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PURDUE UNIVERSITY SCHOOL OF NUCLEAR ENGINEERING

October 4, 1982

Mr. El Igne
ACRS
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear El:

RE: Comments on 9/30/83 PTS ACRS Meeting

Our 9/30 PTS working group meeting was in my opinion the best we have had so far. This is to a large degree due to the fact that the staff appears to have finally decided to "bite the bullet" but also due to the very effective method of presentation of Steve Hanouer.

I think that the overall approach is sound and that the choice of 270°F as an RT_{NDT} value is appropriate at this time. I think that substantial refinement remains to be carried out before we know the real margins and hence appropriate limits. This can only be accomplished if an appropriate framework is established. The staff has neglected to speak on this point and from the responses to some of my questions I am not sure whether they are adequately sensitive to this need. I hope that the ACRS will help here by following up on this matter.

I have a number of suggestions that derive but do not exhaust the general concern of the previous paragraph.

(a) All overcooling transients experienced to date should be carefully analyzed to quantify, to the extent possible, the cold leg/downcomer thermal hydraulic conditions.

(b) An effort should be made to identify and quantify vendor-specific aspects of overcooling probability projections.

(c) All presently available analyses as well as those to be performed should be documented and classified such that the key contributing scenarios may be identified and studied at will in more detail. That is, those scenarios yielding too high critical-RT_{NDT}'s are not of interest nor are those that yield very low values but have extremely low probability of occurrence. Due to the "steepness" of these curves a narrow band of such accident sequences will be dominant and one should be able to back out the sequences contributing to this band. Also the analyis assumptions (i.e., h, downcomer treatment, etc.) as well as transient results should be readily available for scrutinizing.

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(d) We need to carefully delineate from the diagnostic point of view the domain of PTS transients of *significance* and provide the operator with appropriate tools and instructions. All above suggestions, but particularly suggestion (c), should be useful in this regard. It is important that the operator is not lead to an overall situation whereby being too anxious to avoid the potentially minor PTS he may cause other problems.

(e) The method used by the staff to evaluate the small break RT_{NDT} is not appropriate. This method does not acknowledge the existence of stratification which a more careful evaluation of the CREARE data reveals. Based on some calculations I performed (paper enclosed) I believe that the staff temperature will be too high (compared to reality) early and too low later in the transient. My calculations indicate that the lower plenum is important but the CREARE data did not have a lower plenum. Experiments with lower plenum are to be run soon and then we will know whether I am correct in my criticism of the staff (and Westinghouse's) predictions.

(f) I believe there is an important error in nomenclature that causes a lot of confusion. Both the *critical* as well as the *vessel* transition temperatures are referred to by the same symbol, namely RT_{NDT}. The critical value comes from thermal-hydraulic/material/fracture calculations while the *vessel* value is a property of the material. The condition for crack propagation is that the critical value is below the vessel value. But since they are both denoted by the same symbol we cannot express this condition mathematically. Suppose, however, we choose to signify the critical value by $RT_{NDT,cr}$. Then the condition for crack propagation would be

$$RT_{NDT,cr} < RT_{NDT}$$

(g) Finally, I like to support the staff's proposal that PTS problems are anticipated by 3 years.

Sincerely,

T. G. Theofanous
Professor

TGT:wb