



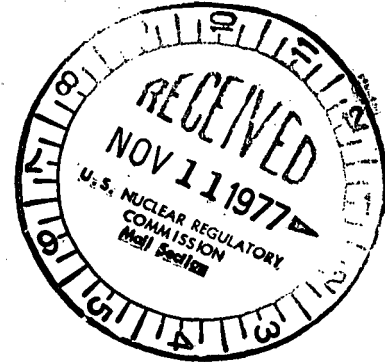
**Consumers  
Power  
Company**

## REGULATORY DOCKET FILE COPY

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • Area Code 517 788-0550

November 10, 1977

Director of Nuclear Reactor Regulation  
Att: Mr Albert Schwencer, Chief  
Operating Reactors Branch No 1  
US Nuclear Regulatory Commission  
Washington, DC 20555



DOCKET 50-255 - LICENSE DPR-20 - PALISADES  
PLANT - PROPOSED TECHNICAL SPECIFICATIONS  
CHANGE FOR STEAM GENERATOR INSERVICE INSPECTION

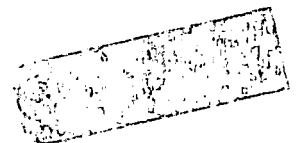
Attached is a proposed Technical Specification change request for steam generator inservice inspection requirements at the Palisades Plant. This proposed Technical Specification change would also allow sleeving to be used as a repair method. The supporting information for this request was presented to the NRC staff on September 1, 1977 and November 8, 1977.

Consumers Power has previously indicated that we plan to utilize the sleeving process during the upcoming refueling outage. We would appreciate approval of this request by January 1, 1978.

*David P. Hoffman*

David P Hoffman  
Assistant Nuclear Licensing Administrator

CC: JGKepler, USNRC



CONSUMERS POWER COMPANY  
Docket 50-255  
Request for Change to the Technical Specifications  
License DPR-20

For the reasons hereinafter set forth, it is requested that the Technical Specifications contained in Provisional Operating License DPR-20, Docket 50-255, issued to Consumers Power Company on October 16, 1972 be changed as described in Section I, below:

I. Changes

Replace Section 4.14 as follows:

<u>Remove Pages</u>	<u>(Dated)</u>	<u>Insert Pages</u>
4-68	(6-17-77)	4-68
4-68a	(4-26-76)	4-68a, 4-68b
4-69	(4-26-76)	4-69

II. Discussion


The proposed Technical Specification would allow Consumers Power to use sleeving as an alternate technique for repairing degraded steam generator tubes. Combustion Engineering Report, "Palisades Steam Generator Tube Repair by Sleeving," CEN-59(P), dated August 26, 1977, has been provided to document the technical basis for this request. In addition, the specifications for inspection intervals and sampling requirements have been modified to reflect current Palisades Plant steam generator conditions and industry practices. The attached "Inspection Plan" provides additional information to support this request. Table 4.14, "Operating Allowance" (pertinent only to the last inspection) has been changed to show the current "Maximum Allowable Degradation."

III. Conclusions

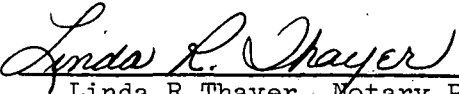
The Palisades Plant Review Committee and the Safety and Audit Review Board have reviewed the proposed change and recommend its approval.

CONSUMERS POWER COMPANY

By

  
C R Bilby, Vice President  
Production & Transmission

Sworn and subscribed to before me this 10th day of November 1977.

  
Linda R Thayer, Notary Public  
Jackson County, Michigan  
My commission expires July 9, 1979.

#### 4.14 Augmented Inservice Inspection Program for Steam Generators

##### Applicability

Applies to the tubes within both steam generators.

##### Objective

To provide assurance of continued integrity of the steam generator tubes over their service lifetime.

##### Specification

4.14.1 Inspections will be made at a frequency not less than 12 nor more than 24 calendar months after the previous inspection. Tube inspection requirements will include inspection of all unplugged tubes with an ECT indication of greater than or equal to 30% in either of the previous two inspection periods. The conventional, circumferentially wound ECT pull type probe shall be used to inspect all unplugged tubes for which an ECT indication greater than or equal to 30% was noted in either of the two previous ECT inspections.

In addition, a random sample of 2% of the tubes in the hot leg and 1% of the tubes in the cold leg of each steam generator will be inspected using the conventional, circumferentially wound ECT probe.

For the purposes of this Technical Specification, "tubes" refers to that portion of the steam generator U-tube from the point of entry on the cold-leg side to the top support of the cold leg, or from the point of entry on the hot-leg side completely around the U-bend to the top support of the cold leg.

4.14.2 Special inspection techniques shall be used to inspect all tube/tube support plate intersections where an ECT indication was present during the last inspection which was greater than or equal to 45% but cannot be interpreted in the current inspection due to the presence of dents.

