the axial shapes anlayzed were based on LCO shape index tents expanded to include the most adverse uncertainty in shape index at the limits of the tents. Since the shape index uncertainty is derived from the uncertainty in the shape annealing and rod shadowing factors, their uncertainty is implicitly included. Furthermore, as described in the answer to Question 3, the uncertainty in the rod shadowing factors were also explicitly incorporated in an adverse manner. Another example of this procedure is that the uncertainty in the measurement of the power level is accounted for by initiating the event from a power level in excess of the operating power level by the amount of the power measurement uncertainty. Instrument and trip system response delay time uncertainties are incoporated into the CESEC model as adverse time delays. Uncertainties in the heat transfer coefficient used in the CESEC model were also included in the most adverse manner.

This procedure, which includes selection of the most adverse operating parameters and initial conditions after incorporating uncertainties for each variable, assures that the uncertainties have been adequately incorporated into the analysis.