



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

December 20, 1979

*Rocket*  
50-263

ALL POWER REACTOR LICENSEES

Gentlemen:

On November 1, 1979, we met with reactor fuel vendors, some plant licensees, and other interested parties to discuss recently developed staff views on cladding rupture, swelling, and coolant blockage that could result from reactor accidents. Based on a preliminary evaluation of the correlations being developed, the NRC staff determined that parts of the ECCS models might be non-conservative in this area and therefore might not be in compliance with Appendix K of 10 CFR 50. We understand from the discussions at the meeting, confirmed by vendor letters of November 2, 1979, that differences between the present models and our preliminary correlations are either small within the limited range of applicability or that these differences do not produce large changes in peak cladding temperature. In either case, we now understand that such differences should not affect compliance with the temperature limit specified in 10 CFR 50.46 for licensed operating reactors. On this basis it might be expected that the effect on plants under review would also be small, but that effect has not yet been determined.

We are transmitting herewith our draft report on cladding rupture temperature, strain, and resulting assembly flow blockage; this report provides a full discussion of the information we presented at the November 1, 1979 meeting. Should you desire to comment on this draft report, "Cladding Swelling and Rupture Models for LOCA Analysis," please provide us with written comments by January 9, 1980. Because we are requesting a critique that will help ensure the technical quality of the final report, we request that the focus of your comments be technical in nature. You may also wish to address the topics for discussion that we have sent to the fuel vendors and which are set forth in the enclosure to this letter. We also welcome comments and suggestions on clarity so that the final report can be made complete and explicit on correlation derivation and use.

Sincerely,

*Darrell G. Eisenhut*  
Darrell G. Eisenhut, Acting Director  
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Enclosures:

1. Draft Report
2. Topics for Discussion

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## Topics for Discussion

1. Confirm that the Zircaloy cladding models displayed in Section 4.0 and which are referenced in Section 5.0 are the models that are used in your licensing LOCA analyses. Confirm that your models have been displayed accurately (i.e., to within +5%). If you are unable to respond affirmatively to the above requests, provide the appropriate references and describe the discrepancies.
2. The location, magnitude, and shapes of superplastic strain peaks and low-ductility valleys cannot be determined precisely from prototypical rod burst tests because there are too few such experiments with enough controlled variables. Do you have any information that would suggest altering the shapes and magnitudes of the strain and blockage correlation curves?
3. Most of the recent (since 1974) prototypical data were supported by public funds and are publically available. It therefore appears practical and beneficial to develop standardized rupture temperature, strain, and blockage curves. The curves in the report (or modifications that we might make) could serve as an interim licensing standard, and an industry standards committee could develop revised curves based on present and future research results.
4. It may be appropriate to require that approved vendor cladding models be revised to conform with the correlations that will appear in the final version of the report. If your present models are in agreement with, or conservatively overpredict, the NRC correlations over the range of temperature and stress of interest, and if you wish not to change your present curves your ECCS model revision could simply consist of explicit limits on the range of applicability of your correlations.
5. The alpha-plus-beta strain and blockage "valleys" portray a real phenomenon, but the exact location of the very steep sides of the valley may be unknowable for real LOCA conditions. Sensitivity analyses could be done to account for uncertainties in the location of the curves and in prediction of the rupture temperature and stress, but this would have the effect of narrowing the allowable calculated valley and creating a pseudo singularity in the analysis. It might be better for the licensing analysis to be insensitive to this feature.
6. The on-going NRC research program has produced data over a wide range of conditions. Based on discussions with those performing licensing LOCA analyses, it appears that the actual range of interest may be quite narrow, and that the future program could be beneficially focused on a narrower range.

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