

**Consumers  
Power  
Company**

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March 10, 1975

Regulatory

File Cy.

Mr. Angelo Giambusso  
Director of Reactor Licensing  
US Nuclear Regulatory Commission  
Washington, DC 20555

Re: Docket 50-255, License DPR-20  
Palisades Plant  
February 1975 Eddy-Current  
Test Report and Technical  
Specification Change Request

Dear Mr. Giambusso:

An eddy-current inspection of the Palisades steam generator has been conducted in accordance with the Commission Order of February 6, 1975 and Palisades Plant Technical Specification 4.14.2. (The Commission Order added Sections 4.14.4 and 4.14.5 to the Plant Technical Specifications.)

As a result of this inspection, we are also submitting a Technical Specifications change as an attachment to this letter. This change is supplied in three (3) executed and thirty-seven (37) conformed copies and is a Request for Change to the Technical Specifications of Provisional Operating License DPR-20, Docket 50-255, issued to Consumers Power Company for the Palisades Plant.

The following is an item-by-item discussion of the requirements and results of the eddy-current inspection conducted during February 1975.

Requirement 1

Technical Specification 4.14.2 requires that at the end of no more than 90 effective full power days or not more than six calendar months from the date of initial criticality after the August 1973 shutdown which was achieved on September 5, 1974, whichever occurs first, an inspection of the steam generator tubes will be conducted in accordance with the requirements of Regulatory Guide 1.83, "In-Service Inspection of Pressurized Water Reactor Steam Generator Tubes," (issued June 1974) as it applies to inspections after the baseline inspection.

Disposition

This requirement has been completed. The applicable requirements of Regulatory Guide 1.83 are as follows:

Subrequirement a. No fewer than 3% of the total number of steam generator tubes should undergo eddy current examination during each in-service inspection.

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Disposition

All tubes on the hot leg side of both steam generators were inspected.

Subrequirement b. Inspection of U-bend design steam generators should routinely concentrate on the hot leg side of the generator after the first two in-service inspections.

Disposition

This was the third full inspection of these steam generators and it did concentrate on the hot leg side with all hot leg tubes being inspected.

Subrequirement c. Every inspection subsequent to the baseline inspection should include all tubes which previously had defect indications (not including plugged tubes) and should also consider tubes in those areas (including the cold leg side) where design and experience have indicated potential problems.

Disposition

All tubes which had previous indication (> 20%) in either the hot or cold legs of each steam generator were inspected. In addition this inspection included those areas in the cold leg side where design and experience have indicated potential problems.

Subrequirement d. If the eddy current inspection pursuant to Regulatory Position C.4 indicates that more than 10% of the inspected tubes have detectable wall penetration (> 20%) or that one or more of the inspected tubes have an indication of an unacceptable defect (see Regulatory Position C.7.a).<sup>\*</sup> (1) The steam generator should be considered unacceptable for continued service until additional examinations are conducted and (2) an additional 3% of the tubes should be inspected, concentrating on tubes in those areas of the tube sheet array where tubes with defects were found.

<sup>\*</sup>Regulatory Guide 1.83 (June 1974) defines an unacceptable defect as one which would result in not satisfying the calculated acceptable minimum tube wall thickness that can sustain a LOCA in combination with a safe shutdown earthquake. This definition results in an unacceptable defect being one with more than 73% through wall penetration. The Commission Order of February 6, 1975, however, has effectively redefined this to be any defect with 50% or more wall thinning. For the purpose of this inspection, the Commission's recent requirement has been used to define an unacceptable defect.

If, in the inspection made in Regulatory Position C.5.a(2) above, more than 10% of the inspected tubes have detectable wall penetration (> 20%) or one or more of the inspected tubes has an indication of an unacceptable defect, additional tubes (no less than 3% of the total tubes in the steam generator) in the area of the defect should be inspected.

#### Disposition

This requirement was completed. All of the tubes on the hot leg side of both steam generators were inspected. The cold leg inspection included a 10% sample (836 tubes) in Steam Generator A and a 4% sample (352 tubes) in Steam Generator B.

