UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

ENCLOSURE 1

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATING TO ADDENDUM 2 TO NUSCO TOPICAL REPORT ON PHYSICS METHODOLOGY FOR PWR RELOAD DESIGN (NUSCO-152) NORTHEAST UTILITIES SERVICE COMPANY MILLSTONE UNIT NO. 3 DOCKET NO. 50-423

1.0 INTRODUCTION

By letter dated November 13, 1987, Northeast Utilities Service Company (NUSCO), submitted Addendum 2 to NUSCO Topical Report on Physics Methodology for PWR Reload Design (NUSCO-152) (Ref. 1). This addendum summarizes the comparison of zero power physics data and the power measurements to predictions for Cycle 1 of Millstone Unit No. 3. The staff reviewed NUSCO-152 and found the methodology acceptable for use by NUSCO to perform physics analyses for the Haddam Neck Plant (Ref. 2) only. NUSCO now requests approval to use the methodology for Millstone Unit No. 3.

2.0 EVALUATION

Addendum 2 to Topical Report NUSCO-152 summarizes the comparison of measurements to prediction for Millstone 3 Cycle 1. The overall quality of the data is very similar to that provided for Haddam Neck Cycles 12, 13 and 14. The two major sections of this addendum are the Zero Power Physics test data verification and the power distribution verification.

2.1 Zero Power Physics Test Verification

The zero power physics tests consist of measurement of critical boron concentration, isothermal temperature coefficient, control rod bank worth and ejected rod worths.

The critical boron concentration was predicted at all rods out (ARO) and with Banks D, C, B and A inserted. The difference between measured and predicted values varied from -6ppm to -32ppm with an average value of -23ppm. The acceptance criterion for these measurements is ±100ppm.

The isothermal temperature coefficient was predicted and measured at three configurations. The deviation ranged from -0.11pcm/°F to -0.68pcm/°F with an average deviation of -0.413pcm/°F. The acceptance criterion is ±4pcm/°F.

Control rod bank worths were predicted and measured for 7 different configurations. The deviations ranged from +3.04% to -3.83% with an absolute average difference of 2.93%.

2.2 Power Distribution Verification

Thirteen comparisons of predicted vs measured radial power distribution were shown at various cycle exposures. The agreement between measured and predicted was excellent in all cases. The average absolute difference for these comparisons was less than 1.0 percent in all cases and the standard deviation was less than 1.0 percent in all cases. The comparisons of the axial power distributions also showed good agreement between measured and predicted values. Peaking factors were also compared for the 13 cases. The largest differences between measured and predicted $F_{\Delta H}$ and F_Q are about 1.7% and 5.9% respectively with average absolute differences of 0.44% and 2.16% respectively.

Comparisons were made between measured and predicted boron rundown values during cycle depletion. The greatest deviation was 51ppm with the average difference of 27ppm. For the axial offset comparison, the largest deviation was 4.88% with an average absolute difference of 1.4%.

3.0 CONCLUSIONS

We have reviewed the data submitted in Addendum 2 of Topical Report NUSCO-152 and find that the measured and predicted values compare very well. In most cases, the deviations were very similar to those from the Haddam Neck data, even though, the amount of data was smaller. Based on this review, we find that the methodology is acceptable for NUSCO to use for PWR physics analyses in support of plant operation and licensing for the Millstone Unit 3 plant. Because of the somewhat limited data base used, we recommend that NUSCO perform periodic reevaluation of the model validity as new data becomes available to provide continuing assurance of its applicability. NUSCO has committed (Ref. 3) to perform a periodic reevaluation of its model validity. The test program and test review criteria used will be consistent with those in ANSI/ANS 19.61-1985 "American National Standard Reload Startup Physics Tests for Pressurized Water Reactors." We find this acceptable.

REFERENCES

1. J. F. Opeka letter to C. I. Grimes/A. C. Thadani/V. S. Noonan, "Physics Methodology for PWR Reload Design," dated September 12, 1986.

2. F. M. Akstulewicz letter to E. J. Mroczka, "Review of Physics Methodology for PWR Reload Design (NUSCO-152)," dated August 3, 1987.

3. E. J. Mroczka (NUSCO) letter to NRC, dated April 4, 1988.

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Dated: May 11, 1988