6.0 HIGH VOLTAGE ALTERNATE REPAIR CRITERIA AT TUBE SUPPORT PLATES FOR SOUTH TEXAS UNIT 2

This section integrates the results of the prior sections of this report to develop the alternate repair criteria at the three lowest hot leg TSP intersections (TSPs C, F and J) above the FDB (Plate A). The general approach, design requirements, performance summary and recommended alternate repair criteria are provided in this section for the South Texas-2 SGs. Tube repair limits for the FDB, hot leg TSPs above TSP J and all cold leg TSP intersections are based on NRC Generic Letter 95-05 (Reference 1) and the South Texas Unit 2 1-volt ARC submittal (Reference 2).

6.1 General Approach to Tube Repair Criteria

In Reference 3, a 3 volt ARC was developed for TSPs C to M based on applying RELAP5 hydraulic TSP loads to demonstrate limited TSP displacements of ≤ 0.15” without tube expansion. The approach for the ARC of this report is to very conservatively define a 3 volt ARC independent of RELAP5 hydraulic loads and to provide large margins against even bounding hydraulic loads.

The elements of the approach to the tube repair criteria are:

- Limit the 3 volt ARC to the lowest 3 TSPs (plates C, F and J) above the FDB.
- Apply bounding hydraulic loads as developed in Section 3 of this report.
- Expand tubes at the TSP intersections to “lock” TSPs C, F and J to demonstrate acceptable SLB tube burst probabilities and leak rates for large hydraulic load margins even relative to the bounding hydraulic loads.

Limiting the 3 volt ARC to TSPs C, F and J restricts the ARC application to TSPs for which the SG flow would be one-dimensional even under SLB conditions. Consequently, the one-dimensional assumption used to develop the hydraulic loads (limiting and RELAP5 loads) is more clearly applicable since potential uncertainties due to mixing of the hot and cold leg flow above TSP L are eliminated. The partition plate separating the hot leg from the cold leg between plates B and L prevents hot and cold leg mixing over this span. Limiting the 3 volt ARC to 3 plates also limits the tube expansions to “lock” the TSPs to three plates. The maximum of 3 expansions in any tube limits the tube axial tensile stress at the top of the tubesheet that results from expanding the tubes, and minimizes the potential for circumferential cracking at the TTS expansion transition compared to a larger number of expansions per tube. In addition, the limitation of expansions to the 3 TSPs

reduces the interaction of displacements between TSPs, and excludes effects of upwards displacements at the higher TSPs, which tend to have the largest hydraulic loads, on the lower TSPs.

The bounding hydraulic loads are developed in Section 3, Table 3.2, under the assumptions of up-flow only and split flow (half of flow up and half down). The up-flow only assumption maximizes the loads at the upper TSPs and the split flow assumption maximizes the loads at the lower TSPs. The 50/50 split flow assumption to maximize the lower TSP loads is an overestimate of the expected down direction flow since the upward direction has lower flow resistance than the down direction path requiring flow up through the downcomer of the SG. The stagnation point for the split flow would be lower than the assumed plates L to M span (such as J to L span for RELAP5 results), and the lower TSP loads would be smaller than obtained from the bounding analysis assumptions. The bounding up direction loads on TSPs L to R, with a maximum pressure drop of 3.56 psid across TSP R, are about a factor of two higher than obtained from the RELAP5 results. The 2.33 psid load across TSP C bounds the down direction loads on TSPs C, F and J, and is about a factor of three higher than the RELAP5 loads. The maximum loads on the 3 volt ARC TSPs are -2.35 psid for TSP C, -1.37 psid for TSP F and +1.76 psid for TSP J, and the maximum load on any TSP is the +3.56 psid load at the top TSP (plate R).

Although the TSPs C, F and J displacements would be acceptable without TSP expansions even for the bounding TSP loads (See Section 6.2), 16 tubes are being expanded on the hot leg to “lock” the TSPs at plates C, F and J. The principal objective for the tube expansions is to provide additional hydraulic load margins above the bounding loads even though the bounding loads represent the limiting TSP pressure drops. The tube expansions maintain limited TSP displacements with increasing assumed loading conditions. At some point in the assumed increased loading conditions, the prediction of TSP displacements becomes unreliable because stresses in a structural member can be predicted to exceed yield and permit plastic deformation. The point of plastic deformation of a structural member defines the allowable loading condition and maximum TSP displacements as described in Section 6.2.

