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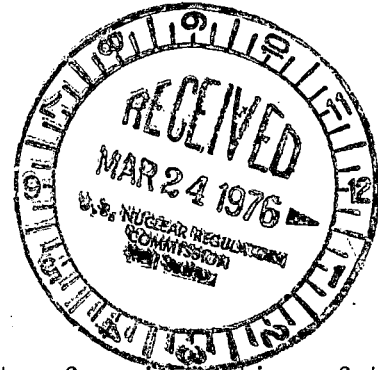
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March 22, 1976

Director of Nuclear Reactor Regulation
Att: Mr Robert A. Purple, Chief
Operating Reactor Branch No 1
US Nuclear Regulatory Commission
Washington, DC 20555


DOCKET 50-255, LICENSE DPR-20 -
PALISADES PLANT - CORRECTIONS,
MARCH 1976 EDDY CURRENT TEST REPORT



Our submittal of March 9, 1976 presented the results of an inspection of the Palisades steam generator, the basis for developing an operating allowance, and the length of run to be permitted prior to the next inspection.

Following a review of this submittal and comments by the Regulatory Staff we have noted a number of errors and a need to clarify information presented. The following corrections, revisions and/or additions are submitted:

1. The title page "Report of Eddy Current Testing, Data Evaluation and Tube Plugging" has been changed adding revision date. Revised Page 13 attached.
2. Page No IV-1 has been revised to clarify the basis for the plugging criteria - operating time. Revised Pages IV-1, IV-2 and IV-3 are attached.
3. Headings No 3 and No 4 and Pages IV-4 and IV-5 have had typographical errors corrected. Revised Pages IV-4 and IV-5 are attached.
4. Section VII has been changed adding a table showing the tubes plugged under each plugging criteria. Minor changes in the total tubes listed as plugged have also been made.


David A. Bixel
Assistant Nuclear Licensing Administrator

CC: JGKeppler, USNRC



Regulatory Docket File

CONSUMERS POWER COMPANY
PALISADES NUCLEAR PLANT

Revised 12/17/75 Dated **3-22-76**

REPORT OF EDDY CURRENT TESTING,
DATA EVALUATION AND TUBE PLUGGING

March 1976
(Revision 1, 3-22-76)

IV. FURTHER EVALUATION BY REINTERPRETATION OF 1975 AND 1976 DATA

The further data evaluations described herein were performed by Consumers Power Company.

A. Multiple Indications

A total of 45 indications were reevaluated. Twenty-one of these were from the A generator, and 24 were from the B generator. The further evaluation of these indications was performed because the as-recorded data indicated that there was no indication in 1975, while a substantial indication existed in 1976. These 45 indications do not represent all such occurrences. They do, however, represent a significant portion. The results obtained from the reevaluation have thus been universally applied to all multiple indications.

Table 1 presents the results of the reevaluations performed. It can be seen that, of the 45 indications that were reevaluated, 40 of the indications were present in the 1975 data. While the strip charts for the other five locations in 1975 did not have interpretable indications, there was a slight signal on the vertical channel which was not interpretable. This evaluation reveals that the defects, as recorded in 1976, did not grow from zero as indicated in the 1975 data.

In some cases, there has been a change in the volume and depth of these indications. The volume changes are significant in that they are frequently the reason why the signal is readily interpretable in 1976 but not in 1975.

The plugging criteria - operating time chosen for the multiple indications - was an engineering judgment based on our observation that the indications were small volume and are not considered a safety problem. In addition, the reevaluation showed that most of the indications were present at the time of the 1975 inspection. The possibility of the small volume indications being cracks was also considered and it was concluded that this was not likely since through wall penetration would have been expected and none occurred. We conclude that the indications are most likely either dormant areas of intergranular attack or are pits. In either case, they

present an operating problem rather than a safety problem since their volume is much less than that assumed when computing the allowable tube wall degradation.

B. Wastage Indications

1. Reevaluation of Moderate Increases

Two categories of indications were submitted for reevaluation. The first category (Table II) contains indications that were recorded as 30% or greater in 1975 and had at least a 20% increase indicated in the as-recorded data as a result of the 1976 inspection. Sixty-four indications fitting these criteria were reevaluated (21 from A and 43 from B).

