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Wm Kerr, Chairman
ATWS Subcommittee

Yesterday the ATWS subcommittee met to consider the Utility Group proposal, which was more favorably received than would have been anticipated. This suggests that we may have the opportunity to adopt low cost remedies for the short term which would buy the time needed for the utilities to adopt a program and demonstrate a reduction in challenge rate.

For PWRs it would seem possible to significantly reduce the frequency of loss of feedwater transients. For the remaining transients a change in fuel composition would enhance the moderator temperature coefficient and would be consistent with loading for increased burn up, and by reducing the fast fluence reaching the vessel, would mitigate the Thermal Shock. This could be augmented by a prompt control grade insertion of rods which would, in some cases, avoid the need for a scram and would surely reduce the ATWS pressure peak which would occur in 90 seconds. These measures in addition to reducing risk and increasing availability would avoid the necessity of increasing safety valve

capacity with the attendant possibility of increasing the frequency of SBLOCAS

For BWRs, both the NRC and the Utilities proposals depend on the use of a diverse shutdown means to be invoked just once during the lifetime of all current and forseeable LWRs. The application of diversity is useful when the nature of the anticipated failure mechanism is known; for example the CMF of components. It is less useful, however, in mitigating failures resulting from maintenance error, as when the wrong unit is serviced, sabotage, or other mechanisms wherein essential services may be unavailable and plant conditions unpredictable.

The Utility Group assumes that failure to scram would be 2/3 electrical (Kahl) and 1/3 mechanical (Browns Ferry) so that ARI, which is electrical, would result in an improvement not to exceed a factor of 3. This might very well be restated as 1/10 electrical, 1/10 mechanical and 8/10 systemic, or unknown, which would limit assured Recirc Trip, ARI, or SLCS injection to no more than 10% of the events

For BWRs the mechanism for avoiding a turbine trip are less obvious. An early G.E. proposal, REVAB, which would divert steam to the torus and thereby avoid a scram, was rejected. One possibility

might be the prompt injection of nitrogen voids to compensate for boiling voids lost as a result of the initial pressure transient, followed by additional void loss resulting from the increasing pressure. The voids produced by the Recirc Trip are slow in response and those produced by reducing the coolant level, even slower. Prompt injection concurrent with every transient would be without penalty and could limit at least some transients sufficiently that the scram would not occur. Even partial success by making the scram unneeded, though not prevented, would serve to reduce risk, and without inviting spurious SLCS injection.

During the 30 to 40 year service life of the 150 LWRs now in operation and under construction, i.e., 5000 reactor years, we should expect to see one ATWS event. We can not, however, predict the condition of the plant when the event occurs. Essential services may be unavailable or even the control room may be uninhabitable. We can not therefore, with any assurance, depend on correct operator response.

It would be useful to compare the proposed BWR emergency ATWS operating procedures with those that

were employed in the TMI event. The principal difficulty arises from the inability of the bypass to deliver the existing 35 to 40% power to the condenser although in normal operation the condenser handles approximately 65%

- At TMI the power was at the afterheat level, approximately 1%. The ATWS level following Recirc Trip would be 35 to 40%

- The ATWS operator, using available information would reduce coolant flow and level to enhance void formation. The TMI operator, using available information, reduced flow and allowed the core to become uncovered.

- The TMI operator was dealing with a plant in normal condition. The ATWS operator can not count on normal conditions.

- The ATWS operator would reduce flow in order to gain time. An additional 10 minutes would reduce the probability of human error in initiating SLCS, from 0.99 to 0.16. No provision is made for reducing human error in performing the operation which at TMI caused the core to become uncovered.

- It is significant that the ATWS power level would range from 40% to 25% during the emergency operation, whereas at TMI it was 1%.

This suggests that the utility proposal would reenact the TMI event but under more difficult conditions, and inviting more severe consequences. It is almost certain that the proposal will be unacceptable to the NRC, however the NRC rule is equally unacceptable, but for different reasons, as demonstrated by the public comments. We therefore have an opportunity to adopt some of the mitigating features proposed by the utilities which, with the now available Recirc Trip, should buy the time needed to develop and demonstrate systems and procedures for reducing the frequency of transients.

A prodigious effort is being proposed for mitigation of the one BWR failure to scram in 33,000 demands. The event would occur under circumstances that can not be predicted and in spite of all efforts, success can not be assured. A more rational program would address all of the 33,000 demands and attempt to limit or prevent the transients, each now requiring reactor shutdown, and reduce the frequency by an appreciable amount. This, in addition to reducing risk, would be of economic value to the utilities, and, in contrast to the utility and NRC proposals, success would be demonstrable.

A program of reducing the frequency of transients would require some development and that the utilities substantially increase their capabilities. I believe that it has been shown that the utilities need to increase their capabilities, and not just in the area of operator training, and a program to accomplish this should be initiated without delay and should receive the highest priority.

Meanwhile we must continue to accept prescriptive requirements.