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October 25, 1982

Dr. William Kerr
c/o Dr. Paul Boehnert
Nuclear Regulatory Commission
Advisory Committee on Reactor Safeguards
Room 1044B
1717 H Street NW
Washington, D.C. 20555

Dear Bill:

Attached are my comments re the ACRS subcommittee meeting on ATWS of 10/22/82. I hope they prove useful to you.

If we can provide you additional help on this or other matters, please call us.

Sincerely,

Chuck Mueller

C. J. Mueller, Manager
Probabilistic Risk Assessment
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CJM/mr

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PRA-82-45
8M414, A15

Comments Resulting from the ACRS Subcommittee
Meeting on ATWS - 10/22/82

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The title comments are directed at two main issues:

(1) Appraising the risk "posture", costs, and associated uncertainties for the ATWS plant fixes stipulated by the Utility Group (UG) and the NRC Staff in their presentations at the subject meeting.

(2) Making a choice between the two sets of fixes.

My appraisal of the UG assessment of ATWS is the subject of an earlier report to the ACRS and is attached for your convenience. No conclusions in that memo changed and it explores in some detail some of the uncertainties discussed herein. Thus it will serve as an adjunct to this report.

Before addressing the two issues, it is important to state that the feeling reflected in the meeting was that the UG technical analysis supporting their risk numbers was well done and represented a responsible and conscientious effort to quantify ATWS risk and the impact of the UG fixes. This is substantiated by the fact that the NRC basically endorsed the risk analysis by UG with the only important exception appearing to be the peak suppression pool temperature assumption of 285°F whereas the NRC accepted 200°F. The impact of this was roughly a factor of 3 in BWR risk. This factor was "regained" by the procedures devised by UG to deal with ATWS sequences. Although these emergency procedure guidelines (EPG) were well thought out as evidenced by the presentations, whether they assure sufficient improvement in the human response contribution to ATWS risk is questionable. In fact, the issue of human vs. automatic response with respect to the SLCS appears to be the major item differentiating the NRC and UG fixes for BWRs.

Addressing now the first issue, the aforementioned uncertainties include the following interrelated set:

(1) Plant-to-plant variability with respect to risk, risk reduction, and cost.

(2) Existing scram unavailability as well as unavailability with the addition of an alternate rod injection (ARI) system.

(3) Non-consideration of quantitative overall risk impact including competing risks or unrecognized benefits accruing with the fixes.

(4) Variation of transient frequencies and consequences as a function of plant age.

(5) General uncertainties associated with PRA state-of-the-art applied to the UG risk study on ATWS including

(a) Large uncertainties on the failure probabilities of key systems such as the SLCS and AFWS.

(b) BWR suppression pool temperatures.

(c) Human response which of course is integral with (a) and (b) and involves stress situations and threshold effects (at what point in time does operator success probability stop changing).

(6) Cost treatment subjectivity, especially with respect to downtime and analysis cost assumptions.

(7) Overall cost uncertainties for benefits and impacts including risk given that the above subjectivity could be eliminated.

Given all these uncertainties it is apparent that the risk and cost numbers presented by the UG and NRC for their respective fixes are very soft. Since the UG estimate of 0.16-4 for BWR AWS risk is slightly above the "safety goal" of 0.1-4 mentioned by Bernero, there would presumably be a significant fraction of the BWR population with a risk greater than the safety goal if simply the UG fixes were implemented. The same effect would be felt for the analogous situation for CE/B&W plants which have a nominal risk of 0.2-4 per the Bernero passout. The Westinghouse PWRs came in at a nominal "safe" 0.03-4 with UG fixes per the Bernero handout.

The question then becomes which set of fixes, those of the UG or those of the NRC, if either, should the ACRS favor. My leaning, faced with very fuzzy information, is to support the UG position for Westinghouse PWRs and the NRC position for the others, if this could be assured to resolve the issue. My reasons and reservations are as follow:

First, I think it important to meet the safety goal. If the safety goal is not met, or if it is met by changing the assumptions on the existing analyses, there will be the public perception of industry irresponsibility and lack of credibility. However, for Westinghouse plants, there appeared to be a concensus that ATWS would be a non-problem with the UG fixes, if it isn't already. Since the safety goal is met with nearly an order of magnitude margin, extra fixes seem to make no sense. With respect to the other plants which would have nominal risks of several greater than the safety goal, adding the NRC fixes which represents a fairly small investment above that required for the UG fixes, buys (on paper) a factor of two or three margin with respect to the safety goal.

My reservations are based upon the uncertainties and the "real" safety need for the risk reduction provided by the additional NRC fixes. For example, if the BWR nominal ATWS risk with UG fixes were 0.9-5, a number likely achievable by "refining" assumptions in light of the large uncertainties, the safety goal would have been met with margin and the UG fix would be adequate. Given that the safety goal represents an acceptable level of public safety, and if the NRC estimates of $23.6 M and $3.3 M for the costs of the respective fixes are assumed, roughly $20 M will have been spent per plant to

achieve an (unnecessary) risk reduction that may well have been achieved by using more refined (less conservative) assumptions in the analysis. Although it is likely that the $20 M could be spent more profitably, this may be a relatively small price to pay for ATWS resolution.

Another reservation comes in the use of prescriptive rather than performance criteria. However, in today's climate the regulatory process seems to preclude a performance criterion being viable.

Second, it seems conceivable that with a large part of the estimated cost difference between the UG and NRC fixes coming from increased downtime from installation and spurious trips, a concentrated effort to reduce these downtime contributions would likely lead to a strongly diminished cost differential between the fixes (at least for BWRs).

In summary, my choice is based on the desire to see a relatively inexpensive close to the ATWS issue in a reasonably short time. Although the numbers are fuzzy, there is a practical limit to the amount of time and analysis that should be spent on an issue that appears to not involve an undue risk to the public, given the acceptability of the aforementioned safety goals.