6.1.1 Allowable TSP Displacements for Acceptable SLB Tube Burst Probability

The overall objective is to have limited TSP displacements such that the tube burst probability is negligible for indications at TSPs C, F and J under the 3 volt ARC. Tube burst probabilities as functions of the throughwall crack length extending outside a TSP were developed in Section 9.3 of WCAP

15163, Revision 1. The calculated burst probabilities per indication are very small (order of 10^{-8} or smaller) for exposed throughwall lengths up to about 0.35". Assuming every hot leg TSP intersection had an exposed throughwall crack length of 0.308", the steam generator burst probability would be negligibly small at about 10^{-5}. Therefore, for the 3 TSPs under the 3 volt ARC, a maximum TSP displacement of 0.30" results in a total tube burst probability of $< 10^{-5}$. Clearly, maximum TSP displacements up to 0.30" are acceptable to obtain a negligible burst probability for TSPs C, F and J. Since this is a lower bound burst probability even if every TSP intersection has a throughwall crack exposed at 0.30", a total burst probability of 10^{-5} can be assigned to all 3 volt ARC indications in developing the total SG burst probability for the operational assessment.

6.1.2 Allowable TSP Displacements for SLB Leakage Considerations

Although an indication inside the TSP cannot burst, the flanks of a crack that could burst at SLB conditions can open up within the confines of the TSP. This condition has been labeled as an indication restricted from burst, or an IRB. Conceptually, the IRB leak rate can vary with TSP displacement that exposes part of the throughwall crack. A leak test program was performed to determine a leak rate that would conservatively envelop the leak rate from an IRB. This test program and results are described in Section 8 of WCAP 15163, Rev. 1.

For South Texas-2, the applicable SLB pressure differential is 2405 psid, based on the PORVs for pressure relief. At this pressure differential, the bounding IRB leak rate is 5.0 gpm (Section 8 of WCAP 15163, Rev. 1). The IRB leak rate, as compared to the much larger leak rate from a freespan burst, is dependent upon the ID of the TSP hole limiting the crack opening at or near the center of the crack. This crack opening constraint leads to a limit on TSP displacement. It is shown in WCAP 15163, Rev. 1 that tests were performed up to a maximum TSP displacement of 0.21" in developing the bounding IRB leak rate of 5.0 gpm. Since the throughwall crack lengths that led to the 5.0 gpm IRB leak rate were on the order of 0.6" or longer, the center of the crack limiting the crack opening would be inside the TSP for displacements up to about 0.3". For assessing conservative design margins, displacements up to about 0.3" are reasonable for application of the IRB leak rate. For the predicted bounding TSP loads, the maximum TSP displacements should be ≤ 0.21" to maintain the displacements within the database used to develop the 5.0 gpm IRB leak rate.

6.2 TSP Load Margins and Bounding Displacements

To estimate the limiting load margins and bounding TSP displacements, the results of Table 4.14 for single plate loading are applied. The intent is to estimate the margins on the pressure drops for any single plate since it would be unrealistic to apply the large load margins to all the plates. Without tube expansion, the maximum TSP displacements per unit load (per psid across the TSP) are given by Cases 102 and 103 of Table 4.14. The maximum load for the 3 volt ARC plates would be the down direction load on TSP C, which has a displacement of 0.0565" per psi load. The bounding downward load on this plate is –2.35 psid so that the bounding displacement would be –0.133". The maximum local TSP displacement in the upward direction is 0.0808" per psi load. As noted in Section 6.1, the maximum up direction load for TSPs C, F and J is +1.76 psid for TSP J, and the maximum up direction displacement for the bounding loads at these plates would be +0.142". These maximum displacements of –0.133" and 0.142" for the bounding hydraulic loads are well within acceptable values to limit burst probabilities to negligible levels and to remain within the test range of 0.21" displacement for the IRB leakage database. The maximum acceptable load is that at which a structural member becomes plastic such that the associated TSP displacements are no longer predictable. From Table 4.14, the limiting components for maintaining stresses in the elastic range are the TSPs. The pressure drops to reach yield in the TSPs with no tube expansion are +3.5 and –3.4 psid. These pressure drops provide a factor of 2 margin against yield on the maximum upward load of 1.75 psid at TSP J and a factor of 1.5 margin on the bounding downward load of 2.35 psid at TSP C.

