UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

May 16, 1984

Mr. William J. Dircks
Executive Director for Operations
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Dircks:

SUBJECT: ACRS REVIEW OF GENERAL ELECTRIC SAFER/GESTR-LOCA ECCS EVALUATION MODEL

During its 289th meeting, May 10-12, 1984, the Advisory Committee on Reactor Safeguards completed its review of the General Electric SAFER/GESTR-LOCA revised ECCS Evaluation Model. The ACRS had previously considered elements of this review during its 278th meeting, June 9-11, 1983. Subcommittee meetings were held on this matter on December 2-3, 1982, February 17-18, 1983, and April 24, 1984. During our review, we had the benefit of discussions with representatives of the General Electric Company and the NRC Staff. We also had the benefit of the documents referenced.

The General Electric Company has developed an improvement in the methods used to evaluate the performance of emergency core cooling systems in boiling water reactors (BWRs) of the jet pump design. They have proposed that this improved method be accepted for routine use in demonstrating that BWR cores meet licensing requirements. The NRC Staff has reviewed the proposal and has concluded that the new methodology, with certain restrictions, can be used for licensing. The ACRS has also reviewed the proposal, and we concur with the NRC Staff.

The improved method of analysis takes advantage of data and understanding which have been developed in the past decade regarding thermal-hydraulic behavior during large-break loss-of-coolant accidents (LBLOCA) in light water reactors. It will permit some reduction in the present, unnecessarily large margins from limits on peak cladding temperature required with present methods, while still fully meeting the letter and intent of 10 CFR 50.46 and Appendix K to Part 50. The reduction in required temperature margin will, in turn, permit BWR licensees more flexibility in the operation of these reactor cores and in associated fuel management practices. Significant economies in power generation will result. We believe there is an additional advantage in the improved method in that it provides a more straightforward and understandable assessment of the performance of an important safety system.

The improved ECCS evaluation method uses nominal or realistic values of inputs and correlations, rather than the conservatively biased values which have been used in the past. To meet licensing requirements, a term, "Adder"

is added to the realistic estimate of peak clad temperature (PCT). This Adder incorporates all of the biasing requirements specified in Appendix K in a direct, "nonstatistical" way. A second evaluation of PCT is then made, using the realistic models along with data and evaluations of variability and uncertainty inherent in the analysis to provide an "upper-bound" estimate of PCT. It is estimated that at this value no more than 5 percent of actual PCTs in a population of hypothetical LBLOCA's would be in excess of the calculated PCT. When operation with a given core is approved, NRC will require a demonstration that the PCT value calculated by the licensing method always exceeds the upper-bound value.

The NRC Staff review of this item has progressed in two phases: Review of the SAFER and GESTR-LOCA codes, and review of the application methodology designed to demonstrate conformance with the requirements of 10 CFR 50.46 and Appendix K to Part 50. The NRC had earlier issued Safety Evaluation Reports indicating their acceptance of the SAFER/GESTR-LOCA models with the provision that their use was subject to Staff approval of an acceptable application methodology, and so informed the ACRS. The Staff has now issued an SER which approves the General Electric application methodology for these codes, subject to specified limitations on their use.

The ACRS believes that revision of the ECCS evaluation methodology to permit the expected economies in operation is well justified. We also believe there is a positive contribution to overall nuclear power plant safety with the improved analysis in that it provides a more understandable evaluation of ECCS performance along with more explicit assessment of margins of uncertainty and variability. We support the General Electric revision. We also expect other vendors and licensees to engage in a similar effort in the near future. We believe, however, that the NRC Staff must continue to provide careful review of all such proposals and changes to assure that appropriate overall plant safety margins are maintained.

Sincerely,

Jesse C. Ebersole

Jesse C. Ebersole
Chairman

References:

1. U. S. Nuclear Regulatory Commission, "Safety Evaluation Report on General Electric ECCS Evaluation Methodology," Draft Report dated March 1984.
2. U. S. Nuclear Regulatory Commission, "Emergency Core Cooling System Analysis Methods," SECY 83-472, dated November 17, 1983.
3. U. S. Nuclear Regulatory Commission, "Safety Evaluation Report on the SAFER Code," dated July 12, 1983.

4. U. S. Nuclear Regulatory Commission, "Safety Evaluation of the General Electric Company Topical Report, NEDE-23785-1, Volume 1-GESTR/LOCA, A Model for the Prediction of Fuel Rod Thermal Performance," September 1983, report approved November 2, 1983.
5. General Electric Company Topical Report, "The GESTR-LOCA and SAFER Models for the Evaluation of the Loss of Coolant Accident," NEDE-23785-1-P (Proprietary); Volume 1, "GESTR/LOCA - A Model for the Prediction of Fuel Rod Thermal Performance," December, 1981; Volume 2, "SAFER - Long Term Inventory Model for BWR Loss-of-Coolant Analysis," December, 1981; Volume 3, "SAFER/GESTR Application Methodology," March 23, 1984.