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Harry Tauber
Vice President
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May 8, 1980

Mr. Ashok Thadani
Reactor Systems Branch
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Thadani:

The purpose of this transmittal is to comment on the Nuclear Regulatory Commission (NRC) staff position as contained in Volume 4 of NUREG-0460 and to set forth the position of Detroit Edison on this issue.

We at Detroit Edison have been following the Anticipated Transients Without Scram (ATWS) issue for a number of years because of our concern for safety and our specific interest in the impact of ATWS on the design of Fermi 2, a BWR-4 that is approximately 80 percent complete and scheduled for fuel loading in 1981. Our engineers have reviewed the ATWS documentation, the company has supported outside ATWS studies by both the Bechtel Power Corporation and KMC, Inc., and most recently the company has supported the $3 million study by General Electric in response to the February 15, 1979 request from the Nuclear Regulatory Commission (NRC) for a generic evaluation of Alternative 3 as defined in NUREG-0460. We have also initiated a study by the Stone & Webster Engineering Corporation, one of the supporting architect/engineers for Fermi 2, to determine the impact of proposed ATWS retrofits on the cost and schedule of Fermi 2.

It is our view that the basic approach or emphasis to ATWS should be to improve the reliability of the reactor scram system rather than assuming the system is unreliable and then providing extensive mitigation capability as proposed in Volume 4 of NUREG-0460. Therefore, Alternative 2 cited in the report, plus an effective manually initiated 86 gpm standby liquid control system, is Detroit Edison's recommended solution to the ATWS issue since substantial improvement in safety can be achieved at a reasonable cost. We do consider a timely resolution to this issue to be the most cost effective approach for a project such as Fermi 2 in view of our current schedule. A timely resolution is also the most prudent from a safety standpoint since it is important to avoid making extensive changes to the plant once it goes into operation, and this would more than likely be required if Alternative 4 were selected as prescribed in Volume 4.

It has been stated both that ATWS is a non-problem and that ATWS should essentially receive the care and treatment of a design basis accident

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(DBA). These polarized positions are apparently still deeply engrained in corresponding segments of the industry and the NRC. Proving either position by probability techniques through a synthesis approach or by experience is difficult. Nevertheless, the probability technique should be used as a guideline since there is no other rational basis for making a decision.

To determine the appropriate allocation of resources for dealing with ATWS, it seems appropriate to consider the relative risk due to ATWS as a major criterion. The NRC staff has chosen a core melt frequency due to a BWR ATWS with no fixes of 2×10^{-4} per reactor year. This value is also the NRC predicted ATWS frequency since any ATWS is assumed by the NRC to produce a core melt in a current BWR with no ATWS fixes which includes the assumption of no provisions for recirculation pump trip (RPT).

The NRC ATWS frequency and risk values are larger than those determined by General Electric, the Electric Power Research Institute or WASH-1400 and represent to us an extreme upper limit. Thus, it is appropriate to compare the NRC ATWS risk to the upper limit for risk of core melt from non-ATWS events given in WASH-1400. Such a comparison places the upper limit ATWS risk at about twice that of the upper limit non-ATWS risk.

To reduce the ATWS risk, all BWR's have now been ordered to install RPT, and Fermi 2 included RPT in its design several years ago. This modification removes the major short-term threat from ATWS by greatly reducing the pressure spike allowing more time to achieve a shutdown through backup measures without a high risk of core melt and was considered to be a prudent step to take.

Based on general operating experience, we perceive (as does General Electric) the electrical portion of the scram system to be the most vulnerable to a disabling failure. Consequently, it is prudent to provide a backup scram activation that would bypass and be independent of the normal electrical portion of the scram system. The Fermi 2 design already has an independent breaker activated from the control console that would allow an operator to de-energize the power feed to the reactor protection system (and thus the scram solenoids) independent of the normal automatic and manual scram circuitry. In addition, we propose to implement the alternate rod insertion (ARI) system of General Electric that allows for an alternative means of dumping air from the scram air header. This again is independent of the electrical portion of the normal reactor protection system as defined in NUREG-0460.

The one identified "weak link" in the mechanical portion of the scram system is the scram discharge volume (actually two tanks); if either tank is not sufficiently empty at the time of scram, one half the rods may fail to insert upon receipt of a scram signal. Thus, the normal

BWR-4 design includes a water level sensor in each of the two scram discharge volumes. We have already extended our design to include two safety grade water level sensors in each scram discharge volume that will initiate a scram upon sensing higher than normal water level as proposed by General Electric.

We further intend to modify the standby liquid control system to allow 86 gpm manual initiated injection of sodium pentaborate solution through the jet pump instrument lines. Consistent with this provision, we will also review operating procedures to assure that an operator can make a valid routine check of the success of scram when required and include backup moves in the event of failure of the normal scram including manual initiation of the standby liquid control system.