The most conservative assumption to assess load margins would be to assume that the bounding top TSP R pressure drop of 3.56 psid applies for the lower TSPs C, F and J. This is twice the predicted bounding up direction load for TSP J and TSPs C and F would be expected to have downward loads under any realistic assumption for the flow stagnation point in a SLB event. For the upward direction 0.0808" displacement per psi load, the maximum TSP displacement for a 3.56 psid load would be 0.288". Even under this very conservative assumption, the displacements result in negligible burst probabilities even if it is assumed that all TSPs have this displacement. Although the displacement exceeds the 0.21" displacement test range for the IRB leakage data, the result is sufficiently close that the bounding IRB leak rate of 5.0 gpm can be considered applicable. From Table 4.14, the upward pressure drop to reach yield in the TSPs is 3.5 psid so that the maximum upward displacement of about 0.288" is also the maximum allowable displacement to maintain TSP stresses in the elastic range.

The above assessments show that TSP displacements are acceptable under the bounding load conditions even if no expansions are performed to “lock” the TSPs.

At South Texas-2, 16 hot leg TSP expansions will be performed to increase the design margins against the TSP hydraulic loads. The TSP displacement results of Case 112 from Table 4.14 can be used to estimate the expected TSP displacements and the acceptable load margins that result in TSP displacements maintaining the structural members within elastic limits. For the 16 tube expansions, the TSP displacement in the up direction is 0.0135” per psi so that applying the bounding up direction load of 3.56 psid (top TSP R) would result in TSP displacements of only about 0.048”. The limiting TSP load to maintain the TSPs within elastic limits is 14.3 psid. This load for maintaining elastic limits would result in a TSP displacement of about 0.19”. Thus, even for TSP loads as high as 14.3 psid, the TSP displacements would be less than the 0.3” acceptance guideline discussed in Sections 6.1.1 and 6.1.2 and the TSPs would remain elastic. The 14.3 psid load provides safety factors of 8.1 against the bounding up direction load of 1.756 psid at plate J for the 3 volt ARC TSPs, 6.1 against the bounding down direction load of 2.35 psid at TSP C and 4.02 against the maximum up direction load of 3.56 psid for the top TSP R. It can be concluded that the TSP expansions provide acceptable TSP displacement margins for loads well beyond the credible load conditions indicated by the bounding load of 3.56 psid at the top TSP R.

In summary, the maximum expected displacement for TSPs C, F and J with 16 tubes expanded is about 0.048” for the maximum bounding load of 3.56 psid, which envelopes the limiting case of 2.35 psid on TSPs C, F and J. TSP loads as high as 14.3 psid result in an acceptable maximum TSP displacement of about 0.19” based on the maximum load that maintains TSP stresses within elastic limits. Since the tube expansions are not required to limit TSP displacements to acceptable values for the bounding loads, the addition of the 16 hot leg tube expansions to “lock” the TSPs leads to the very conservative margins on hydraulic loads. Table 6-1 summarizes the conservatism and load margins incorporated in the design for implementation of the 3 volt ARC.

6.3 Tube Repair Limits for South Texas Unit 2

Tube repair limits are required for ODSCC indications at the hot leg TSPs, at the FDB and at the cold leg TSPs. At the time of this report, few indications in Model E SGs have been reported at the FDB intersections or at cold leg TSP intersections. The largest voltage indications and the largest number of indications occur at the lower TSPs C, F and J. Therefore, for indications at TSPs above TSP J including the cold leg TSPs and for the FDB, it is adequate

and conservative to apply the GL 95-05 ARC for ODSCC at TSPs, which are based on the assumption of free span indications at SLB conditions. The GL 95-05 criteria are the recommended repair criteria for ODSCC indications at the FDB and intersections above TSP J including the cold leg TSP intersections (i.e., all intersections except TSPs C, F and J). The repair limit for these indications is 1.0 volt. For these TSP indications, the appropriate structural limit would be $1.43\Delta P_{SLB}$ since the R.G. 1.121 margin of $3\Delta P_{NO}$ is satisfied at normal operating conditions due to the constraint provided by the TSPs. Due to the large tube to FDB clearances, constraint against burst cannot be confidently assured and the $3\Delta P_{NO}$ structural margin requirement is appropriate for indications at the FDB intersections. GL 95-05 requires the upper voltage repair limit to be updated on an outage-by-outage basis to the latest database, correlations and growth information. Separate upper voltage repair limits will be provided for the TSP and FDB intersections as described in the South Texas-2 1-volt ARC submittal of Reference 2. Bobbin indications >1.0 volt and below the upper voltage repair limit that are not confirmed by RPC inspection may be left in service.

