

February 1, 2001

Mr. David J. Modeen, Director
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SUBJECT: NUCLEAR ENERGY INSTITUTE/ELECTRIC POWER RESEARCH INSTITUTE
FIRE TESTING: COMPREHENSIVENESS WITH RESPECT TO
OUTSTANDING CIRCUIT ANALYSIS ISSUES (TAC NO. MA4745)

Dear Mr. Modeen:

The purpose of this letter is to request additional information with regard to fire-induced circuit failure analytical criteria identified in the Nuclear Energy Institute's (NEI) risk informed safe shutdown methodology, NEI 00-01, and your approaches to related circuit failure analysis issues resolution.

The Boiling Water Reactor Owner's Group's (BWROG) final deterministic post-fire safe shutdown methodology guidance document, from which NEI 00-01 was derived, was the subject of an extensive CY 2000 NRC staff Request for Additional Information (RAI). The BWROG document contained numerous examples of circuit analysis criteria. We note that, as useful as the BWROG effort was in identifying these circuit analysis criteria, the BWROG effort did not provide technical bases for those criteria. During a July 26, 2000, public meeting to discuss the staff's RAI, the BWROG representatives stated that all of the circuit analysis criteria contained in their deterministic document had been collected from existing operating reactor licensing bases, and that no circuit analysis issues outside of these licensing bases appeared to be safety significant. Therefore, in the opinion of the BWROG, technical bases were not required.

It is the staff's position that the technical bases of all of the circuit analysis criteria relied upon in NEI 00-01 should be provided. The technical bases are necessary for the staff to assess the adequacy of the criteria, and its applicability on an industry-wide basis.

The following issues were identified in the staff's RAI on the BWROG document. It is unclear to the NRC staff what method will be used to close each of these issues (e.g. fire tests, expert elicitation panels, probabilistic arguments, etc.). The staff understands that, for circuit analysis issues that cannot be addressed through testing, other technically defensible approaches to resolution may be appropriate. Please provide a brief explanation of the method intended to close each of these issues, and NEI's schedule for their closure:

1. Determination of the number of spurious equipment actuations (or sets of spurious actuations) to be assumed per fire event, and (even though the spurious actuations may not occur simultaneously) whether the spurious actuations are to be assumed to eventually exist concurrently if not purposely mitigated or otherwise addressed by the licensee.
2. Determination of the number of concurrently existing fire-induced cable failures/circuit faults to be assumed per fire which can cooperatively cause spurious equipment actuations.
3. The timing of cable failures and their resultant circuit faults.
4. The probability of conductor-to-conductor electrical interaction in multi-conductor cables and cables in contact.
5. Cable failure probability dependency on circuit design (e.g., a short to ground may be more problematic in a grounded control circuit than in other control circuit designs).
6. The effect of certain cable material considerations (e.g., thermoset versus thermoplastic) on cable failure probability.
7. The effect of variations in fire intensity/fire size on cable failure probability.
8. The probability of conductor-to-conductor electrical interaction for cables in the same tray, and cables in different trays in the same room (which may for example, be separated vertically but not horizontally).
9. Control room cabinet to cabinet fire, hot gas and smoke propagation.
10. The probability of unsuppressed fires and the probability of a damaging fire, as well as the effect on fire severity and fire consequence estimates of (1) time from inception to effective suppression, and (2) fire location characteristics having unique potential for causing severe plant damage and/or interfering with post-fire safe shutdown.
11. The technical basis for your position on spurious equipment operation leading to mechanistic damage as a result of one or more fire-induced cable failures/circuit faults (see IN 92-18).
12. The technical basis for your assumption that Multiple High Impedance Fault (MHIF) electrical arcs clear through either (1) a developed open circuit or (2) a developed high current "bolted short" (which in turn actuates a circuit interruption device).
13. Various circuit design specific assumptions of inherent safety (e.g., "indication circuits are not a safety problem in fires," "certain motors can't fail due to their design").

Since staff has been notified that NEI has integrated the deterministic Boiling Water Reactor Owner's Group (BWROG) Safe Shutdown Guidance Document within NEI 00-01, we now plan to issue only a single safety evaluation report (SER) upon completion of NEI 00-01 (rather than two SERs, one for each of the NEI and BWROG documents).

D. Modeen

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The staff continues to believe that timely resolution of fire-induced circuit failure issues through a voluntary industry initiative is appropriate. If there are any questions, please contact Joe Birmingham at (301) 415-2829 or Leon Whitney at (301) 415-3081.

Sincerely,

/RA/

John Hannon, Chief
Plant Systems Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

Project No. 689

cc: See list

D. Modeen

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