PDR

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

JUN 21 1979

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a) doc. control
b) assign to Olshinski

MEMORANDUM FOR: R. J. Mattson, Director
Division of Systems Safety

FROM: I. Villalva, Project Manager
Standardization Branch,
Division of Project Management

SUBJECT: RECOMMENDED LICENSING REQUIREMENTS

Copy to:
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PDR

In response to your memorandum of May 31, 1979, I am submitting some of my thoughts for increasing nuclear power plant safety. As you know, the designs of the PWR ECCS's were not developed on an overall systems engineering basis. Rather, they emerged as a series of sub-systems designed to ameliorate the effects of certain prescribed LOCA's. As a result, these ECCS's generally resemble heat-and-beat-to-fit systems that grew somewhat like topsy. Thus, in order to accommodate certain pipe breaks, it is necessary to actuate certain ECCS sub-systems (e.g., HPI, accumulator tank injection, HPI) at discrete stages of a LOCA, such that there is no continuum of action by any ECCS sub-system. In fact, certain breaks cannot be immediately accommodated by the ECCS, while others, than can immediately be accommodated, may subsequently require a certain amount of dead time for the transition of one ECCS sub-system to another.

Based on the above, I recommend that construction permit applications docketed after a certain date, say June 1, 1980, be required to include an integrated ECCS design. The design of the system should be based on overall systems engineering requirements, such that it can accommodate continuously the full spectrum of postulated pipe breaks. The design of such a system must, of course, conform to the requirements of ESF systems.

Conceptually, a high pressure RHR system that could also be used for ECC purposes could be a starting point for an integrated ECCS design. Such a system would alleviate a traditional concern (i.e., interfacing a low pressure system with the primary pressure boundary), and could resolve some of the issues raised by the ACRS (e.g., it could eliminate the need for energizing the pressurizing heaters during post-LOCA stages, as well as the water hammer concerns associated with the steam generators). The actual design of the system should be left to the NSSS suppliers or the BOP designers. Although the design of the system should be tempered by economic considerations, it should ultimately be governed by safety considerations. The economic considerations would account for details such as where to locate the heat exchangers (HXs) and major components, while the safety considerations would account for factors such as reliability, maintainability, and effectiveness. For example, the placing of the HXs and all high pressure components inside containment would offer at least two advantages: (i) it would reduce the length of high pressure piping runs, (ii) it would

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eliminate the need to penetrate containment with a high pressure piping system containing radioactive fluids, thereby reducing the likelihood of contaminating the external environment. These advantages, however, could be overwhelmed by disadvantages such as (i) the increased costs associated with a larger containment, (ii) the reduction in reliability associated with exposing major components to a hostile environment, and (iii) a significant loss of maintainability. The above considerations would, of course, be significantly modified by design concepts using "dog houses" just outside containment and other modifications. In brief, many trade-off studies would be required to optimize the basic concept, but here again, the details should be left to the designers.

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