For free span indications, tube repair limits are based on the R.G. 1.121 guidelines for structural margins against tube burst as discussed above for indications at TSPs and at FDBs. Since the small maximum TSP displacement during a postulated SLB event reduces the tube burst probability at TSPs C, F and J to negligible levels ($< 10^{-5}$), independent of the degree of ODSCC at the hot leg TSP intersections (i.e., all hot leg TSP intersections are assumed to have throughwall indications), tube repair limits for axial tube burst are not required for these TSPs. Tube repair is primarily required only as necessary to maintain SLB leakage within acceptable limits. The structural limit for the hot leg TSP intersections and the full ARC repair limit for limited displacement of the TSPs is addressed below.

As developed in Section 9.8 of WCAP 15163, Rev. 1, a structural limit for axial tensile tearing of cellular and IGA indications applies at very high voltages with limited TSP displacements. This structural limit appears to be in excess of [ ][a,c] volts. Even if a factor of two reduction is applied for growth and NDE allowances (factor of about 1.5 to 1.75 is typical), the full ARC repair limit would be about [ ][a,c] volts. For conservatism in defining the ARC repair limit for limited TSP displacement, a tube repair limit of > 3.0 volts is conservatively applied for indications at hot leg TSPs C, F and J for the South Texas-2 SGs. Bobbin indications > 3.0 volts are repaired at these TSPs independent of RPC (or equivalent probe) confirmation.

6.4 Inspection Requirements

The GL 95-05 requirements applied for the 1-volt ARC eddy current inspections also apply for implementation of the limited displacement ARC. However, the inspection threshold for RPC confirmation of bobbin indications should be adjusted for the increased repair limits. RPC inspection of bobbin indications greater than the 3.0 volt repair limit with a sample inspection of a minimum of 100 intersections below the 3.0 volt repair limit will be applied at hot leg TSPs C, F and J intersections. The GL 95-05 1.0 volt RPC threshold is applied for the 1.0 volt repair limit at hot leg intersections at plates L through R, at the FDB and at cold leg TSP intersections.

As noted in Section 6.2, the tube expansions at TSPs C, F and J are not required to limit TSP displacements to acceptable levels for the bounding hydraulic loads. The TSP expansions provide for large margins on the TSP hydraulic loads while maintaining acceptable TSP displacement and structural component stresses within elastic limits. Given the expansions to “lock” TSPs C, F and J and limit displacements, the dependence of TSP displacements on the stayrods and peripheral supports is reduced significantly. As a consequence, inspections of the stayrods and peripheral supports (support bars and wedges) are not required for adequate structural integrity to limit displacements. There has been no evidence of cracked welds at South Texas TSP support bars or wedges. No Westinghouse plant has identified a loss of structural integrity for the stayrods such as might be associated with the loss of the locking nut at the top TSP. The tube expansions more than compensate for an assumed loss of one stayrod or one peripheral support, either of which is a very low likelihood event over the planned one operating cycle with the 3 volt ARC at South Texas-2.

6.5 SLB Analysis Requirements

Per GL 95-05, SLB leak rate and tube burst probability analyses for condition monitoring are required prior to returning to power and the results are to be included in a report to the NRC within 90 days of restart. SLB leak rates and burst probabilities obtained for the actual voltage distribution measured at the inspection (condition monitoring) are required prior to restart and the projected next EOC values (operational assessment) are required in the 90 day report. If allowable limits on leak rates and burst probability are exceeded for either the condition monitoring or operational assessment, the results are to be reported to the NRC and an assessment of the significance of the results is to be performed. For the limited displacement ARC, SLB leak rates must be calculated for the hot leg TSP indications at plates C through J, and both leak rates and tube burst probability are to be calculated for the

FDB, cold leg TSP indications and hot leg indications at plates L through R. The contribution to the tube burst probability for TSPs C, F and J would be < 10^{-5} and can be neglected in the tube burst probability analyses. The required SLB analyses are discussed below.

