APR 1 1982

Mr. Fred Cadek
Westinghouse Electric Corporation
Box 355
Pittsburgh, Pennsylvania 15230

Dear Mr. Cadek:

As you know, the NRC is presently reviewing its requirements concerning Inadequate Core Cooling (ICC) instrumentation. Design requirements are specified in Section II.F.2 of NUREG-0737, and in Appendix B of that document. In the course of our review, it has come to our attention that some aspects of our design requirements, e.g., the seismic qualification for core exit thermocouples, may impose a cost burden for some plants which is not justifiable in terms of the potential need and benefits derived from that aspect of the design.

Please provide us with cost data which show the costs associated with the various design alternatives for inadequate core cooling instrumentation described in the table below. This data will be used by the NRC for the purpose of a cost/benefit evaluation to determine if some of our existing requirements can be relaxed while still meeting the safety objectives of the ICC instrumentation system.

The table identifies five design options which we want to consider. In addition, we would appreciate industry comments and cost estimates concerning a sixth option, which would be your recommendation for an optimum design based on value/impact considerations. This may, of course, be identical to one of the identified five options. Estimates for both forward fit (new plant design) and backfit (new plant design modifications and operating reactor design upgrade) are desired and should be clearly identified.

For purposes of your cost estimate, you should assume that the NRC will require all of the instrumentation identified in the first column of Table I as a minimum ICC instrumentation system. Assume that the current designs of the Westinghouse RVLIS system and the Combustion Engineering Heated Junction Thermocouple (HJTC) system meet the inventory monitoring requirements with reactor coolant pumps off. You can also assume for these cost estimates that other differential pressure (d/p) measurement concepts are acceptable in principle for inventory monitoring with the pumps off if they include pressure sensing taps from the reactor vessel head to the lowest level of the hot leg and from the top of the hot leg candy cane for B&W designed reactors. Assume also that the Westinghouse d/p monitor and the Combustion Engineering HJTC system provide adequate inventory trending with pumps on. Other concepts which are acceptable in principle for trending the primary coolant liquid inventory content or void with pumps on are based on pump power or pump current measurements.

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For all design options, assume that NRC will require high Quality Assurance standards for design, construction and installation in conformance with Appendix B 10 CFR Part 50. Any option recommended by you should be described and cost/benefit considerations should be discussed. The benefit of a design option should be assessed in terms of its contribution to ICC monitoring system reliability, capability to avoid plant down time for maintenance, need for multiple channels to verify the information during an accident or to prevent plant shutdown due to ICC system unavailability, performance under expected environmental conditions, protection against ambiguity because of failure under harsh environmental conditions, and special problems associated with separation requirements for safety grade and non-safety grade instrumentation. If you recommend design requirements other than those associated with the traditional safety grade of equipment, please be explicit. For example if a power source need not be Class 1E, we would still expect it to be of some specified high reliability and battery backed if momentary interruption is not tolerable.

We request that you provide us with your cost estimates by April 19, 1982. Thank you for your cooperation.

Sincerely,

/s/

Roger J. Mattson, Director
Division of Systems Integration

TABLE I

COST/BENEFIT STUDY

FOR ICC INSTRUMENTATION

Cost of Design Options ($/Plant)

Instumentation	1	2	3	4	5	6
Core Exit Thermocouples						
Subcooling Margin Monitor						
Inventory Trending with RCS Pumps Off						
Inventory Trending with RCS Pumps On						

DESIGN OPTIONS

1. Reference Design - meets NUREG-0737 design requirements.

2. Delete all seismic design requirements from reference design.

3. Delete environmental qualification requirements, except seismic, from reference design.*

4. Delete single failure design requirements (redundancy) from reference design.

5. Delete Class 1E power source requirement from reference design.

6. Respondents' Recommended Design (Describe differences relative to Option 1)

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* In this option, when we say "delete environmental qualification", we mean that there need be no qualification by testing under expected accident conditions, but the equipment would be expected, by design or analysis, to survive and function under design basis accident conditions.

ENCLOSURE 9

Enclosure 9

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.

(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