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Franklin Research Center
A Division of The Franklin Institute

February 22, 1983

Mr. Paul A. Boehnert
Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: ACRS ECCS Subcommittee Meeting
San Jose, California, February 17-18, 1983

Dear Paul:

This meeting was specifically assembled for the purpose of reviewing GE's SAFER/GESTR based LOCA ECCS evaluation model.

Technical content of GE's presentation was of adequate detail to understand the proposed LOCA ECCS evaluation model (EM) based on SAFER/GESTR. Although this EM will use the new 1979 Decay Heat curve, the Decay Heat exemption request by utilities (if any) is with use of the currently approved LOCA ECCS EM. If this new model is approved and used, GE expects to achieve 3-4% better utilization of fuel in its reactors.

In terms of decay heat curve application, GE performed a sensitivity study which supports the claim that a single decay heat curve can be defined for the use with LOCA ECCS.

The scope of LOCA experiments (U.S. and Foreign) with respect to CCFL correlation was rather extensive and in most cases based on prototypical geometry. Accordingly, GE has made it sure that the correlation works for the two locations of interest: upper tie plate (UTP) and side entry orifice (SEO). Although broader validity for the CCFL correlations was claimed by GE, because of its dimensional form, changes in geometry will require retesting.*

*GE could reformulate CCFL correlation in a non-dimensional form and resubmit it to NRC for approval. This approach of resubmission was not favored by GE, because of potential additional delays in LOCA ECCS model approval!

DESIGNATED ORIGINAL

Certified By B. Roberts

TRAC BO2 represents the BWR version of TRAC code developed by EG&G. GE has done extensive work on model development and the resulting code appears to have good best estimate (BE) capability. The number of axial and radial control volumes is based on physical characteristics of the reactor and appears to adequately describe the behavior. A nodalization study has been performed only for two nodalization schemes,GE reasons that BWR thermalhydraulics were well understood by GE prior to this model and the nodalizationstudy in a way confirms what was known to them before. While I feel quite comfortable with the nodalization in general, I have some doubts with respect to the use of a single node in the circumferential direction (θ-direction), in particular as it relates to dynamic forcing function imposed on the reactor internals and the reactor vessel.* Short run (7 milliseconds) should be made with about six (6) circumferential nodes to eliminate this concern.

With respect to numerics associated with TRA BO2, I am very impressed with the progress made since December 2, 1982, and with the quality of the product. Not only has GE implemented TRAC PF1 (fast 2 step method) but also they have made it numerically stable (by making it locally implicit). What is lacking is a complete analysis to demonstrate the stability of the numerical scheme. At present, the conclusion that the algorithm is stable is based on runs with time steps that are 2 orders of magnitude longer than the stability criterion of the explicit operator permits.

TRAC BO2 qualification is performed by GE without a direct participation in Standard Problem Plan, however, it covers extensive range of actual experiments in USA and abroad. I feel GE has done a very good job on that.

SAFER code has models capable of predicting the LOCA response in an almost best estimate mode. An apparent shortcoming of SAFER is the average core representation. This representation does not permit differentiation between the behavior of peripheral and midcore channels, an experimentally observed physical fact, also accurately computed by TRAC BO2. It is recommended that the core representation in SAFER be reexamined and modified to provide the capability to capture this behavior.

SAFER code adder concept has several shortcomings. First, it appears that instead of computation of Δ_1, Δ_2 as proposed by GE, the envelope response of experiment, TRAC BO2 and SAFER should be used for Δ computation. Another shortcoming is in the method of computation of Δ_1. It appears that the

*Thermal hydraulic asymmetries may not be significant due to relatively large volumes and blowdown promoted mixing.

method of comparison first selects the axial location where highest PCT occurs, than transient response for this point is subdivided in a number of equal intervals and comparisons are made between TRAC and experiments in each of these intervals. This implies that comparison may occur between dissimilar points in time (in real physical sense), since the same physical phenomena in the experiment and TRAC B02 results may occur at different times. To eliminate this potential shortcoming the TRAC B02 response time scale should be mapped on the experiment time scale in such a manner that the significant (known) phenomena on TRAC B02 response time scale correspond to the experiment. I am sure other statistical (more rational) ways of achieving the same objective can be devised.

In general, GE is to be congratulated for the development of potentially excellent tool for BWR thermal hydraulic analysis. The improved LOCA ECCS model is also a positive step in the right direction and the criticism expressed above should be interpreted as an attempt to assist GE in this commendable effort.

Very truly yours,

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cc: David A. Ward