The SLB leak rates for hot leg TSP indications at plates C, F and J are to be calculated as free span leakage using the GL 95-05 leak rate methods, if the sampled indication is not found to be a potentially overpressurized indication. Potentially overpressurized indications in the Monte Carlo analyses are indications for which the sample is predicted to burst as a freespan indication. For indications that are found to be potentially overpressurized indications, the bounding leak rate of 5.0 gpm for indications restricted from burst (IRB) is applied. Free span leak rate methods must be applied for the FDB and cold leg TSP indications and hot leg indications at plates L through R. The free span leak rates are based on the EPRI methodology for correlating probability of leakage and SLB leak rates with bobbin voltage. Acceptable methods are described in WCAP-14277, Revision 1 (Reference 4).

As noted above, in addition to the free span leak rates, the leak rate analyses for hot leg TSP indications at plates C, F and J (TSPs with 3 volt ARC) are to include the potential leakage from overpressurized indications within the TSP. There is a finite probability that a crack might open up significantly more than the crack opening that occurred in the SLB leak rate measurements. The probability that a crack will open up to the limits of the tube to TSP gap is equivalent to the probability of free span burst. The analysis methods for the overpressurized condition are given in Section 9.5 of WCAP 15163, Rev. 1. The overpressurized condition leak rates are obtained from the probability of free span burst and the bounding leak rate of 5.0 gpm (IRB bounding leak rate) for the overpressurized condition.

The SLB leak rate analysis can be symbolically represented as:

$$LRSLB = [(1\text{-}POB)*POL*LR_c + POB*LR_b]_{\text{Hot Leg TSPs C, F and J}} + [POL*LR_c]_{\text{FDB+Cold Leg TSPs+Hot Leg TSPs L to R}}$$

where:

LRSLB = Total SLB leak rate
POL = Probability of leakage based on POL versus voltage correlation
LR_c = Leak rate based on leak rate versus voltage correlation
POB = Probability of burst at SLB conditions for hot leg TSP indications based on free span burst pressure versus voltage correlation (zero or one)

LR_b = Bounding leak rate for overpressurized indications as developed in Section 9.6 of Reference 3

The free span tube burst probability must be calculated for the FDB, hot leg TSPs L to R and cold leg TSP indications per the requirements of the GL 95-05. The contribution to the burst probability for TSPs C, F and J can be assumed to be < 10^{-5}. The free span analysis methods are described in Reference 4. Per NRC GL 95-05, the burst probability limit for reporting results to the NRC is >10^{-2}.

6.6 Summary of South Texas-2 ARC at TSPs

This section provides a summary of the alternate tube repair criteria (ARC), as developed above, to be applied at South Texas-2 tube support plates, including plates C, F and J with limited SLB displacement. This summary includes the tube repair limits, general inspection requirements, SLB leak rate and tube burst probability analysis requirements. SLB analysis methodology is summarized in Section 6.5 and described in detail in Section 9 of WCAP 15163, Rev. 1. Tube expansions at 16 locations on TSPs C, F and J are required to support these ARC. A summary of the conservatism and load margins for the ARC design is provided in Table 6-1.

South Texas-2 Tube Repair Limits

- For hot leg TSP indications at plates C, F and J, bobbin flaw indications >3.0 volts shall be repaired independent of RPC confirmation.

- For indications at hot leg plates L through R, at the FDB and at cold leg TSP intersections, bobbin flaw indications >1.0 volt and confirmed by RPC inspection shall be repaired. Bobbin flaw indications greater than the upper voltage repair limits for South Texas-2 indications at these intersections shall be repaired independent of RPC confirmation. The upper voltage repair limits for hot leg plates L through R, for the FDB and for cold leg TSP intersections shall be updated at each inspection based on the latest database, correlations and plant specific growth rate information. Growth rates as required by GL 95-05, 2.a.2 shall be used to develop the upper voltage repair limits.

- All indications found to extend outside of the TSP and all circumferential crack indications shall be repaired and the NRC shall be notified of these indications prior to returning the SGs to service.

- All flaw indications found in the RPC sampling plan for mechanically induced dents (corrosion denting is not present with stainless steel TSPs

at South Texas-2) at TSP intersections and bobbin mixed residuals potentially masking flaw indications shall be repaired.

- For the South Texas-2 Model E SGs, no intersections near TSP wedge supports are excluded from application of ARC repair limits due to potential deformation of these tube locations under combined LOCA + SSE loads.

General Inspection Requirements

- The bobbin coil inspection shall include 100% of all hot leg FDB and TSP intersections and cold leg TSP intersections down to the lowest cold leg TSP with ODSCC indications. The lowest cold leg TSP with ODSCC indications shall be determined from an inspection of at least 20% of the cold leg TSP intersections.