Of the 64 indications, 9 were found to have their signals slightly distorted by dents in 1976. As previously stated, signals distorted by dents do not permit valid interpretations. These indications in Table II are marked by an asterisk in the 1976 interpretation column. The large increases represented by these indications are not factual.

Of the 55 remaining indications, 46 are reported as $\geq 50\%$ during the 1976 examination. The reevaluation of the 1975 data revealed that 20 of the 46 were $\geq 50\%$ in 1975, and that the growth rates of these indications are much less than indicated on the as-recorded data.

Sixty-four indications all began as having indicated growth $> 20\%$. Following reevaluation, only 3 indications had growth of $> 20\%$.

Of the 20 indications found to be $\geq 50\%$ in 1975 after reevaluation, 13 are classified as small volume per this arbitrary, but conservative criteria described in the following paragraph. On 5 of the 7 remaining indications, the largest signal amplitude was 15 minor divisions. The other 2 indications were very large and had signal amplitudes of 40 to 50 minor divisions. However, these tubes were interpreted to be in the 40s in the as-recorded 1975 data.

Another element added to the reevaluation was a characterization of the volume of the defect. This characterization is made to indicate

the volume of the indication relative to the signal volume from a large area wastage defect approaching the uniformly thinned condition assumed in establishing the required tube wall thickness. A large wastage defect produces a signal of 40-50 minor divisions on the strip chart recorder. A thru-drilled hole of 0.05 inch produces a signal amplitude of about 20 minor divisions. The 80%, 60% and 40% holes in the calibration standard produce displacements of 30-45 minor divisions. An arbitrary standard has been set calling indications of 10 minor divisions and less as small volume indications.

In conclusion, for the category of indications which were $\geq 30\%$ in 1975 and exhibited $> 20\%$ increases in the as-recorded 1976 data, some increase in wall degradation did occur. However, it was not nearly of the magnitude indicated in the as-recorded data. The largest increase seen on this sample of tubes was 15-22%.

2. Reevaluation of Large Increases

The second category of indications (Table III) selected for reevaluation was those with growth indications (from the as-recorded data) much higher than 20%. In most cases, these indications were zero in 1975 and increased by 30% or more in 1976. A total of 108 such indications was reevaluated (61 from A and 47 from B).

The 1976 interpretations were distorted by the presence of slight dents on 14 of the 108 indications. Thus, these large increases are not valid. These indications are marked with an asterisk in Table III.

There were 28 indications $\geq 50\%$ in the 1976 interpretation. The reevaluation indicated that 16 of the 28 were $\geq 50\%$ in 1975 also. Thus, the growth of these indications was much less than indicated. Seventy-nine of the indications were identified as small volume per the criteria of 10 minor divisions on the strip chart cited earlier. This helps account for the fact that these indications went undetected in 1975; and also put them in a category of having little safety significance since the required wall thickness is computed based on a uniformly thinned wall.

In three instances, the specific area of the tube was not examined in 1975. These indications lie between the hot leg bend and the uppermost support on the cold leg side. During previous inspections, these areas were not examined in all cases. Improvements to the test requirements this year specified that hot leg tests would be conducted to the uppermost support on the cold leg side.

A zero in the reevaluation column of Table III does not mean that an indication was not present in 1975. The zero indicates a lack of ability to interpret. In all cases, there was some type of indication in the vertical channels of the strip charts, but it was normally less than the background noise or some other variable was present making interpretation impractical.

The conclusion reached from the reevaluation effort is that the high growth in corrosion indicated in the as-recorded data did not occur.

3. Study to Determine Why Some Data Was Not Recorded in 1975

As an additional feature of the further evaluation effort, several indications were studied to determine why they were not recorded in 1975. A key feature of this effort was the characterization of the volume of the indications. The indications selected were from Table I (multiple indications) and Table III (wastage indications). Table IV summarizes the results.

