1. Introduction

WCAP 15163, Revision 1 provided the technical basis for proposed 3V Alternate Repair Criteria (ARC) for ODSCC at tube support plate (TSP) intersections in the South Texas Plant Unit 2 steam generators (SG). The technical basis justifying the 3 V ARC was based on analyses that showed that TSP displacement during main steam line break (MSLB) accident conditions would not exceed 0.15" maximum at the TSPs for which the ARC were proposed. It was shown that the probability of burst (POB) was much less than the 10^{-2} limit established by GL 95-05 (Reference 1). Leak rate tests data were included that provided a bounding leak rate for indications at TSP intersections that were predicted to be sufficiently large that they would burst if they occurred in the freespan of the tube, based on the freespan burst correlation included in the licensed 1 Volt ARC according to Reference 1.

This report is an addendum to WCAP 15163, Revision 1 that provides additional information to support the proposed ARC, specifically with regard to the conservatism of the hydraulic loading on which the TSP displacements are based, and documents the added conservatism provided by expanding a number of tubes at each of three TSPs to lock the TSPs in place.

The basis of the TSP displacement analyses in WCAP 15163, Rev 1 was input transient hydraulic loads calculated using RELAP5. During review of the technical report, WCAP 15163, Rev 1, the NRC provided a request for additional information (RAI) (Reference 2), which was further clarified by the NRC during subsequent discussions. The staff noted that the application of RELAP5 to determine TSP loading during a MSLB was not considered inappropriate, but that validation of the code version utilized against available test data was necessary prior to its application to provide input hydraulic loading for the TSP displacement analysis for STP Unit 2.

In response to the NRC position, a bounding analysis was initiated, based on conservative first-principles assumptions, to determine bounding hydraulic loads and TSP deflections that do not depend on the use of RELAP5. The objective of this analysis was to demonstrate the significant margins for POB that exist for the 3V ARC. Section 3 of this report presents the bounding hydraulic analysis methods and the resulting TSP pressure drops.

The proposed application of the 3V ARC was limited to the hot leg of the three TSPs above the flow distribution baffle (FDB) in the STP-2 SGs to reduce uncertainties in the calculation of the TSP loading. In addition, to add conservatism, expansion of 16 tubes at each of the three TSPs to lock them in place was added to the proposed ARC. The tube expansion process

and the restraint loading provided by the tube expansions are discussed in Section 5.

TSP displacement analysis is discussed in Section 4. The analysis is a static, elastic analysis that assumes unit loading. The results of this analysis can be extrapolated within defined limits because the analysis is an elastic analysis.

The POB analysis is adequately addressed in WCAP 15163, Rev 1, Section 9. The POB is shown to be $<<10^{-2}$, the limit specified in Reference 1.

Section 6 discusses the Alternate Repair Criteria based on the bounding hydraulic loads and the addition of TSP locking by expansion of tubes at each of the hot leg support plates (C,F, and J) for which the 3-Volt ARC are intended to apply.

References:

1. "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking," Generic Letter 95-05, dated August 3, 1995
2. NRC Letter, T. Kim to W. Cottle, "South Texas Project, Unit 2 – Request for Additional Information re: Licensing Amendment Request Associated with Modifying Alternate Repair Criteria of Steam Generator Tubes at Certain Intersections of the Tubes and Tube Support Plates (TAC No. MA8271)", AE-NOC-00000699, dated October 31,2000.