#### Requirement 2

Technical Specification 4.14.4 provides Alternatives A and B. Alternative A was followed and reads as follows:

The Licensee shall conduct, prior to further reactor operation, the following steam generator in-service inspection program:

Inspect all steam generator tubes in both steam generators which previously had defect indications (not including plugged tubes) of greater than 20% wall penetration in the manner prescribed by Regulatory Guide 1.83 (issued June 1974) as that guide applies to inspections after the baseline inspection. All tubes with indications of 50% or more wall thinning shall be plugged.

#### Disposition

Item 1.d discusses this requirement. In addition, all tubes with indication of 50% or more (as defined in Item 3) will be plugged.

#### Requirement 3

Technical Specification 4.14.5 required that any steam generator tubes with eddy-current indications of 50% or more wall thinning shall be removed from service by plugging. Such indications may be confirmed by averaging during a given inspection, but such average shall be based on not less than three readings, in which case an average indication of 50% or more wall thinning shall result in tube plugging.

#### Disposition

All tubes observed with indications  $\geq 50\%$ , as defined by Technical Specification 4.14.5, will be plugged. Table 1 below is a tabulation of the tubes which are scheduled for plugging.

<u>Steam Generator</u>	<u>Leg</u>	<u>Number of Tubes Scheduled for Plugging in Accordance With TS4.14.5</u>
A	Hot	77
B	Hot	202
A	Cold	2
B	Cold	0

#### Requirement 4

Technical Specification 4.14.4, Part C, required that the results of the above-described inspection and tube plugging program, and a proposal for the conduct of future operations, including a recommended schedule for the next steam generator tube inspection, shall be submitted to the NRC Staff for review and approval by letter prior to further operation.

#### Disposition

Results of inspection and tube plugging program:

All of the tubes in the hot leg of both steam generators were tested. This test resulted in detection of approximately 328 tubes with  $\geq 50\%$  wall thinning. A majority of these tubes ( $\geq 50\%$ ) were retested (a minimum of two additional times) and the results averaged to determine acceptability. The total tubes remaining in the  $\geq 50\%$  wall thinning classification following retesting were 281 tubes.

A 3% sample of tubes (272 tubes) was examined in the cold leg of the A steam generator. Two tubes were observed with an indication of  $\geq 50\%$  as defined in Item 3 and an additional 7% of the tubes (564 tubes) was inspected, more than meeting the requirements of Item 1.d. No additional tubes were observed with indications of  $\geq 50\%$ . This inspection showed that 43 tubes had new ( $> 20\%$ ) or increased wall thinning ( $> 5\%$ ) above previous test results. This, we believe, meets the intent of Regulatory Guide 1.83.C.5(d) including Footnote 5.

A 3% sample of tubes was examined in the cold leg of the B steam generator. No tubes were observed with indications of  $> 50\%$  and nine (9) tubes had new ( $> 20\%$ ) or increased wall thinning ( $> 5\%$ ) above previous test results. This, we believe, meets the intent of Regulatory Guide 1.83.C.5(d) including Footnote 5.

Some multiple indications were observed during this inspection. Twenty-eight of these indications showed  $\geq 50\%$  through wall penetration and will be plugged. A study of this type of indication was made by comparing a sample of five indications (three in December 1974 and two in February 1975) with the data taken in the summer of 1974. For all of the tubes studied, the indications were found to be present in 1974 and had not incurred a significant change.

General discussion of tube inspection program:

In December of 1974, a sample of over 500 tubes was measured in the A steam generator and it was concluded that significant further wastage had not taken place since September 1973. This data appears to be in reasonably good agreement with the data taken in the A steam generator in February 1975. The February data taken in the B steam generator, however, disclosed a larger than expected number of tubes with indications  $\geq 50\%$  tube wall thinning.

Early in the February 1975 eddy-current testing program, it became apparent that "new" indications were being observed. A review of the summer 1974 data showed that some of the indications had been missed by the eddy-current readers. In an effort to be responsive to this problem and to be able to provide reasonable assurance that all indications of  $\geq 50\%$  tube wall thinning were detected, the eddy-current testing program was reviewed. In response to this review, a data verification process was begun using qualified (ASNT-level II) eddy-current interpreters. This review was separate from the initial interpretation of data and constituted a 100% overcheck of the data taken during the February 1975 testing program. We believe that this program along with an intensified quality assurance effort has served to increase the awareness of testing personnel and resulted in increased accuracy of the testing effort. The overcheck effort has resulted in the additional identification of nine tubes with indications of  $\geq 50\%$  tube wall thinning.

