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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
ROCHESTER GAS AND ELECTRIC CORPORATION
R.E. GINNA NUCLEAR POWER PLANT
DOCKET NO. 50-244
R.E. GINNA RESPONSES REGARDING EXXON CODE ERROR

1.0 INTRODUCTION

On March 15, 1985, Exxon Nuclear Corporation (ENC) informed the NRC of a coding error in the TOODEE2 computer code which affected the LOCA-ECCS analyses for several PWRs. In reference 1, Exxon provided a description of the coding error. The error was in an expression for a multiplier on the reflood heat transfer coefficient. The incorrect coding caused the heat transfer coefficient multiplier to be 1.045, when it was intended to be 1.0.

In addition to the coding error in the TOODEE2 code, the staff has also become aware of 3 additional concerns in ENC LOCA analyses. These include:

- Use of heat transfer augmentation factors for local rod peaking and mixing vanes in some recently submitted LOCA analyses performed to support license amendment applications. The use of these factors has been found unacceptable during our review of the EXEM/PWR ECCS evaluation model.

- Discovery of an input error in the St. Lucie Unit 1 LOCA analysis. This error is described in Reference 2.

- Assuming the validity and applicability of applying the Westinghouse-derived K(z) curve to ENC fuel.

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In order to determine the extent to which our concerns with respect to the ENC LOCA models and analysis methods were generically applicable, the staff contacted all PWR licensees using ENC fuel on March 20, 1985. At that time, NRC requested that each of the licensees evaluate these concerns with respect to their plants and determine if they were applicable.

On March 26, 1985, the licensee for the R.E. Ginna Nuclear Plant, the Rochester Gas and Electric Corporation, provided in reference 3 its evaluation of the ENC LOCA issues. Supplemental information was provided by the licensee in reference 4. The staff's evaluation of this information follows.

2.0 EVALUATION

The Ginna reload fuel was supplied by ENC from 1978 to 1983. In 1984, Ginna began a transition to Westinghouse fuel. Thus, the current core configuration at Ginna is a mixed core consisting of ENC 14x14 fuel and Westinghouse optimized fuel assemblies (OFA). Separate LOCA calculations have been performed for the ENC and the OFA fuel.

In reference 3, the licensee stated that the most recent ENC LOCA analysis was submitted on August 9, 1982. Based on the information contained in reference 3, Ginna confirmed that their analysis did not contain three of the four concerns identified by the staff. The concerns not applicable to Ginna are the coding error, the St. Lucie Unit 1 input error, and the use of the unapproved heat transfer augmentation factors. The staff agrees. Thus, the staff's first three concerns with respect to the ENC LOCA analyses do not apply to Ginna.

The remaining issue concerns the validity of assuming use of the Westinghouse-derived K(z) curve for ENC fuel. Currently, ENC LOCA analyses are performed to substantiate the maximum allowable peaking factor, Fq, based upon a chopped cosine power shape. To assure conformance to 10 CFR 50.46 for a range of power shapes, the K(z) curve is utilized, in conjunction with F_q, to limit allowable peaking factors as a function of core elevation. This K(z) curve was developed by Westinghouse for its fuel utilizing an ECCS evaluation model which is wholly in conformance with Appendix K. ENC has assumed that the Westinghouse-derived K(z) curve applies to the ENC fuel, but has not provided adequate support for this assumption.

The licensee has stated that the most current LOCA analysis for the Ginna plant has been performed for the Westinghouse fuel using the approved Westinghouse evaluation model. That analysis was performed assuming a complete core of OFA. The licensee has concluded that the analyses performed by Westinghouse bound all fuel currently loaded at Ginna. This qualitative representation was not confirmed by quantified analysis, however. Further, the licensee did not identify any analyses, performed with an approved ECCS evaluation model which verify the K(z) curve for the ENC fuel.

Based on the above, the licensee is not in conformance with Section I.A. of Appendix K to 10 CFR Part 50. Specifically, an approved model has not been used for evaluation of ECCS performance following a LOCA for the current fuel configuration at Ginna using a model which adequately addresses a "range of power distribution shapes and peaking factors representing power distributions that may occur over the core lifetime".

Analyses have been performed by ENC, provided via reference 5, which demonstrate that the ENC fuel would behave similar to Westinghouse fuel. These analyses, which were performed for both 14x14 and 15x15 fuel rod arrays, examined the core hydraulic and temperature transients for both the ENC and Westinghouse fuel assuming the same core boundary (plena) conditions during the LOCA. These results demonstrated that the ENC fuel predicted peak cladding temperature within a ±50°F band with respect to the Westinghouse fuel. Since the peak cladding temperature predicted for the ENC fuel for Ginna was 1928°F, adding a 50°F penalty for

fuel-related differences could yield a peak cladding temperature of up tp 1978°F. This adjusted peak cladding temperature value is significantly less than the 2200°F criteria specified in 10 CFR 50.46(b)(1). Based on this fact, the staff concludes that there is reasonable assurance that the Ginna plant will operate in conformance with the acceptance criteria of 10 CFR 50.46. Accordingly, the current plant Technical Specifications are sufficient to assure compliance with the acceptance criteria 10 CFR 50.46 without further operating restrictions.

With regard to the evaluation model, the licensee in reference 6 also committed to submit an evaluation model and ECCS analysis for the R.E. Ginna plant which wholly conforms with the requirements of 10 CFR Part 50.

3.0 CONCLUSION

Based on the foregoing the staff has concluded:

- The LOCA analyses performed for the Ginna Nuclear Plant do not contain the TOODEE2 code error, the St. Lucie Unit 1 input error, nor do they use the unacceptable heat transfer augmentation factors.

- The K(z) curve for the ENC fuel has not been verified using an ECCS evaluation model wholly in conformance with Appendix K.

- The staff has reasonable assurance that the Ginna plant satisfies the criteria of 10 CFR 50.46.

Based on the above, the staff has concluded that the Ginna plant can be operated without undue risk to the public health and safety as significant safety margin exists regarding peak fuel clad temperature and that in the event of a design basis LOCA the maximum fuel element cladding temperature will not exceed 2200°F. However, NRC requires that the licensee provide an ECCS analysis using an approved ECCS evaluation model, which either (1) verifies the current K(z) curve for the ENC fuel, or (2) determine a new K(z) to be applied to the ENC fuel.

4.0 ACKNOWLEDGEMENT

This Safety Evaluation was prepared by R. Jones and C. Miller.

Dated: April 5, 1985.

REFERENCES

1. Letter, G. F. Owsley (ENC) to H. Denton (NRC), "Error in the 48,000 MWD/MTU LOCA-ECCS Analysis for D. C. Cook Unit 1," GFO:85:008, March 21, 1985.

2. Letter, J. W. Williams, Jr. (FPL) to J. R. Miller (NRC), "St. Lucie Unit 1 Docket No. 50-335, ECCS Analysis," L-85-124, March 22, 1985.

3. Letter, R. W. Kober (RG&E) to J. A. Zwolinski (NRC), "Loss of Coolant Accident Analysis," March 26, 1985.

4. Letter, R. W. Kober (RG&E) to J. A. Zwolinski (NRC), "Loss of Coolant Accident Analysis," containing tables providing computer models, April 4, 1985.

5. Letter, J. C. Chandler (ENC) to C. O. Thomas (NRC), JCC:067:85, April 4, 1985

6. Letter, R. W. Kober (RG&E) to J. A. Zwolinski (NRC), "Loss of Coolant Accident Analysis," containing a commitment to perform an ECCS evaluation, April 4, 1985.