

February 4, 2005

Dr. Mario V. Bonaca, Chairman
Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: ESTIMATING LOSS-OF-COOLANT ACCIDENT FREQUENCIES
THROUGH THE ELICITATION PROCESS

Dear Dr. Bonaca:

I am responding to your letter of December 10, 2004, concerning the draft NUREG-series report describing efforts by the staff of the U.S. Nuclear Regulatory Commission (NRC) to develop loss-of-coolant accident (LOCA) frequencies using an expert elicitation process. The staff conducted this work in support of a broader effort to propose a new voluntary rule that would redefine the largest design basis LOCA from the current double-ended guillotine break (DEGB) of the largest pipe to a smaller size. We appreciate the time and effort the Advisory Committee on Reactor Safeguards (ACRS) has devoted to this review.

In your letter, the Committee recommended that the staff should revise the draft report before issuing it for public comment. As you requested, we will provide the Committee with a copy of the revised report once we have incorporated changes to address your specific comments, as follows:

- (1) *The report should include a better explanation of what a generic frequency value for the fleet of plants means and to what extent plant-to-plant variability affected the results.*

The expert panel was instructed to develop generic, or average, values for the commercial fleet; the instructions made no distinction between “generic” and “average.” In this activity, the panel considered the service history for the entire population of plants. However, because a few outliers do not significantly affect the fleet average, only factors that impact a large number of plants can significantly affect the average. Consequently, the panel was instructed to account only for broad plant-specific factors and not specific plant-to-plant variability. We will clarify this point in the revised report.

- (2) *The report should state clearly what the understanding of the experts was when they answered questions about the LOCA size categories.*

Your letter states that you “were told that some experts assumed that the calculated break size corresponded to double the flow rate while others did not.” Key technical terms, including the LOCA size categories, were defined during the elicitation process. Specifically, the LOCA size categories were defined as cumulative frequencies at a given flow rate; these flow rates were then converted to an equivalent pipe diameter.

Thus, the LOCA frequency associated with each LOCA size category relates to the cumulative frequency of a single-ended break of the cited size, and all larger breaks (including double-ended breaks) of that size and larger pipe.

- (3) *This practice [geometric averaging] is at variance with the methods employed in References 5–7, in which the arithmetic averaging method is applied to the probability distributions of the experts.*

As discussed in Section E.5 of the draft report, we use the geometric mean (GM) aggregation method because it is more appropriate than the arithmetic mean (AM) for aggregating the expert elicitation results we obtained. The key requirement for aggregation is that the group opinion must be somewhere in the middle of the group. For the very wide range of results we obtained, the GM method satisfies this requirement, while the AM method does not. In addition to the supporting rationale cited in the draft report, this approach was endorsed by the decision analyst on the external peer review panel.

Subsequent to our presentation at the ACRS meeting on December 2, 2004, we analyzed a mixture distribution (MD) aggregation as a sensitivity analysis. However, because the mixture distribution used is the average of the individual experts' distributions, the MD method yields results similar to those obtained using the AM method. Consequently, the above observation about the inappropriateness of the AM method also applies to the MD method.

While we believe the baseline results are an appropriate synthesis of the panel responses in light of the elicitation objectives and structure, we make no recommendation as to their appropriateness for other applications. Because of the demonstrated sensitivity of the baseline results to alternative assumptions and analyses, we believe the purposes and context of any application must be considered in using the study results. While this places an additional burden on users of the results, those users are in the best position to judge the extent to which the study results can be used for their particular applications.

- (4) *The final distribution reported in the Executive Summary should be the composite distribution that the analysts, based on the sensitivity analyses, believe represents the expert community's current state of knowledge regarding LOCA frequencies.*

We have revised the Executive Summary of the report to reflect our analysts' belief that, of all the group estimates considered, the study results best represent the expert panel's current state of knowledge regarding LOCA frequencies for the stated study objectives. We cannot claim that the study results represent the state of knowledge of the expert community.

It is not clear that the expert elicitation process, as conducted, supports a goal of representing the "expert community's" state of knowledge. First, while chosen to be broadly representative of the international expert community, the selected panel of 12 experts was not a random sample from this community. Second, the experts were asked about their personal opinions, and not about their assessment or perception of the expert community's opinion. To estimate the expert community's distribution based on the panel

results, it would be necessary to extrapolate from the known composition of the panel to the unknown composition of the expert community at large. Since the expert community in this area is small, the diversity of the experts on the panel used in this elicitation, including those familiar with worldwide service experience, is intended to encompass the breadth of views in the expert community.

As you are aware, the staff is now targeting the end of March 2005 as the time frame for issuing the proposed rule for public comment. We also plan to issue the revised NUREG-series report for public comment at that time.

Sincerely,

/RA/
Luis A. Reyes
Executive Director
for Operations

cc: Chairman Diaz
Commissioner McGaffigan
Commissioner Merrifield
Commissioner Jaczko
Commissioner Lyons
SECY

Dr. M.V. Bonaca

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