Recommended schedule for next inspection:

The observation of a larger than expected number of additional indications makes it impossible to positively conclude that additional tube wall thinning has not taken place. We, therefore, find it prudent to limit the number of effective full power days until the next eddy-current test is performed or until an exhaustive review of the eddy-current data (comparing current indication with data taken previously) can be completed. If, after the review of data has been completed, we find that we can conclude that additional tube wall thinning has not taken place, we will review this data with your staff and make an appropriate request for an extension of the effective full power day operating time permitted prior to the next inspection.

Based on the results of this eddy-current testing program and the assumptions which were used to establish the present licensing requirements, we have concluded that an additional eddy-current testing program should be conducted following an additional (90) Effective Full Power Days of operation. In addition, we have concluded, as did our January 1975 request for a Technical Specifications change, that the requirement for conducting a Regulatory Guide 1.83 eddy-current inspection within six calendar months is not required or desirable.

The appropriate request for a change to the Technical Specifications is attached.

Additional information concerning Primary System Flow Considerations:

A. Primary System Flow Rate

Primary system flow was most recently measured in August 1974. A preliminary analysis of that data indicated that the vessel flow rate was  $132.2 \times 10^6$  lbm/h at 532°F. Subsequent refinements in the analytical techniques used to reduce the flow data have led to a downward revision in the vessel flow to  $131.3 \times 10^6$  lbm/h. This vessel flow is substantially below the  $136.7 \times 10^6$  lbm/h predicted by Combustion Engineering.

As a result of the February 1975 steam generator inspection, 281 additional tubes are being plugged. Combustion Engineering estimates that this tube plugging will cause an additional loss of  $1.1 \times 10^6$  lbm/h. This additional loss has been confirmed by our own analysis. Based upon the most recent flow measurements, therefore, the vessel flow rate after tube plugging is expected to be  $130.2 \times 10^6$  lbm/h.

B. Overpower Margin

On July 22, 1974, Consumers Power submitted a report entitled, "Steam Generator Tube Plugging Criterion, Palisades Plant." Figure 1 in Section 5 of this report provides a curve of overpower margin as a function of core flow rate. The minimum core flow rate required to preserve an overpower margin of 122% from 2200 MW<sub>t</sub> is  $123.6 \times 10^6$  lbm/h. This corresponds to a vessel flow rate of  $127.3 \times 10^6$  lbm/h. Assuming that the allowance for measurement error is 3%, the required measured vessel flow for 122% overpower margin is  $131.2 \times 10^6$  lbm/h.

The overpower margin of 122% can be preserved for a vessel flow of  $130.2 \times 10^6$  lbm/h by restricting thermal power level to 2183 MW<sub>t</sub> or 99.2% of full power. It is expected, however, that a refined analysis which takes credit for the improved augmentation model (submitted on November 4, 1974) will justify operation at full power. Until that analysis has been submitted, reactor power will be limited to 2100 MW<sub>t</sub>. This limitation provides ample margin for uncertainties in the effect of tube plugging on flow reduction.

The Palisades FSAR shows acceptable results for all anticipated transients when they are initiated from conditions which are characterized by an overpower margin of 122% of 2200 MW<sub>t</sub>. The analysis performed under assumptions of fuel densification shows that the course of each anticipated transient is not significantly changed by the effects of fuel densification and none of these transients violate thermal limits.

In addition to the anticipated transients presented in the Palisades FSAR, the postulated accidents, with the exception of the LOCA (ie, Steam Line Break, Control Rod Ejection, Steam Generator Tube Rupture, and Locked Rotor) have been reviewed to determine the effects of this lower primary coolant flow. The Steam Line Break and Steam Generator Tube Rupture Accidents are both relatively insensitive to initial flow rate. The

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Locked Rotor Incident is sensitive to initial margin to DNBR, but this margin is being preserved. The results of this incident, therefore, are no worse than those presented in the FSAR. The Control Rod Ejection Accident is sensitive to flux peaking, but not to the flow rate.

