



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Docket Nos.: 50-369
and 50-370

LICENSEE: Duke Power Company
FACILITY: McGUIRE NUCLEAR STATION, UNITS 1 AND 2
SUBJECT: TELEPHONE CONVERSATION REGARDING TUBE PLUGGING CRITERION
McGUIRE NUCLEAR STATION, UNITS 1 AND 2

On July 15, 1986, a telephone conference call was held between the NRC, Duke Power Company (the licensee) and Westinghouse regarding alternative steam generator tube plugging criterion for defects located in the tube sheet region. Participants are listed by the enclosure.

By letters dated June 24 and July 1, 1986, the licensee has proposed a criterion called "P-Star" based on analyses to show that a postulated separated tube would experience limited travel within the tubesheet because the separated tube would be captured by an adjacent intact tube. The NRC recommended that the licensee revise the approach in these letters based upon a demonstration of tube pullout resistance (i.e., the contact pressure between the hardrolled tube and tubesheet) sufficient to preclude any tube travel. Such an approach, called "F-Star", is discussed in Westinghouse Report No. 10949, "Tubesheet Region Plugging Criterion for Full Depth Hardroll Expanded Tubes", dated September 1985.

The NRC requested that in the development of its F-Star criterion, the licensee consider the following concerns:

- (1) Because the flaw sizing uncertainty for the stress corrosion cracks in the tubesheet region is large with existing eddy current testing methods, tube plugging may be required if any indication is found within the F* region. The licensee should work towards qualifying eddy current sizing techniques for this type of degradation.
- (2) The Westinghouse report contains no information on tube pullout tests. The licensee should provide test data to support the F* pullout analysis.
- (3) The Westinghouse report contains test data on estimating the contact pressure based on hardrolling tubes in cylindrical collars. The licensee should discuss the difference in contact pressure between hardrolling into a tubesheet versus the test collar.
- (4) In the second paragraph on page 10 of the Westinghouse report, there is a discussion on the reduction of contact pressure resulting from yielding of the tube at heatup. The licensee should provide clarification of this effect since this reduction does not appear to be reflected in the calculation of contact pressure.

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- (5) Because boric acid attacks ferritic steel, a tube with a through-wall flaw below the F* region may eventually result in a loss of contact pressure. In addition, if leakage occurs up the tube, a lubricated interface may exist between the tube and the tubesheet, reducing the friction coefficient. The licensee should discuss the effect of the corrosion and the variation in the friction coefficient on the pullout force.
- (6) Tube degradation may affect the contact pressure. The licensee should consider the effect of tube degradation on the F* distance and the extent of degradation allowed.
- (7) The Westinghouse report contains calculations of contact pressure based on the average of test data. The licensee should use the lower bound data for analysis and should clarify any introduced margins.
- (8) Hardrolling tubes may introduce overroll (hardrolling to above the top of the tubesheet) and underroll (hardrolling to below the top of the tubesheet). The licensee should verify the extent of overroll and underroll at McGuire for each tube for which this method is intended to be applied. A commitment to account for overrolling and underrolling should be provided.
- (9) The Westinghouse report contains little detail of analytical procedures. The licensee should provide the analysis used so that the staff can verify or reproduce the calculations.
- (10) Eddy current testing of the steam generators in McGuire Units 1 and 2 has been completed. The licensee should document the characteristics of stress corrosion cracking detected.

The staff noted that because of the limited test data and operating experience with stress corrosion cracks in the tubesheet region, initial approval of the F-Star criterion is likely to be limited to one or two fuel cycles, or otherwise conditioned on subsequent results.

The licensee indicated that written replies to the above concerns would be submitted during the week of July 21, 1986. A meeting on these replies will be scheduled shortly after receipt. The meeting will also review results of the eddy current tests for the current Unit 1 refueling outage and for the recent Unit 2 outage.

Sincerely,

Darl Hood, Project Manager
PWR Project Directorate #4
Division of Licensing-A

Enclosure: As stated

cc: See Next Page

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Enclosure

Telecon Participants

July 17, 1986

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