

*Backson*  
*Por*

DEC 9 1992

NOTE TO: G. Burdick

FROM : J. Hopenfeld

SUBJECT: Reply to your request for comments on Draft "RES POSITION ON STEAM GENERATOR TUBE INTEGRITY" by L.C. Shao

Based on certain data, discussed in Items 1-8, the document concludes that "it is reasonable to continue operation for one fuel cycle with flaws greater than 40% through-wall at TSP intersections." The document further suggests that "subsequent operation will require additional review after completion of one cycle and will include consideration of information developed at that time".

GENERAL COMMENT:

The information provided in Items 1-8, of the subject document does not address the main issue concerning steam generator tube integrity which arose from recent operating experience with CDSCC. The issue is as follows:

Is it safe to operate plants where an accident such as steam or feed line break may open existing but previously undetected cracks, which will result in a significant primary-to-secondary leakage. Whether the leakage is significant or not would depend on whether the operator can stop the leak before the RWST is depleted. Degraded tubes also may cause a significant increase in risk from severe accidents.

The fact that cracks within the TSP can withstand the MSLB pressure and that their length will not become critical during one fuel cycle is not an indication that they also will not leak. The Trojan burst test results show that three out of the 2 test specimen developed leaks at pressures, of 3300 psi, 7500psi, and 5500psi, with an average depth of penetrations of 38%, 58% and 72% respectively.

Item (7) points out that the above specimens "have shown no leakage under normal operating or MSLB pressure conditions". IT FAILS TO POINT OUT, HOWEVER, THAT THERE IS NO DATA WHICH WOULD ALLOW ONE TO RELATE THE ABOVE LEAKAGE WITH THE OBSERVED DEGREE OF DEGRADATION. In other words, if these specimen had undergone a more severe wall penetration would these specimens have leaked at 2600 psi?. Considering that the 21 specimen represent a sample of a population of 10,000, the conclusions in (7) above are questionable.

The document ignores two other tubes which were pulled out of two US plants and developed leaks at SLB pressures. The leakage was at least an order of magnitude higher than under normal delta ps. A third tube from a Belgian plant indicates a factor of eight increase in leakage under SLB conditions, (see Mar. 23 memo) . Theoretical

9212140072 921209  
PDR MISC  
9212140072 PDR

*JF05*  
*1/0*

considerations also indicate a factor of 1000 increase in leakage under SLB conditions.

In conclusion, the absence of a deterministic and empirical models for these newly observed cracks precludes the conclusions reached in the subject document. The claim that the conclusions in Item 9 are supported by items 1-8 could be considered valid only if one ignores the available data which indicate that higher than normal leakage will occur at SLB pressures even if the tubes do not rupture.

Finally the justifications for any plant operation should not be based on staff opinions or published data on SCC.

SCC is a semi empirical art, in the absence of applicable database other routes of approaching the problem should be considered.

The justification for operating with cracked tubes should be based on what procedures would the operator follow given certain primary to secondary leak and a MSLB between the containment and the MSIV. These justifications should clearly demonstrate compliance with 10CFR100.

I believe that the staff can more properly judge operator action than predict localized corrosion behavior.

#### SPECIFIC COMMENTS:

##### Item 1.

The EDM initiated grooves studies provide some measure of the ability of the tube to resist rupture given certain known wall imperfections. It bears little relation to how ODSCC form, propagate and leak in steam generator environments.

##### Item 4

This definition of "significant" is questionable. It makes no difference whether the cracks extend beyond the TSP if they leak at the gap. It appears that operators rely on such leakage because they lowered the leakage requirements during normal operations. Unless one can show that the TSP will cause cracks to plug and they will remain plugged under MSLB pressures the above definition may lead to confusion.

The statement that "upper bound laboratory ODSCC ....

would not be expected to occur during one fuel cycle " is not supported by data. The document should compare and present plant and laboratory data with regard to stress intensities and environments before making such claims.

#### Item 5

The high frequency quoted,  $6.8 \times 10^{-4}/RY$  contradicts the statement that " it is reasonable" , Item 9 , because this frequency would result in a core melt probability of  $6.8 \times 10^{-3}/RY$  with containment bypass as discussed in the March 27 Memo. The above number is considerably higher than present safety goals.

The statement that the key initiating event for SGTR is MSLB is incorrect when taken in the context of the entire document. Item 6 contradicts this statement.

#### Item 7

Although this item is correct, as stated, it presents only part of the data. As already discussed, three tubes leaked at Trojan. Three tubes from other plants also leaked at MSLB pressures. Rudimentary consideration dictate that leakage increases when  $\Delta p$  across the wall is increased.

#### Item 8

The lengthy discussion of uniform thinning only confuses the main issue. There are several ways that the reduction load bearing capabilities of a component due to corrosion can be accounted for there is nothing special about these equations. The ASME code takes this into account. The main problem here is LOCALIZED corrosion with an UNKNOWN ATTACK RATE.

#### Item 9

A discussion should be added of the type of new information which is required for the "additional review" to justify subsequent operations.

#### ATTACHMENT 1

Second Item : Dr. instead of Mr. or just Hopenfeld

The following is missing:

On Sep\* 11, 1992 J. Hopenfeld filed an addendum to the March 27, 1992 concluding that "strong coupling exists between hot leg mass flow, SG tube leakage and crack

On Sept 11, 1992 J. Hopenfeld filed an addendum to the March 27, 1992 concluding that "strong coupling exists between hot leg mass w, SG tube leakage and crack propagation. If confirmed, such a relation between system behavior and undetected tube defects may cause small leaks to quickly enlarge and results in a MULTIPLE TUBE RUPTURE BEFORE THE RCS IS DEPRESSURIZED BY FAILURE OF THE SURGE LINE. THE RESULTANT CONTAINMENT BYPASS WILL INCREASE THE SOURCE TERM."

J. Hopenfeld

cc;

P. Norian, Gm. Mazetis, W. Minners, E. Beckjord