- All bobbin flaw indications exceeding 3.0 volts for hot leg TSP intersections at plates C to J, and 1.0 volt for hot leg intersections at plates L through R, for all FDB intersections and for all cold leg TSP intersections shall be RPC (or equivalent probe) inspected. In addition, a minimum of 100 hot leg TSP intersections at plates C through J with bobbin voltages less than or equal to 3.0 volts shall be RPC inspected. The RPC data shall be evaluated to confirm responses typical of ODSCC within the confines of the TSP.

- A RPC inspection shall be performed for intersections with mechanically induced dent signals >5.0 volts and with bobbin mixed residual signals that could potentially mask flaw responses near or above the voltage repair limits.

- Visual inspections of the stayrods or peripheral supports are not required to adequately limit TSP displacements and maintain structural integrity. The TSP expansions at TSPs C, F and J provide for large margins on the TSP hydraulic loads while obtaining acceptable TSP displacements and maintaining structural component stresses within elastic limits. The tube expansions more than compensate for an assumed loss of one stayrod or one peripheral support, both of which are very low likelihood events over the planned one operating cycle with the 3 volt ARC at South Texas-2.

SLB Leak Rate and Tube Burst Probability Analyses

- SLB leak rates and tube burst probabilities shall be evaluated for the actual voltage distribution found by inspection and for the projected next EOC distribution.

- Based on the voltage distribution obtained at the inspection, the SLB leak rate shall be compared to the South Texas-2 allowable. The SLB tube burst probability for FDB and cold leg TSP intersections and the hot leg intersections at plates L through R shall be compared to the reporting value of 10^{-2} and the NRC shall be notified prior to returning the SGs to service if the allowable limits are exceeded. If the allowable limits are exceeded for the projected EOC distribution, the NRC shall be notified and an assessment of the significance of the results shall be performed. A report shall be prepared that includes inspection results and the SLB analyses within 90 days following return to power.

6.7 References

1. NRC GL 95-05; "Voltage Based Repair Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking"; August 1995
2. SG-98-01-004; “South Texas Project Unit 2 Technical Justification for License Amendment to Implement NRC Generic Letter GL 95-05 Voltage Based Repair Criteria for Steam Generator Tube ODSCC”; January 1998
3. WCAP-15163, Revision 1, “Technical Support for Implementing High Voltage Alternate Repair Criteria at Hot Leg Limited Displacement TSP Intersections for South Texas Plan Unit 2, Model E Steam Generator,” March 1999
4. WCAP 14277; SLB Leak Rate and Tube Burst Probability Analysis Methods for ODSCC at TSP Intersections (Revision 1); December 1996

Table 6-1
Summary of Conservatism and Load Margins for Application of the Limited TSP Displacement ARC

Issue	Conservatism Identified
Hydraulic Loads for TSP Displacements	Bounding loads developed to envelop potential TSP pressure drops. Loads bound prior RELAP5 loads at all TSPs.
Tube Expansions to “Lock” TSPs	16 tubes expanded in hot leg at TSPs C, F and J even though expansions not required to obtain acceptable TSP displacements for bounding loads.
TSP Displacements	TSP displacements with expanded tubes are limited to maximum of about 0.048” for bounding loads
Hydraulic Load Margins for Acceptable TSP Displacements	• TSP displacements < 0.21” for TSP loads as high as 14.3 psid, which provides design margin safety factor of about 3.74 against bounding TSP loads. • Acceptable load margins to 14.3 psid limited by value at which TSP ligament stresses exceed elastic limits. • TSP displacements < 0.3” required to obtain tube burst probability $< 10^{-5}$, and < 0.21” desirable for application of the IRB bounding leak rate.
Burst Probability Estimate of $< 10^{-5}$ for Contribution from TSPs C, F and J	Conservatively, all hot leg TSPs are assumed to have exposed throughwall indications of 0.3” under SLB conditions.
SLB Leakage	SLB leakage based on applying a bounding IRB leak rate for all indications predicted to burst under free span conditions and free span leakage for indications not predicted to burst under free span conditions. All leak rates very conservatively assume open crevice conditions with maximum tube to TSP hole clearance
Tube Repair Limit	Although axial tensile rupture data support a much higher repair limit, the tube repair limit is very conservatively set at 3 volts.