D911115

The Honorable Ivan Selin
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Chairman Selin:

SUBJECT: STEAM GENERATOR TUBE REPAIR LIMITS

During the 379th meeting of the Advisory Committee on Reactor Safeguards, November 7-8, 1991, we discussed the NRC's steam generator tube repair limit. Our Subcommittee on Materials and Metallurgy reviewed this matter during a meeting on November 6, 1991 and had the benefit of discussions with representatives of the NRC staff and an EPRI/industry committee for alternate repair limits for steam generators.

The sudden rupture of steam generator tubes due to a transient such as a steam line break or a seismic event needs to be precluded. To prevent such ruptures, the Technical Specifications of a plant define an inspection plan for steam generator tubing. In the Technical Specifications, the plugging limit is expressed in terms of imperfection depth alone, and not in terms of imperfection area. The limit of 40 percent on depth is appropriate for general thinning of the tube wall, or for long cracks. However, it is a poor indicator of reduction in burst pressure if the imperfections are deep pits or flaws that are little wider than they are deep.

A repair limit based on depth alone was appropriate when general wall thinning was a common mechanism of tube degradation. However, as water chemistry has improved over the last decade, it has been much more common for the flaws that develop to be short cracks that are localized in areas such as a support plate, or the tube sheet. It is difficult to find and gauge these cracks.

Analysis, burst tests, and experience in many European nuclear plants show that a few short cracks do not have a significant effect on the burst pressure of a tube, even if the cracks go all the way through the tube wall. It is only when these cracks line up and effectively form a long flaw that they significantly reduce the burst pressure. The continued use of the 40 percent depth limit as a repair limit results in a large effort by the licensees and a significant exposure to workers, and leads to the repair of many tubes that have a negligible risk of failure. We urge that the staff be encouraged to work with the industry to establish more appropriate and generic repair limits in a timely manner.

Additional comments by ACRS Member Harold W. Lewis are presented below.

Sincerely,

David A. Ward
Chairman

Additional Comments by ACRS Member Harold W. Lewis

The instruments used in the tube inspections depend upon the effect of the tube on the inductance and mutual inductance of magnetic coils at frequencies for which the tube thickness is comparable to the skin depth. Such measurements of gross properties are in principle insensitive to the morphology of the cracks, and are in particular not unique indicators of crack depth. The staff is therefore regulating according to a parameter that cannot be uniquely measured. These are instruments which are ancient in concept, and some research attention to the development of more discriminatory instrumentation could help a great deal. It is a mistake to believe one is measuring something that is beyond the capability of the measuring instrument.