

7/26/2000

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ISSUES - DRAFT SE

STAFF WAS UNABLE TO CONCLUDE THAT TUBE INTEGRITY CRITERIA COULD BE MET UPON PLANT RESTART AT TIME LICENSEE ELECTED TO PROCEED WITH SG REPLACEMENT.

UNRESOLVED ISSUES RELATING TO LICENSEE'S OPERATIONAL ASSESSMENT, INCLUDING:

- PROBABILITY OF DETECTION (POD) OF U-BEND CRACKS
- CRACK SIZE MEASUREMENT ERROR IN U-BENDS
- CRACK GROWTH RATES

COMMON DENOMINATOR: ASSUMED POD AND SIZING PERFORMANCE NOT VALIDATED BY DESTRUCTIVE EXAMINATION OF CRACKED TUBE SPECIMENS

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- PREDICTIVE MODELS
- RELATIVE SUSCEPTIBILITY OF ROW 3 U-BENDS TO CRACKING COMPARED TO ROW 2

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Staff Concerns Identified in July 20, 2000 Letter

NRC staff remains concerned about the ability of unplugged tubes with small radius u-bends to satisfy the applicable tube integrity performance (acceptance) criteria for the requested 4 month operating interval.

The staff's concerns stem from its review of the licensee's operational assessment.

Concerns fall into three main areas:

- probability of (flaw) detection assumptions
- flaw size measurement error assumptions
- material property assumptions

The licensee needs to address these concerns before the staff can make a final determination.

The staff requested additional information concerning these issues.

Probability of Detection (POD)

- The assumed POD performance of the high frequency plus-point in the IP-2 u-bends has not been validated.
- Assumed POD performance is based on performance demonstration data for the mid-range plus-point probe at tube dents.
- Staff is concerned that this assumption lacks technical justification and is potentially non-conservative due to differences in tube geometry, surface deposits, and signal to noise ratios.
- The staff believes the results of the licensee's analyses are very sensitive to the assumed POD. Note, POD is used to estimate the number and size of flaws which may remain undetected in tubes which are still in service.

Flaw Size Measurement Error

- The assumed flaw size measurement error distribution associated with use of the mid-range and high frequency plus-point probes in the IP-2 u-bends has not been validated.
- Assumed measurement errors are based on performance demonstration data for the mid-range plus-point probe at tube dents.
- The staff is concerned that this assumption lacks technical justification and is potentially non-conservative due to differences in tube geometry, surface deposits, and signal to noise ratios.

Flaw Size Measurement Error (Cont)

- The above concerns notwithstanding, the staff considers flaw sizing measurements based on the high frequency probe 800 KHz data to be more accurate than those based on the mid-range probe 400 KHz data due to significantly improved signal to noise.
 - Burst pressure estimates based on the 800 KHz flaw size measurements are 18% lower than those based on the 400 KHz measurements. Licensee needs to explain why its analysis appears insensitive to which set of measurements is used.
- The staff believes the results of the licensee's analyses are very sensitive to the assumed measurement error distribution. These distributions are used to estimate the number and size of flaws which may remain undetected in tubes which are still in service.

Material Properties

- Reference analysis (W) appears based on a best estimate material flow strength adjusted for strain hardening. Flow strength was assumed invariant with the initial non-strain hardened material properties.
- This assumption does not appear to account for the wide variability of this parameter as indicated by the material certification data for non-strain hardened tube material at IP-2.
- Additional justification for the assumption is needed. Alternatively, the operational assessment should be revised to account for the flow strength variability from tube to tube.
- Flow stress is an important input parameter to the licensee's analysis since burst strength is a linear function of flow stress.