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J Arnold, Chairman
B&W. Subcommittee.

A matter came to light at the July 27. BSAR-205 Subcommittee meeting, which I believe should be brought to the attention of the Committee. Two instances of misapplication of the single failure criterion will be cited as follows..

Case A

In my July 15 presentation regarding the failure of the d.c. bus, the following salient points emerged.

a. Failure of the d.c. bus, by initating a scram, in turn caused the bus to be needed for residual heat removal.

b. The Staff position is that the single failure criterion had been met. Two trains existed before the event.

c A probabalistic approach was used to show that the independent failure of the second train, during the next time interval, would be improbable.

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d. No fix would be required.

Case B

The failure of one train of the LPIS, although essentially identical in principle, has been treated in an opposite fashion.

a. The failure of the nozzle which connects a check valve to the reactor vessel would constitute a small LOCA and would at the same time disable one train of the LPIS

b. The position has been taken that the single failure criterion had <u>not</u> been met although as in Case A, two trains existed before the event.

c. A probabalistic approach was not used in this instance, although it should have been. The probability of a LOCA, as compared to Anticipated Transients, is small; the probability of its occurance in this short run of pipe would be extremely small. It is true that such nozzles have been subject to cracking which would alter the probability of failure at this point. The proper course would be to remedy the cracking problem.

A high rate of failure leading to LOCA can not be tolerated; a failure rate sufficiently low would require no LPIS action; if moderately low, a single LPIS train would suffice. The single failure criterion as applied does not give consideration to these factors.

d. A fix was required. The fix consisted of a system of pipes, valves, and other components cross connecting the two trains, which would on failure of the nozzle, make both trains available and thereby satisfy the single failure criterion.

e. The unneeded cross connection violates the independence of the two LPI trains.

The single failure criterion was originally adopted as a minimum requirement i.e., a protective function would not be allowed to fail because a component had failed, and before the failure could be detected and repaired, a protective action would be demanded. The criterion is now used as a criterion for acceptance, without regard to the number of components nor the frequency of challenge, and in addition is not applied uniformly as cited above.

Three d.c. bus failures have occurred, in each case initating a scram thereby bringing about the need for d.c. in removing residual heat. This failure is not an improbable event.

The failure of the short section of pipe between the reactor vessel and the first check valve, would be required to be less probable by orders of magnitude. Yet the probable failure did not require a fix, but the improbable failure did require a fix. The consequence of each failure would be much the same i.e., loss of one of two trains.

It is likely that the expensive fix even worsened the situation. The interconnection of the two trains, to some degree degraded their independence and otherwise increased the failure probability. This would, then, degrade the reliability of the system in coping with all potential failures of the entire system of primary piping, other than this particular nozzle.

It is clear that the application of the single failure criterion is in need of overhauling.

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