In the company's view, implementing Alternative 2 will reduce the chances for an ATWS by at least an order of magnitude (largely through the improvement of the reliability of the electrical component) and reduce the ATWS contribution to overall risk of core melt somewhat more because addition of RPT will not allow every ATWS to lead to core melt as previously assumed. This assertion of risk reduction requires that the mechanical portion of the scram system be somewhat more than an order of magnitude more reliable than the presently designed electrical portion, a position firmly held by all the reactor vendors. However, it does not require the mechanical portion to have the extremely low failure probabilities (e.g. $\ll 10^{-7}$/demand) that have sometimes been assigned. Moreover, now that the scram discharge volume problem has been addressed, the more likely result of mechanical failure is for only a portion of the rods to fail to fully insert.* Since procedures will be in place to detect partial scram failures of significance and to operate the standby liquid control system, most such failures could be accommodated without serious damage. We submit that the full failure probability of the mechanical portion of the scram system (essentially no rods inserted) is presently low enough to achieve more than an order of magnitude reduction in ATWS probability by reducing the failure probability of the electrical portion through implementation of Alternative 2. (It should be noted that General Electric assigns a factor of 10^2 to the improvement afforded by Alternative 2.)

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*There appears to be a generally held engineering judgment in the NRC staff that the mechanical portion of the scram system is less susceptible to common mode failure than the electrical portion. The staff also acknowledges the unlikelihood of an undetected mechanical failure that would affect all or most of the drives, but they give no credit for this judgment -- apparently because they have not found an acceptable quantitative pred tion of the probability of common mode failure of different number of rods (see NUREG-0460, page 23, Vol. 3, and page 27, Vol. 1, and ACRS Subcommittee on ATWS, transcript March 26, 1980, A. Thadani).

Assuming a greater than order of magnitude reduction in ATWS risk now places its contribution (starting with the NRC risk level) to core melt at less than 20 percent of the WASH-1400 upper limit to total melt risk. The value can easily be made less than 10 percent by simply taking credit for the greater scram system testing frequencies normally used in BWR's (relative to monthly testing assumed by the NRC) or the lower frequencies of significant transients developed by the Electric Power Research Institute (3.5 instead of six per year used by the NRC).

The fixes prescribed above that place the ATWS risk at something below 10 percent of the total accident risk appear to us prudent and justifiable. The fixes are well thought out, and the benefits are obvious.

We have serious reservations in going beyond Alternative 2 as presented in Volume 4 of NUREG-0460. First, since we feel that over an order of magnitude benefit is provided by Alternative 2, less than a factor of two additional improvement remains for Alternative 3/3A when the values of Table E.2 of Volume 4, NUREG-0460 are modified to account for this increased improvement for Alternative 2. A factor of two is not worth the risks associated with expanded backfits, the increased potential for inadvertant injection of boron that accompanies an automatic boron injection system, and the extra expense. Secondly, if Alternative 4/4A is required, the premise appears to be that ATWS will happen with a "probability of one" and its consequences must be mitigated with extremely high reliability; i.e., ATWS is treated as a classical DBA with all of the associated uncertainties in degree of reliability that will ultimately be required. Since we view the upper bound on ATWS contribution to core melt to be less than 10 percent, the extreme high reliability of the DBA approach to fixing ATWS on most operating and near-term plants, called for by Alternative 4/4A, is not justified unless an entirely new criterion for reactor safety is established. On a cost benefit basis, if nothing more than a factor of 10 improvement (rather than the factor of two currently allowed by the staff) were afforded Alternative 2, the major portion of the "Values" (cost benefits) shown for BWR Alternatives 3A and 4A in Table 2 of Volume 4, NUREG-0460, would now accrue to Alternative 2 (approximately 90% and 95% of the "Values" for 3A and 4A, respectively). The remaining incremental "Values" for going beyond Alternative 2 would then be so small as to make Alternative 3A difficult and Alternative 4A impossible to justify on a cost benefit basis.

In summary, we see merit in prescribing Alternative 2 in conjunction with an effective manually initiated 86 gpm standby liquid control system for near-term BWR's including Fermi 2. Moreover, it would be prudent to implement that Alternative as soon as practicable. We see little logic to going further. Moreover, were Alternative 3/3A to be prescribed and not legally bounded with very specific criteria as in a rule, it is likely that the rationale that would require Alternative 3/3A will ratchet the utility into Alternative 4/4A before implementation is completed. The difference between Alternative 4/4A and Alternative 3/3A is far more than replacing two small pumps with two large pumps because of the very real potential for essentially unlimited backfit requirements of Alternative 4/4A required to accommodate a new ATWS DBA in plants already operating or essentially built that were not originally designed to handle such an occurrence.

Prescribing Alternative 3/3A or 4/4A for operating or near term BWR's, particularly by direct order of the NRC, in view of the questionable benefit, large costs and lack of firm design, represents to us a very unwise allocation of resources. For these reasons, we cannot endorse the recommendations of NUREG-0460, particularly Volume 4.

Sincerely,

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cc: Harold Denton, Office of Nuclear Reactor Regulation
Ronald Callen, Michigan Public Service Commission
Dr. William Kerr, ACRS Subcommittee on ATWS