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CLARK,R.A. Operating Reactors Branch 3

SUBJECT: Forwards response to NRC 810827 ltr requesting addl info re core thermal hydraulics.

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U.S. NUCLEAR REGULATION COMMISSION
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Office of Nuclear Reactor Regulation
Attention: Mr. Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Clark:

Re: St. Lucie Unit 1
Docket No. 50-335
Stretch Power Application

The enclosed responds to your letter of August 27, 1981 requesting additional information in the area of core thermal hydraulics.

Very truly yours,

J. A. De Mastry for

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/DME/ah

Enclosures

cc: J. P. O'Reilly, Director, Region II
Harold F. Reis, Esquire (w/o enclosures)

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References

1. "Statistical Combination of Uncertainties Methodology, Part 2: Combination of System Parameter Uncertainties in Thermal Analyses for St. Lucie Unit 1", CEN-123(F)-P, January, 1980.

2. "Fuel and Poison Rod Bowing, Supplement 3", CENPD-225-P, Supplement 3-P, June, 1979.

3. Interim Safety Evaluation Report on Effects of Fuel Rod Bowing on Thermal Margin Calculations for Light Water Reactors (Revision 1)", February 16, 1977.

QUESTION 1

Supplement 3P to CENPD-225P, "Fuel and Poison Rod Bowing, June 1979 has not been approved by the NRC staff and, therefore, is not an accepted method of accounting for the effects of fuel rod bowing. Please propose an alternate method of addressing the effects of fuel rod bow and describe the impact on your stretch power analyses.

Response

This question expresses an NRC concern that the fuel rod bow penalty applied in Reference 1 is based upon an unreviewed C-E topical report, Reference 2, and therefore should not be applied until the review of Reference 2 is completed. This concern can be addressed by reverting to the alternate treatment of rod bow that was used in past St. Lucie-1 licensing submittals. This method balances the interim burnup-dependent rod bow penalties suggested by the NRC in Reference 3 with the reductions in radial peaking factors inherent in fuel assemblies with higher burnups.

Using the guidelines established by Reference 3, all assemblies which are expected to exceed the NRC-specified DNB penalty threshold of 24,000 MWD/T during Cycle 4 were surveyed. At the end of Cycle 4, the maximum burnup attained by any of these assemblies will be ≤37,800 MWD/T. Based on the data in Reference 3, a DNBR penalty of 4.6% is implied for a burnup of 37,800 MWD/T. An examination of power distributions for Cycle 4 shows that there exists at least 10 percent DNB margin for assemblies exceeding 24,000 MWD/T relative to the DNB limits established by other assemblies in the core because the radial peaking factors in the assemblies which have burnps greater than 24,000 MWD/T have peaking factors at least 10% lower than the maximum radial peaking factor. This margin is greater than the reduction penalty of 4.6 percent imposed upon fuel assemblies exceeding 24,000 MWD/T in Cycle 4. Therefore, no power penalty for fuel rod bowing is required in Cycle 4.

An explicit allowance for a rod bow penalty was made in Section 6.2 of Reference 1. The decision to revert to the treatment of rod bow used in the past eliminates the need for this allowance in arriving at the DNBR limit. Thus, the DNBR limit given in Reference 1, which is based on a statistical combination of uncertainties, contains additional conservatism.

This additional conservatism is quantified in Section 6.2 of Reference 1. A 1.006 multiplicative penalty is applied to the 95/95 DNBR value to account for rod bow. This results in an increase of 0.007 in the DNBR limit. The discussion in Section 6.2 demonstrated that the 95/95 DNBR limit, including the allowance for fuel rod bow, is 1.227. This value was rounded off to 1.23 as an additional measure of conservatism. Since rod bow will now be treated in a different manner, the 0.007 allowance in the DNBR limit is no longer necessary. Therefore, the 95/95 DNBR limit for the St. Lucie -1 used in the methods described in Reference 1 should be 1.220.

QUESTION 2

Will St. Lucie Unit 1 have an Asymmetric Steam Generator Transient Protection (ASGTP) trip identical to that installed at Calvert Cliffs Unit 1?

Response

Yes.