



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

AUG 19 1982

MEMORANDUM FOR: Victor Stello, Deputy Executive Director  
for Regional Operations and Generic Requirements

FROM: Harold R. Denton, Director  
Office of Nuclear Reactor Regulation

SUBJECT: CRGR BRIEFING ON COST/BENEFIT STUDY OF DESIGN REQUIREMENTS  
FOR INADEQUATE CORE COOLING INSTRUMENTATION

An NRR briefing on TMI Action Plan Item II.F.2 was given to CRGR on March 24, 1982. Our briefing report was transmitted to CRGR by letter, H. Denton to V. Stello, "Briefing Report in Preparation for CRGR Review of TMI Action Plan II.F.2 Requirements," on March 16, 1982.

As a result of the March 24 briefing, the Committee requested that we prepare a cost/benefit assessment of the major design requirements for this item. A copy of the meeting minutes (CRGR Meeting No. 11) is included in Appendix A. The results of our study are presented in the enclosed report. Please note that equipment suppliers have requested that the cost data be treated as proprietary. While not specifically tabulated in our report, these data have been factored into our analysis and are included in Appendix B (proprietary).

In addition to the cost/benefit assessment, the enclosed briefing report addresses several open technical issues relating to our generic review of the Westinghouse and Combustion Engineering proposed inventory tracking systems which were discussed at the March 24 CRGR briefing. Those issues were:

- (1) Westinghouse d/p System:
  - (a) Failure Mode and Effects Analysis (e.g., effects of a break in the sensor line connecting to the primary system)
- (2) Combustion Engineering HJTC System:
  - (a) response of HJTC with break in the upper head,
  - (b) response of HJTC after a large break LOCA; particularly, the drain rate of the separator tube during a rapid drop in level outside of the tube,
  - (c) Failure Mode and Effects Analysis (FMEA)

We have completed our review of additional information submitted on these issues and have concluded that the issues are resolved. Because of the complexity of the thermal-hydraulic behavior of the CE HJTC system with the pumps running and under a variety of possible accident conditions, we have contracted with Dartmouth College (Dr. Graham Wallis) to confirm the staff's evaluation and to provide additional assurance that there are not other unidentified anomalies which could result in ambiguous information to the operator. This work, which will be completed this Fall, is confirmatory in nature and if problem areas are identified, it is expected that they will be resolved in connection with our operating procedure guidelines review.

In summary, our continuing review of the proposed inadequate core cooling instrumentation systems and the cost/benefit study of the design requirements have progressed to a point that we are prepared to offer final recommendations to the Commissioners regarding the approval of generic designs, the applicability of design requirements specified for Item II.F.2 of NUREG-0737, and the review process and schedule to complete the implementation of acceptable instrumentation systems and procedures on all licensed reactors in the USA. We request that CRGR endorse the following recommendations to the Commissioners, which encompass and supersede the recommendations previously provided in SECY-81-582 and SECY-81-582A and the recommendations provided in our March 16th briefing report to CRGR:

- (1) The inadequate core cooling instrumentation systems proposed by Combustion Engineering and Westinghouse constitute acceptable generic designs when properly implemented and operated in accordance with operating procedure guidelines acceptable to the staff.
- (2) In principle d/p measurement techniques for reactor coolant system inventory tracking are acceptable provided that they meet NUREG-0737 design requirements and monitor the coolant inventory over the range from the vessel upper head to the bottom of the hot leg. For B&W reactors, a d/p measurement from the top of the candy cane to the low point in the hot leg is also required. A d/p measurement extending from the bottom of the reactor vessel will not be required if equivalent instrumentation (e.g., pump current monitor) is provided to trend the RCS void content when pumps are running.
- (3) Inadequate core cooling instrumentation sub-systems which were incomplete with respect to procurement and installation on January 1, 1982 must conform to the design requirements specified for Item II.F.2 of NUREG-0737.

AUG 19 1982

- (4) Instrumentation systems which were complete with respect to procurement and installation prior to January 1, 1982 and which are being used as an inadequate core cooling instrumentation sub-system (e.g., in-core thermocouples) must be upgraded in design consistent with NUREG-0737 Item II.F.2. However, NUREG-0737 design specifications may be considered as design guidelines for this purpose. The staff should maintain review flexibility and provide relief from seismic and environmental design qualification requirements on an individual plant when plant unique problems impose an abnormal cost penalty to meet these requirements. Any relief granted will be done with full consideration of the new Environmental Qualification Rule and other applicable regulations. It is expected that very few licensees will request exceptions or be able to justify them.
- (5) Licensees not yet committed to a specific inventory tracking system design should be ordered to conclude their conceptual design review and submit detailed engineering, procurement, and installation schedules for an acceptable reactor coolant system inventory tracking monitor not later than January 1, 1983.
- (6) The staff should renegotiate a practical schedule for implementation of additional instrumentation and upgrading of existing instrumentation for each operating reactor. This negotiation can occur at the same time as the similar discussions with licensees regarding the SECY-82-111 requirements. Installation and instrument upgrading should be required during the earliest refueling shutdown consistent with the existing status of the plant and practical design and procurement considerations. This is likely to result in installation dates for several plants which will be later than that proposed in the February 19, 1982 memorandum from D. Eisenhut to Distribution, "Operating License Rule for NUREG-0737 Requirements."
- (7) After installation, the operating utilities should be given ample time to allow the operators to familiarize themselves with the performance characteristics of the additional instrumentation. The utilities should assure operator confidence in the new systems prior to extensive integration of the coolant inventory signals into emergency operating procedures.

We are available to brief the CRGR on the contents of the enclosed report if you so desire.



Harold R. Denton, Director  
Office of Nuclear Reactor Regulation

Enclosure: Briefing Report

cc: W. J. Dircks  
Regional Administrators