

Mr. Victor Stello, Jr.
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Stello:

SUBJECT: ACRS COMMENTS ON PROPOSED RESOLUTION OF USI A-17, "SYSTEMS INTERACTIONS IN NUCLEAR POWER PLANTS"

During its 313th meeting, May 8-10, 1986, the Advisory Committee on Reactor Safeguards reviewed the draft of a proposed resolution (Reference 1) for Unresolved Safety Issue A-17 (USI A-17), as presented to the CRGR on April 10, 1986. In its review, the Committee had the benefit of discussions with representatives of the NRC, as well as subcommittee meetings held on November 6, 1985, March 12 1986, and May 7, 1986. Furthermore, there has been a long history on this subject. The ACRS identified this issue formally in a letter dated November 8, 1974 to the then-Director of Regulation, L. M. Muntzing (Reference 2).

In brief, we believe that the proposal made to the CRGR on April 10, 1986 is inadequate. However, in view of the importance of the issue, we do not wish to defer all action on the resolution of this issue while a completely revised resolution is prepared over a period of many years. We recommend that the proposed resolution be modified to include a two-step process as indicated below and then published for public comment.

Recommendations

1. For the near-term, we recommend a resolution of the issue similar to that proposed in the August 13, 1985 draft CRGR package (Reference 3) sent from T. P. Speis to R. Bernero, J. P. Knight, H. L. Thompson, and W. T. Russell for comment. The NRC should clearly identify the limitations and scope of this near-term, partial resolution and state that the broader scope resolution will be developed over the next few years. As proposed in the August 13, 1985 document, the near-term, partial resolution would include the following:

~Some investigation would be required by licensees at all operating plants for certain specified spatially coupled adverse systems interactions.

~The NRC staff would provide data and background information on functionally coupled adverse systems interactions for information and possible application by licensees and/or industry groups, but with no immediate NRC requirement.

~The NRC staff would begin preparation of a new Standard Review Plan section on systems interactions to ensure a more integrated and systematic review of plants, initially for spatial, and later for functional, interactions.

2. For the longer term, the NRC should allocate the necessary resources and initiate appropriate studies on functional and spatial interactions, including causally connected failures, cascades, and other multiple failure modes. This program of studies should be designed to ascertain, within a few years, which functional and spatial interactions are likely sources of significant risk. For these failure modes, a pragmatic method of investigation and evaluation should be developed, tested, and then proposed, if appropriate.

For the longer term, consideration should also be given to the use of a diverse and/or dedicated system for emergency heat removal which can serve as an acceptable resolution path for many aspects of the systems interactions issue while serving other safety functions.

3. We note that the proposed resolution of USI A-17 includes additional guidance for future plants in the area of single failure. If invoked, this appears to require a three-train design for those systems wherein a single initiating event can cause both a requirement for plant shutdown and a loss of one train of shutdown capability when, in addition, a credible single failure is assumed. We are inclined to favor the general idea. However, we recommend that such a far-reaching departure from past design practice be removed from the USI A-17 package and proposed on its own merit in a more appropriate forum.

Discussion

1. We conclude that the NRC staff has chosen a rather limited concept of component failure when analyzing for the possible effects of systems interactions. In the case of room flooding, for example, the effect on electrical components is defined in terms of component availability (or loss of availability) under the flooding conditions, and the resulting effect on safe shutdown capability. One is not required to consider whether such flooding could result in electrical faults or spurious control signals that might interact through the electrical or control complex and thereby lead to a malfunctioning of equipment required for safe shutdown. We cannot support such a nonconservative bounding of the analysis.

We appreciate that adequate data may not be available concerning the possible faulting modes (disruptions beyond simple loss of function) of nonqualified components under flooding conditions, but the matter should be analyzed, using a range of plausible assumptions, instead of disregarding the likelihood of faulting. We recommend that the approach consider the faulting modes and consequential adverse systems interactions associated with exposure of components to both safety and nonsafety conditions beyond their design basis.

We recommend that particular attention be given to those cases wherein multiple adverse systems interactions are likely from a single common cause event such as fire, pipe rupture, or earthquake. Such interactions may exacerbate an already hazardous situation and are likely to be numerous and appear in an unpredictable time sequence. We recognize that such analysis could become very complex due to the numerous possible interaction sequences, and that simplifying assumptions will be necessary.

Event-created environmental conditions beyond the component design basis

have not been given adequate consideration in the proposed NRC staff resolution.

2. The proposed NRC staff resolution would fragment the systems interactions issue in its consideration by the NRC staff. There would probably be a similar fragmentation by licensees. This fragmentation has historically led to many systems interactions being neglected. We believe that the converse should be accomplished; namely, that both within the NRC staff and within each licensee's organization there should be an interdisciplinary group responsible for identifying and investigating systems interactions issues.
3. The proposed NRC staff resolution presented to the CRGR on April 10, 1986 would result only in an information letter identifying for utilities a range of potentially significant areas for them to investigate and evaluate, relying largely on prior findings and some studies. Although the concept of licensee responsibility for safety is at the heart of the NRC regulatory approach, in practice the record of licensee performance is uneven. There is little reason for confidence that, on the issue of systems interactions, all licensees will perform adequately. For this reason, among others, we support the proposed resolution of August 13, 1985.
4. We recognize that certain aspects of the systems interactions issue are currently treated in several sections of the Standard Review Plan. However, the guidance for these matters is not complete. There are many gaps, and the USI A-17 Task Force itself concludes that many issues remain to be studied on existing plants.

Sincerely,

David A. Ward
Chairman

References:

1. Memorandum dated March 3, 1986 from Themis P. Speis, Director, Division of Safety Review and Oversight, for Raymond F. Fraley, ACRS, Subject: Draft CRGR Package on USI A-17
2. Letter from W. R. Stratton, Chairman, ACRS, to L. M. Muntzing, Director of Regulation, Subject: Systems Analysis of Engineered Safety Systems, dated November 8, 1974
3. Memorandum dated August 13, 1985 from Themis P. Speis, Director, Division of Safety Technology, for R. Bernero, J. P. Knight, H. L. Thompson, W. T. Russell, Subject: CRGR Package for Proposed Resolution of USI A-17, "Systems Interactions in Nuclear Power Plants"