



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

June 9, 1981

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

Dear Mr. Dircks:

SUBJECT: INSTRUMENTATION FOR DETECTION OF INADEQUATE CORE COOLING

As the result of recent discussions with the NRC Staff regarding the position taken on Instrumentation for Detection of Inadequate Core Cooling in Section II.F.2 of NUREG-0737, we have several issues which we would like to discuss further with the Staff.

First, we would like to know the extent to which the Staff has examined a spectrum of transient and accident scenarios to determine what information an operator needs in order to recover from an incident successfully. Illustrative examples of the questions we believe should be addressed are the following:

- (1) What are the conditions under which a level indication would be needed?
- (2) What system conditions are to be evaluated by its use? For example, are void formation, coolant depletion rate, and/or adequacy of core cooling to be indicated?
- (3) Are there operational anomalies or transients under which a level indicator might give the operator information likely to produce an erroneous conclusion which could lead to operator action that would increase risk?

Second, we have questions about the wisdom of installing equipment on a schedule which provides for little or no testing under actual operating conditions. Illustrative of some of the questions which arise are those contained in a letter to the Committee from Dr. Zenons Zudans, an ACRS consultant. A copy of his letter is attached.

In light of these questions we have some concern about a schedule which calls for installation of a level indication system before any significant demonstration of its capability or reliability has occurred.

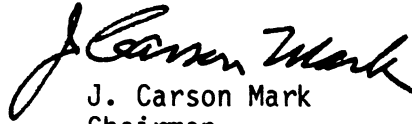
Mr. William J. Dircks

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We would like to discuss this subject with appropriate members of the NRC Staff at an early meeting of the ACRS.

Sincerely,


J. Carson Mark
Chairman

Enclosure:

6/1/81 ltr to W. Kerr, ACRS, from Z. Zudans,
re. Mtg. on Electric Systems Subcommittee on
Core Water Level Measuring Devices, 5/28/81



Franklin Research Center
A Division of The Franklin Institute

June 1, 1981

Professor W. Kerr, Chairman
ACRS Subcommittee on the Electrical Systems
Department of Nuclear Engineering
Phoenix Lab-North Campus
University of Michigan
Ann Arbor, Michigan 48109

re: Meeting on the Electric Systems Subcommittee on Core Water Level
Measuring Devices, 28 May, 1981, Washington, D.C.

Dear Professor Kerr:

NRC's plan to review individual systems proposed for Reactor Vessel Level Indicating Systems (RVLIS) and to generate SER's (by December 1, 1981) for such systems is a good plan to start with. However, I do not think that it is possible to generate a meaningful SER on the basis of currently available licensee submittals or even on the basis of the responses (due by September 1, 1981) to be received on staff questions and positions. The problem is - there is no completely validated RVLIS system available as of now.

NRC, CE and W indicate, that ΔP and HJTC systems are proven technologically, but clearly significant amount of additional performance testing and qualification is required before either of these two systems are proven to be able to operate in PWR environment, survive LOCA and provide meaningful signal after LOCA (ΔP type systems are used for pressurizer water level indication).

CE presentation on ICC (which CE calls IAOPICCI!) displayed a systematic approach to the entire problem addressing requirements, discussion of ICC parameters, instrumentation and projected display system including the operator training and new guidelines. The CE proposed system is potentially able to identify the trends, if not the actual absolute values, of parameters pertinent to identification of ICC onset, progress and recovery. Proof of principle and design development testing of CE system is complete and prototype tests scheduled to be completed by the end of 1981. In spite of Dr. Bailey's (EPRI) negative comments (severe materials problems for C-E probes above 200 psia), I believe C-E system represents a workable alternative. I do not believe, however, that it is prudent to install any hardware prior to the prototype test completion and the environmental qualification.

June 1, 1981

From the presentations (CE and others) it is not clear that the impact of the Commissioner's Memorandum and Order CLI-80-21, May 23, 1980, has been evaluated on the completion dates proposed. CLI-80-21 requires that safety related equipment installed in all NPP shall be qualified in accordance with the DOR Guidelines or NUREG-0588 (in sum equivalent to IEEE-323, 1974) by June 30, 1982 (Mr. Vincent Thomas, I&E)

Westinghouse has performed analysis of certain transients and evaluated the (calculated) indication of ΔP system. It appears that W has a good understanding of the shortcomings of ΔP system. Advantage of ΔP system over HJTC is its ability to indicate reactor vessel water level over its entire range. This indication, however, requires special calibration for each of the various operating conditions because ΔP measures the differential pressure between two points in the primary system. This ΔP is made up of contributions due to the hydrostatic head, head losses due to friction (with flow) and transient decompression/compression locally due to blowdown expansion. In the pressurizer there is normally no flow, hence indication of level can be better calibrated. In general, however, ΔP will give a reasonable gross indication of mass inventory in the vessel, no pumps running, and mass inventory in the vessel and in the primary coolant system if RCP are running.

With respect to the actual hardware to make up a ΔP system, sensors, hydraulic isolators and 400 feet long capillary tubing may contain modes of failure not as yet carefully evaluated. It is advisable to identify such modes of failure and assess the performance of degraded ΔP system and its effect on the rest of the plant. Then it is necessary that ΔP prototypical hardware be environmentally qualified for PWR operating conditions prior to installing it in a NPP.

In conclusion I wish to point out that there is no need for any hysteria in this matter. NPP have instrumentation for most of the ICC (except for an unambiguous indication of reactor vessel water level). This instrumentation has been improved lately (post TMI-2), operators have been restrained to cope with ICC better: hardly a need to commit to the installation of unproven hardware at this time.

Very truly yours,


Zenons Zudans
Senior Vice President

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cc: R. Savio, ACRS