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Secretary of the Commission
US Nuclear Regulatory Commission
Washington, DC 20555

Attention: Docketing and Service Branch

PROPOSED RULE CHANGE, REF. FEDERAL REGISTER VOL. 43, NO. 235, WEDNESDAY, DECEMBER 6, 1978

Gentlemen:

The following comments are offered relative to the subject proposed rule change. The comments expressed are my own opinion as an informed and concerned member of the public. I will first present my feelings on the general subject of the evaluation model, and then answer the specific questions on which NRC requested opinions.

The use of a large number of "conservative" assumptions to generate an "evaluation model" for assessing reactor safety is an unusual engineering practice. While limited knowledge or other expedients may have led to this being a satisfactory approach at the time of the rule making hearings, the whole concept should be reconsidered. It is my feeling that a more standard and straightforward procedure of performing realistic or "best estimate" analyses, and then providing for a reasonable safety factor or margin in the criteria (based on the demonstrated uncertainties in the analysis) has a number of strengths when compared to the present procedure.

The problems with the evaluation model procedure stem from the fact that it causes system designers, operators, and regulators to lose sight of reality. Some of the difficulties this can cause are as follows:

1. Concentration of research into areas that are not real contributors to the uncertainty in the calculation at the expense of researching the real productive areas. (An example of this is the great preoccupation of research with reflood; while in reality, peak clad temperature occurs during blowdown.)

2. Unrealistic determination of the worst case accident, and consequently possible improper optimization of protective systems.

3. Less safe safety systems resulting from systems that are more effective in meeting the requirements of the "conservative" rule, but less effective in fact. (An example may be a lower pressure accumulator system. Since the rule requires you to throw away all the water up to the "end of bypass," you might as well design your system to not inject any up to that time. This would make more water available later from the same size (but cheaper due to lower pressure) tank. In fact, injection of the water early is effective and safer.

4. Misrepresentation (overstatement) to the public of the potential hazard of nuclear power plants.

5. Inability to evaluate the true state of knowledge of the applicants performing safety calculations. (Of course I couldn't predict that experiment - my code is for safety analysis.)

6. Inability to accurately assess the sensitivity of the plant response to changing design variables. (When little heat transfer is allowed out of the rod, changes to flow or quality in the core will not affect clad temperature.)

Assuming now that the above engineering approach will not be adopted, my suggestions relative to the specific questions asked are as follows:

Q #1: Under what circumstances should corrections to ECCS models be used during licensing reviewed without necessitating complete reanalysis of a given plant or an entire group of plants?

A #1:

a. Any time the correction leads to a less severe plant response.

b. When the correction is brought up by the applicant. (My concern here is that the applicant will be more likely to make NRC aware of any errors he may uncover if the financial and schedule impact isn't so large.)

c. When a few scoping analyses adequately define the effect.

Q #2: What would be the impact of the proposed procedure-oriented and certain specific technical rule changes?

A #2: The procedural change (#1) should make reactor licensing more sensible. The idea behind items 2, 3 and 4 of removing fixed requirements on physical processes from the law is sensible and reasonable. In this way, the new knowledge gained through research can be put to use without such a cumbersome process as this proposed rule making change. The effect of allowing calculation of return to nucleate boiling may be much more significant than thought. There is only a little new data (LOFT L2-2) on high pressure rewet with Zr clad fuel rods. If this data is indicative of the difference in rewet behavior between stainless steel and Zr, the calculated cladding temperature may be greatly reduced by allowing RNB. The steam cooling change should only affect ice condensor plants; I don't have an estimate of how much. The transition boiling change should not reference a new paper; it should allow for the latest justifiable data to be used. I think the effect of the proposed change in transition boiling is small.

Removal of the 1.2 x ANS decay heat will have a significant effect on calculated peak clad temperature (several hundred degrees F). This change is absolutely justified. Replacing the Baker-Just oxidation rate equation will also be significant. This should also be a mandatory change as the Baker-Just rate law has been shown to be physically incorrect. The review of clad ductility data should pay special attention to the recent Japanese data that indicates significant loss of ductility may occur due to hydriding on the inside of ruptured cladding. The "additional data" changes should allow for use of data that shows the calculations are too conservative also, such as hot wall delay!

Q #3: How should safety margins be quantified and how can acceptable safety margins best be specified?

A #3: Overall safety margin requirements should be based on the concept of relative risk. The entire "birth-to-death" society cost of a nuclear plant should be at least as attractive as the society cost for an alternative viable energy source (e.g. coal). For licensing, this should be turned into hard numbers. For example, "the probability of the peak clad temperature exceeding 2200^{o}F for the lifetime of this plant shall be less than x."

Q #4: What phenomena have been identified since promulgation of the ECCS rule that are significant to ECCS performance and that are not adequately considered in the existing ECCS rule, in light of current knowledge and experience, or in current licensing practices?

A #4:

a. Those in proposed rule change (decay heat, RNB, etc.)

b. ECC bypass data shows bypass not complete (i.e. < 100%)

c. Blowdown data shows reactor does not empty of liquid prior to refill

d. No hot wall delay

e. Asymmetric downcomer flow aids ECC delivery

f. Moody x .6 = maximum break flow

g. Narrow range of conditions leading to "steam binding"

Q #5: How should the ECCS rule provide for the inclusion of new research information and operating experience? Can or should this be done on a continuing basis? How should provision of acceptable margins be handled in such a process?

A #5: The rule should only specify the performance criteria to be met (e.g. PCT < 2200°F) and the mechanism by which the applicant should prove that he meets that criteria. The NRC regulatory staff should review the calculations and supporting basis submitted by the applicant to determine if correct and justifiable analysis has been performed and substantiated. New research information and operating experience should be incorporated as soon as it has been validated. The acceptable margins are what the rule should define.

I hope this information will be of use to the Commission in deliberations on the proposed rule making. I am available for discussion or clarification of any items discussed herein.

Very truly yours,

L. P. Leach

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