D890119

The Honorable Lando W. Zech, Jr.
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Zech:

SUBJECT: CODE SCALING, APPLICABILITY, AND UNCERTAINTY (CSAU) METHODOLOGY FOR DETERMINATION OF UNCERTAINTY ASSOCIATED WITH THE USE OF REALISTIC ECCS EVALUATION MODELS

During the 345th meeting of the Advisory Committee on Reactor Safeguards, January 12-14, 1989, we completed our review of the methodology developed by the NRC Office of Nuclear Regulatory Research (RES) for determining the overall uncertainty in calculation of the maximum fuel cladding temperature caused by loss of coolant accidents (LOCAs). This matter was also considered during our 344th meeting, December 15-16, 1988, and during a meeting of the Thermal Hydraulic Phenomena Subcommittee held on December 7, 1988. In our review, we had the benefit of discussions with representatives of RES and the Office of Nuclear Reactor Regulation (NRR). We also had the benefit of the documents referenced.

The Committee previously commented on the acceptability of the CSAU approach in a report to you dated September 17, 1987. At that time, the staff's development efforts were approximately at their mid-point. RES has now completed its development effort and has conducted a demonstration of the CSAU method as applied to the realistic calculation of the peak cladding temperature (PCT) for a large-break LOCA.

The objective of developing the CSAU methodology has been to provide a technical basis for quantifying uncertainty in estimates of the PCT expected in a large-break LOCA. Estimates are generated using the realistic analytical models and computer codes permitted under the revised emergency core cooling systems (ECCS) rule. The CSAU methodology is intended to provide not only a practical method for estimating uncertainty, but also one that is well documented and can be audited. This is especially important because calculation of PCT is complex and estimates of its uncertainty require the combination of quantitative analysis and expert opinion.

The CSAU methodology should serve as an appropriate guide for the NRR staff to use in reviewing future submittals from licensees under the revised ECCS rule. It should also serve as a model for methodologies that might be developed and used by licensees and their contractors.

RES has suggested that the general approach used on the CSAU program could be applied to the resolution of issues associated with the NRC's severe accident research effort. We agree.

Additional comments by ACRS member Harold W. Lewis are presented below.

Sincerely,

Forrest J. Remick
Chairman

Additional Comments by ACRS Member Harold W. Lewis

I have no problem with this letter, except that I believe the Committee has been too charitable toward the claim that this methodology sheds much light on the uncertainty question. Although extensive sensitivity analyses were performed as part of this program, sensitivity is not uncertainty. Unless there exists prior knowledge of the uncertainty in the input parameters, sensitivity analyses say nothing about uncertainty. To be sure, comparison of results with experiments would tell something about uncertainty, except that the codes are "matured" by this process. The residual uncertainty for other circumstances is then unknown.

While I applaud this effort, the ultimate question of interest is: "If the calculation predicts a temperature of X~F, what is the chance that it would really be (X+100)~F, if there were an accident." That is uncertainty, and CSAU contributes little to it.

Therefore, the Committee letter may be overenthusiastic in its endorsement of the CSAU methodology for the quantification of uncertainty.

References

1. U.S. Nuclear Regulatory Commission, NUREG/CR-5249 (draft), "Quantifying Reactor Safety Margins: Application of Code Scaling, Applicability, and Uncertainty Methodology to a Large Break Loss of Coolant Accident," October 24, 1988
2. U.S. Nuclear Regulatory Commission, NUREG-1230, "Compendium of ECCS Research for Realistic LOCA Analysis," April 1987

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