LAWRENCE LIVERMORE LABORATORY

NUCLEAR SYSTEMS SAFETY PROGRAM

TF80-225

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Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Frank:

This letter summarizes the conclusions of the BWR Owners Group as presented at the August 27 meeting in Bethesda, as well as the discussion points raised, and remaining issues and concerns.

The purpose of the meeting was to review the Owners Group's plans for complying with TMI Lessons Learned requirement 2.1.2 and their response to concerns raised at the June 12 meeting. Presentations were made by T. Vandeventer (BWR Owners Group), and D. Naaf, S. Stark, P. Valandani, and J. Boseman (all of GE).

The first presentation by D. Naaf reviewed all the Reg. Guide 1.70 Rev. 2 events in order to determine the basis for SRV testing. All events that exposed the valves to liquid or two-phase flow were considered. Scenarios were analyzed which included the initiating event only, and also the initiating event plus a single active component failure or a single operator error. A total of 13 initiating events were considered, and a probabilistic analysis was done to estimate the probability that any of a set of ultimate undesired results would occur. The probabilistic analysis included estimates for the likelihood of the initiating event, component failure or operator error, and the probability that the undesired result would occur given the two prior events have occurred. The result is the failure probability for the undesired consequence, such as a break in the reactor coolant pressure boundary in the drywell. The failure probability was arrived at by assuming independence of all factors in the calculation.

The failure probability was then compared to the probability of a comparable event, as calculated in (or extrapolated from) WASH-1400. This comparison showed that the failure probability of the analyzed scenario was less than or equal to the probability of the WASH-1400 event. It was then concluded that the probability was acceptably low and therefore no tests were necessary. This conclusion was applied to all high pressure liquid and two-phase events. It was also concluded that the probability of an undesirable event resulting from use of the alternate shutdown cooling mode was high enough that testing should be done for this case. Therefore, the low pressure tests, which the Owners Group have already agreed to do, were justified.

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Considerable discussion accompanied the Naaf presentation. The Owners Group approach of using a best estimate probabilistic analysis to show compliance with an NRC requirement is a novel attempt to avoid additional testing of SRV's. It was pointed out that in the past, probabilistic methods alone have not been acceptable in NRC's legalistic world of reactor licensing. The conventional conservative deterministic approach to safety analysis states that if an undesirable event included in the design basis is possible, then the reactor systems must be designed to adequately mitigate the consequences. The Owners Group position is that a probabilistic analysis has shown that the likelihood of the undesirable event is sufficiently small, and therefore the reactor systems (SRV's in this case) need not be qualified for it.

One problem with the probabilistic approach is that very little data exists to base the probabilities on. In many instances, the probabilities are obtained through "expert guesstimates." This makes it very difficult to justify the numbers chosen and leads to great uncertainty in the results. Another problem is the assumption of independence in the sequence of events leading to the undesirable result. For severe transients and accidents, it is often difficult to demonstrate this independence. Finally, even if one is confident in the calculated probability of the undesirable event, a criterion for the acceptance of that probability as being large, small, negligible, etc. must be agreed upon. We feel that these concerns must be satisfied before the Owners Group probabilistic analysis can be accepted.

Another discussion topic concerned the upgrade of the Level 8 trip. It was estimated that the current control grade trip has a 1×10^{-3} failure probability, and that an upgrade would reduce this probability to about 1×10^{-5}. However, a deterministic conservative safety analysis allows no credit for the operability of the control grade trip, giving it a failure probability of unity. The proposed upgrade could not strictly qualify the system as safety grade, though its reliability would be greatly increased. The issue is then: what credit is allowed the upgraded Level 8 trip system in a safety analysis? And if some credit is allowed (failure probability < 1.0), does this upgrade reduce the undesirable event probabilities discussed earlier to acceptable levels such that SRV testing is unnecessary? There was no resolution of this important issue at the meeting. We feel that if the probabilistic treatment is acceptable, given the concerns mentioned are satisfied, then it follows that the Level 8 trip system should be included in the analysis with a finite failure probability. In this case, the potential upgrade should be considered on the basis of its additional contribution to reducing the probability of undesired events.

The remaining presentations were brief and less controversial. Steve Stark presented an evaluation of test requirements for 6 early BWR's which are not included in the probabilistic agreements. The LaCrosse plant is dismissed as usual, becase it is an old 50 MW plant built by Allis-Chalmers. Three plants have no PORV's upstream of the main steam isolation valves, and therefore the PORV's aren't used in the transients under consideration. These plants do have spring safety valves, which need not be tested according to Stark. This seems reasonable since there are no analyzed events which challenge the safety valves in these plants. The Big Rock Point plant did have an overfilling during startup which opened a safety valve, but there was no valve failure.

The other two plants do have PORV's, but no high-level feedwater trip circuits. No plans were presented for qualifying the valves on these two plants. They are considering installing high-level trips. What will be done for these plants is another unresolved issue for the Owners Group.

In response to an issue from the June 12 meeting, P. Valandani compared the results from an analysis of downstream piping loads occurring from the discharge of steam and low-pressure water through an SRV. He concluded that the loads due to steam flow were significantly greater than those from water, independent of plant specific piping geometry. Therefore, if this result is confirmed in the valve tests, he claims a structural analysis will not be needed for each plant. An analysis for the case of high-pressure water discharge was not done, and we feel this should be required to confirm the claim that high-pressure water loads are also smaller than steam loads.

Finally, J. Boseman showed a drawing of the downstream piping system to be tested and mentioned that the orifice plate in the discharge line can create a 40% backpressure.

In the final discussion it was suggested that the valve manufacturers be contacted to determine their willingness to formally guarantee the performance of their valves under all postulated conditions. It is doubtful that they will stick their necks out on this, and it's also not clear what if any credit NRC can allow for a manufacturer's guarantee. However, GE agreed to contact the valve manufacturers on this issue.

The Owners Group plans to make a formal submittal on their plans for testing or complying with requirement 2.1.2 by other means, by September 15. They say they need concurrence on their plan by October 1 in order to insure completion of testing by July 1, 1981. They do not plan to submit a report on the test results until the last quarter of 1981. There was disagreement here, with the NRC demanding some written evaluations by July 1. It is also unlikely that the Owners Group program, if submitted as presented here, will be approved by October 1. Vandeventer stated that slippage in this date could affect the July 1 deadline. However, the test facility being built at Wyle does have the capacity to conduct high-pressure liquid tests if required. It was felt that in general, the Owners Group did not adequately demonstrate that their program complies with requirement 2.1.2, and that many issues need resolution before their program is acceptable.

We hope these comments will assist you in evaluating the BWR valve test program.

Sincerely,

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