Of the 133 tubes and indications evaluated, 129 were small-volume defects per the 10 minor division criteria. Of the four so-called large-volume indications, the largest had an indication of 20 minor divisions. This is at least one half or less than the volume produced by a typical wastage indication. There was no apparent reason as to why 40 out of 133 of the indications were not interpreted. One factor to consider is that all 40 are classed as small-volume defects. Thirty-two out of the 133 indications could not be interpreted in 1975 due to the noise level in the vertical channel presentation. Higher

than normal background noise can be caused by interference from other electrical equipment, probe wear-out, and noise generated within the ECT equipment itself such as by loose connectors or the presence of foreign material on the OD of the tube, etc. Fifty-nine of the indications did not exceed 3 minor divisions in signal amplitude. This is the screening level for data interpretation and only signals which exceed this level require interpretation. Two of the 133 indications were in areas not tested in 1975. These areas will always be tested in the future since procedures require the hot leg testing to be done to the first support plate on the cold leg side.

4. Reevaluation of Data Greater Than 64%

A final feature of the further evaluation effort was to examine indications $> 64\%$ (refer to Table V). In doing this, the real growth of the indications during the nine-month operating period was evaluated.

A total of 46 indications (5 in A and 41 in B) were $> 64\%$ in 1976. For 5 of the 46 indications, growth could not be determined since they were in the area between the last support and the bend on the cold leg which was not examined 100% in 1975.

Ten of the remaining 41 indications were $\geq 40\%$ in 1975. However, on 7 of these indications, the only change in interpretation was the vector angle chosen to determine wall degradation. When comparing data side-by-side, there is no increase in corrosion evident.

Sorting the remaining 41 indications in another manner, 25 of the indications were reevaluated to be $\geq 50\%$ in 1975. Thus, their growth rate was not as large as seen in the as-recorded data. Also, one tube was distorted by a dent, so growth rate could not be determined.

Thirty-three of the 46 indications were recorded as 0 in 1975. Two of these 33 indications were not interpretable during the revaluation. Although there was an indication present, it did not exceed the noise level sufficiently to permit interpretation. Five of the 33 indications were in the area not tested in 1975. Twenty-six of the 33 indications

were present in the 1975 data and could be read during the reevaluation. This resulted in indicated growth not being nearly as large as seen in the as-recorded data. Most of the 33 indications were not evaluated in 1975 because their small amplitude did not exceed the three minor division screening criteria.

Forty-three of the 46 indications are very small-volume defects. Two of the three remaining that exceed 10 minor divisions in signal amplitude, did not have any growth during the operating period. The remaining indication grew by 13%. This indication is in an area where an operating allowance of 15 is applied in the B generator.

5. Conclusions

The conclusions reached from the entire reevaluation effort for wastage indications are:

- Large increases in wastage of > 20% found in the as-recorded data occur much less frequently than indicated.
- Even when increases of the order of 20% do occur, they occur on very small volume defects which are more like pits than wastage areas. They definitely are not at all like the large uniformly thinned wall defects for which required tube wall thicknesses are computed.
- Very large increases in wastage attack of > 35-50% do not occur.
- Of the defects \geq 50% in 1975 which were not detected in the 1975 as-recorded data, only 2 were found to be of a large volume wastage defect nature and of consequent safety significance. These had previously been interpreted in the 45% range.
- Of the defects, > 64% in the 1976 data, there was little real growth in these indications.
- Of the various reasons found for not recording 1975 data, improvements made in 1976 testing which will be carried forward provide assurance that these situations will occur with much less frequency, if at all

VII. EFFECT OF TUBE PLUGGING CRITERIA

The effect of the above tube plugging criteria results in the plugging of 102 tubes in the A steam generator and 609 tubes in the B steam generator. The plugging of this number of tubes results in 1,929 tubes being plugged in the A steam generator and 1,744 tubes being plugged in the B steam generator. There are 6,590 tubes in A steam generator and 6,775 tubes in B steam generator remaining unplugged. The effect on flow and resultant plant output due to plugging of these additional tubes is not believed to be significant. However, these effects are being reviewed and further analysis, if required, will be appropriately presented.

The following table lists the number of tubes plugged under each plugging criteria. Since some tubes would have been plugged under more than one criteria, this list should be considered approximate.

Criteria	Number of Tubes Plugged			
	A Steam Generator		B Steam Generator	
	No Dents	Dents	No Dents	Dents
1. Multiple ECT Indication	30	NA	104	NA
2. Indications other than multiple indication in zone of more significant increase in wall penetration.	NA	NA	60	115
3. Indications other than multiple indication in zone of less significant increase in wall penetration.	37	23	234	96
4. Miscellaneous	12	NA	0	NA