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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

CONCERNING ITEM II.K.2.19 "BENCHMARK ANALYSIS OF SEQUENTIAL AUXILIARY FEEDWATER FLOW"

FOR

BABCOCK & WILCOX REACTOR PLANTS

DOCKETS NOS. 50-269, 50-270, 50-287, 50-289, 50-302, 50-312, 50-313 AND 50-346

Introduction

At a meeting in Bethesda, April 26, 1979, with the owners of Babcock and Wilcox (B&W) reactor plants, we requested a benchmark analysis of sequential auxiliary feedwater flow to the steam generators following a loss of main feedwater. This analysis was provided in a letter from J. Taylor (B&W) to R. Mattson (NRC) dated June 15, 1979. However, in this analysis the TRAP-2 Code with 6 node steam generator model was utilized. All small break analysis presented to the NRC have been performed using the CRAFT-2 Code with a 3 node steam generator model. We require a benchmark analysis for sequential auxiliary feedwater flow also be performed using CRAFT-2 with a 3 mode steam generator representation. By letter dated August 21, 1979 we requested such analysis. Each licensee of B&W reactor plants responded with a report which presented analysis of sequential auxiliary feedwater flow to the steam generators for a loss of main feedwater transients using the CRAFT-2 Code.

This issue was later identified as Item II.K.2.19 of the TMI Action Plan requirements.

Discussion & Conclusions

B&W utilizes the CRAFT-2 computer program in performing loss of coolant accident (LOCA) licensing evaluations for their nuclear steam supply systems (NSSS). Subsequent to the TMI-2 accident, this computer program was used to confirm emergency operator guidelines for all power plants with NSSSs designed by B&W. Our review of these confirmatory analyses have led to questions regarding the ability of the CRAFT-2 program to adequately predict steam generator performance and its influence on the primary system thermal-hydraulic behavior. In particular, we noted that the CRAFT-2 steam generator model did not contain the same degree of detail as the model used with the TRAP-2 Code. TRAP-2 is a computer code primarily used for non-LOCA transients by B&W. In order to validate the TRAP-2 transient code with actual plant data, an asymmetric cooldown test was incorporated into the Crystal River Unit 3 power ascension program. Because of the simplified steam generator model in the CRAFT-2 Code, we also requested that the CRAFT-2 Code be assessed against the Crystal River Unit 3 asymmetric cooldown data.

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The comparative analyses of the startup test demonstrated that the simplified steam generator model used in the licensing code (CRAFT-2) predicted thermal-hydraulic behavior similar to the more detailed steam generator model utilized in the TRAP-2 Code. However, comparisons with data for both codes were poor. Further examination of the Crystal River Unit 3 asymmetric startup test has indicated the test to be inappropriate for assessing computer codes. This is attributed to inadequate instrumentation whereby key data required for code assessment were not obtained.

Reviews conducted by our B&O Task Force, following the TMI-2 accident, have concluded that further assessment of the CRAFT-2 Code would be required. The majority of the concerns identified are documented in NUREG-0565. In particular, the neglect of a mechanistic, regime-dependent heat transfer model and the use of a constant, steam generator heat transfer coefficient throughout the transient have been identified as requiring either revision or further justification. This requirement for further justification and/or revision of the small break ECCS models is being performed under TMI Action Plan Item II.K.3.30. We believe that satisfactory resolution of code modeling concerns as part of the Action Item II.K.3.30 will resolve the modeling concerns of II.K.2.19.

The conclusions of our review of Action Item II.K.2.19 are as follows:

(a) The intent of Item II.K.2.19 was accomplished,
(b) Results provided by CRAFT-2 were similar to those provided by the more detailed TRAP-2 program. However, both codes showed poor agreement when compared with the test data,
(c) The poor agreement of the code prediction with test data has been attributed to the fact that the Crystal River ascension test data was not adequate for assessing thermal-hydraulic codes, and
(d) A more rigorous assessment of the B&W small break LOCA model is being performed under TMI Action Item II.K.3.30. Further code assessment under TMI Action Item II.K.2.19 is therefore unnecessary.

Based on the above conclusions, we consider Item II.K.2.19 completed by all licensees with B&W NSSSs by issuance of this Safety Evaluation Report. Moreover, we do not believe it necessary for Item II.K.2.19 to be addressed any further.

Dated: