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**NORTHEAST UTILITIES**



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May 7, 1980

Docket No. 50-336

Director of Nuclear Reactor Regulation  
Attn: Mr. Robert A. Clark, Chief  
Operating Reactors Branch #3  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Reference: (1) W. G. Council letter to R. Reid dated April 13, 1979.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2  
Steam Generator Tube Eddy-Current Inspection

In Reference (1), Northeast Nuclear Energy Company (NNECO) provided to the NRC Staff preliminary eddy-current test data generated during the Steam Generator tube inspections conducted during the March, 1979 refueling outage. This data exhibited a negative one (1) to two (2) mil dent size progression at tube support plate elevations (TSPL) for Steam Generator No. 1 and a positive one (1) to two (2) mil dent progression at TSPL elevations for Steam Generator No. 2. However, upon consideration of the test accuracy of  $\pm 2$  mils, NNECO concluded that "dent progression at TSPL elevations was essentially insignificant".

Although the data provided in Reference (1) was essentially complete, some additions and revisions were subsequently incorporated. NNECO notes that the additions and revisions contained herein have not resulted in any substantive changes in the results presented in Reference (1). Final dent progression statistics are summarized in the attached Figures 1 through 8 which replace Figures 1 through 8 of Reference (1). In addition, final data summaries are provided in Tables I through IV. These data tables represent results of inspecting in excess of 99% of all accessible TSPL tubes.

In light of the  $\pm 2$  mil random error associated with the eddy-current results, NNECO considered the negative dent progression identified in Reference (1) for Steam Generator No. 1 suspect. Hence, both the test procedure and the data base were further analyzed to determine whether a possible bias existed which could account for the negative dent progression.

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To determine if a test bias existed on the Millstone data for one or both steam generators, a computer program was written to process all the dent data taken during the 1978 and 1979 inspections. This program calculated the average dent growth as a function of 1978 dent size. Since the suspected bias is a relative error, NNECO determined that the effect would increase with dent size. Plots of the data processed in this manner are shown in Figures 9 and 10. A best-fit line has been calculated for the data from 0 to 15 mils for each plot. The slope of the line will indicate any bias in the data, with zero slope indicating no bias. The (y) intercept will provide an estimate of growth since the relative error associated with a zero dent will vanish.

Reviewing the two plots, the best-fit line equations are:

$$\begin{aligned} \text{Steam Generator No. 1 growth} &= (-0.25) (1978 \text{ size}) + 1.54 \text{ mils} \\ \text{Steam Generator No. 2 growth} &= (0.026) (1978 \text{ size}) + 1.41 \text{ mils} \end{aligned}$$

Figure 9 indicates that for Steam Generator No. 1, a strong negative bias exists (-25%). The unbiased growth estimate, on the average, is +1.5 mils.

The plot of average dent growth vs. dent size for Steam Generator No. 2, illustrated in Figure 10, indicates essentially no bias (2%) and a positive 1.4 mil dent growth. This value compares well with the gross change in the average dent growth of 1.6 mils.

NNECO has determined that the biases identified in the test data could have resulted from certain test procedures utilized at Millstone Unit No. 2. The test procedure utilized at Millstone Unit No. 2 specifies equipment calibration by adjusting the electronic instruments to produce an 8 volt signal for an 8 mil radial dent, thereby resulting in a conversion factor of one (1) volt per mil. Furthermore, the test procedure allows for a tolerance of 0.1 volt per mil without applying a correction factor to the data. Therefore, for an actual 9 mil dent, the response could range from 9.9 to 8.1 mils, representing total difference of 1.8 mils. This range can account for a relative error as high as 20% of the reading.

In addition to biases in the testing procedure, variations in the actual size and shape of 8 mil dent calibration standards utilized for eddy-current equipment calibration will introduce biases into the examination data. Efforts are presently underway to assure that particular calibration standards are utilized for specific steam generators for future eddy current examinations.

NNECO has completed the review of the Steam Generator eddy-current examination data and has corrected for any biases which have been identified in the testing procedures. NNECO has determined that both Steam Generators at Millstone Unit No. 2 show a small positive dent progression at the TSPL elevations of approximately 1.5 mil. Since no mechanism for dent shrinkage between Steam Generator surveillances exists, NNECO considers these results more plausible and maintains the Reference (1) conclusion that little or no dent growth has occurred in the Steam Generators in use at Millstone Unit No. 2.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Council  
W. G. Council  
Vice President

By: D. C. Switzer  
D. C. Switzer  
President

Attachment