C. Loss of Coolant Accident Analysis

The most recently submitted Loss of Coolant Accident analysis (submitted October 21, 1974 and amended on November 4, 1974) was performed using an initial vessel flow rate of  $130 \times 10^6$  lbm/h. A sensitivity analysis of peak clad temperature as a function of initial vessel flow rate has not been performed. In the narrow band of vessel flows under consideration, however, the variation in peak clad temperature with flow rate is not expected to be significant.

Conclusion

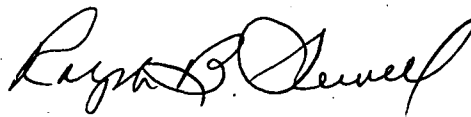
The SARB has concluded, based on the foregoing, that the eddy-current testing has been performed in a manner that complies with the Technical Specifications Section 4.14 and the "Order for Modification of License" dated February 6, 1975.

In addition, SARB has concluded that the safety analysis of the Palisades Plant incorporating the effects of plugging an additional 281 tubes in the steam generators is satisfactory for reactor power levels up to and including 2100 MW<sub>t</sub>.

Following authority for operation, we plan to continue the flushing program and will consider it completed upon satisfactory operation at 2100 MW<sub>t</sub>.

We expect the plant to be ready for start-up early in the week of March 23, 1975. Timely approval of the proposed Technical Specifications change and authority to allow continued operation of the plant is requested.

Yours very truly,



Ralph B. Sewell  
Nuclear Licensing Administrator

RBS/map

CONSUMERS POWER COMPANY

Docket No 50-255

Request for Change to the Technical Specifications

License No DPR-20

For the reasons hereinafter set forth, it is requested that the Technical Specifications contained in Provisional Operating License No DPR-20, Docket No 50-255, issued to Consumers Power Company on October 16, 1972, be changed as described in Section I, "Changes."

I. Change

A. Change Section 4.14.2 to read as follows:

"At the end of no more than 90 effective full power days of operation from the initial criticality after February 1975, an inspection of the steam generator tubes will be conducted in accordance with the requirements of Regulatory Guide 1.83, 'Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes' (issued June 1974) as it applies to inspections after the baseline inspection."

II. Discussion

The purpose of this proposed change is to allow the Palisades Plant to achieve an adequate period of operation following the last full eddy-current inspection of the steam generators. This will allow meaningful conclusions to be drawn with respect to corrosion rates that might be experienced in the Palisades Plant steam generators.

Previous Technical Specifications require that eddy-current testing be performed in accordance with Regulatory Guide 1.83 at the end of no more than 90 effective full power days or six calendar months. Our previous concern (and, therefore, the reason for the six months) was the possibility of prolonged operation at low power levels with significant phosphate concentrations due to the conversion from a phosphate to an all-volatile secondary side water treatment program. Procedures had been established for the conversion of the secondary water treatment (refer to



our August 20, 1974 proposed Technical Specifications Change) and these procedures required that phosphates be removed to the extent practicable at low power levels prior to proceeding to higher power levels. It was estimated during the summer of 1974 that this conversion could take three or four months or more. Further, corrosion rates for operation during the transition period from phosphate to an all-volatile treatment had not been established. Thus, a limit was proposed which was intended to provide an upper time restriction in terms of months of power operation during the transition phase of the conversion of the secondary water treatment. Since the original surveillance program was proposed, the plant has operated within the all-volatile specifications (at power levels up to 60%) for secondary water chemistry. This conversion was achieved in approximately one day of power operation and approximately 30 days' operation at hot standby conditions. Details have been reported in flushing reports submitted in accordance with our operating license and were summarized in a flushing report submitted November 6, 1974. We conclude that there is no need for additional restriction other than the 90 effective full power days of operation.

### III. Conclusions

Based on the foregoing, both the Palisades Plant Review Committee and the Safety and Audit Review Board have concluded that this proposed Technical Specifications Change does not involve an unreviewed safety question.

CONSUMERS POWER COMPANY

By R. A. Lamley  
R. A. Lamley, Vice President

Sworn and subscribed to before me this 10th day of March 1975.

Sylvia B. Ball  
Sylvia B. Ball, Notary Public  
Jackson County, Michigan  
My commission expires May 18, 1976