If the number of intersections to be tested under the criteria above is less than a total (for both generators) of 600, additional intersections shall be selected for testing. The additional examination sites shall be selected from previous ECT results for areas which could not be inspected due to dents in the last inspection in descending order with respect to the depth of the ECT indication.

4.14.3 When inspection reveals that the tube degradation plus an appropriate operating allowance is equal to or greater than the maximum allowable degradation specified in Table 4.14, tube plugging or sleeving shall be performed.

Defect indications may be confirmed by averaging during a given inspection, but such averaging shall be based on not less than three readings.

4.14.4 The operating allowance will be determined using appropriate inspection results. This allowance will be approved by the NRC.

4.14.5 Sleeves will be installed such that, considering the axial location tolerances, swaging does not take place in an area of known degradation. In addition, base line inspection of a statistically justified sample of sleeves will be performed.

### Basis

Consumers Power has concluded that the change from coordinated phosphate to volatile chemistry control for the secondary side of the steam generators has reduced the previous corrosion rate. The inspection program provides for verifying that the corrosion has been arrested; or, for quickly identifying any additional corrosion; or, for identifying other problems.

The inspection program is also consistent with current industry practices and includes appropriate measures to identify additional degradation of the Palisades steam generators. The operating allowance and plugging criteria were developed based on comparative results between steam generator inspections with consideration given to defect type, location, past corrosion rate observed, etc.

Calculations have been performed to demonstrate that a tube uniformly thinned to 36% of its original nominal wall thickness (64% degradation) can withstand a differential pressure of 1380 psi. Likewise, a sleeved tube can withstand the same differential pressure when the limits in Table 4.14 are observed. Combustion Engineering, Inc Report No CEN-59(P) "Palisades Steam Generator Tube Repair by Sleeving," dated August 26, 1977, contains the analytical and test results of tube sleeving.

TABLE 4.14

Maximum Allowable Degradation

Location	Maximum Allowable Degradation
Unsleeved Sections	Degradation = 64%
Sleeved Section	
Region 1 <sup>(1)</sup>	Sleeve degradation = 34% <u>and</u> tube degradation exceeding the maximum allowable degradation for an unsleeved section. <sup>(4)</sup>
Region 2 <sup>(2)</sup>	Either (a) sleeve degradation = 25% when tube degradation in Region 1 exceeds the maximum allowable degradation for an unsleeved section; <u>or</u> (b) tube degradation equal to the maximum allowable degradation for an unsleeved tube. <sup>(4)</sup>
Region 3 <sup>(3)</sup>	Tube degradation equal to the maximum allowable degradation for an unsleeved section.

Footnotes:

- (1) The undeformed region of the tube/sleeve assembly containing the original imperfection requiring sleeving.
- (2) The region containing the expansion joint. Specifically, the region of the tube/sleeve assembly bounded by lines approximately 1/4 inch and 2 inches inboard from the sleeve ends.
- (3) The region of the tube/sleeve assembly containing approximately 1/4 inch of each end of the assembly.
- (4) Degradation occurring in the parent tube at any location in a Region and degradation occurring in the sleeve at any location in the same Region that exceeds the applicable maximum allowable degradation will require tube plugging.

## PALISADES STEAM GENERATOR INSPECTION PLAN

### INTRODUCTION AND BACKGROUND

Palisades Technical Specification, Section 4.14, currently requires tube sampling requirements for ECT to be in accordance with Regulatory Guide 1.83, "Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes," as it applies to inspections after the base line inspection. In actual practice, past steam generator ECT inspections at Palisades have included inspection of 100% of the hot leg tubes and inspection of about 6% of the cold leg tubes. Improved operating conditions and decreased rates of wastage corrosion make 100% inspection unnecessary. Also, Regulatory Guide 1.83 does not address the situation where steam generator tubes are dented. An alternate inspection plan is proposed.

In the 1976 ECT inspection of steam generator tubes at Palisades, some denting of the tubes was observed. The conventional, circumferentially wound ECT pull-through probe cannot detect defects in steam generator tubes at dents due to the large dent signal. It should be noted that the great majority of ECT indications in the Palisades steam generators occur at tube/tube support plate intersections. During the 1976 ECT inspection, approximately 3,449 intersections on 3,322 tubes were known to have wastage indications from previous inspections but could not be interpreted because of dents. 1,132 tubes in the A generator and 2,190 tubes in the B generator were affected. For that outage, a more stringent plugging criteria based on results of the February 1975 ECT inspection was used for the defects obscured by dents. Experience with other operating plants indicates a significant probability that an increased degree of denting will be found in the next ECT inspection.

Special inspection techniques are being developed to allow inspection of steam generator tubes in the vicinity of dents. These techniques involve using a specially designed ECT probe which requires rotation and slow axial translation or an ultrasonic probe requiring similar movement. A disadvantage of these special techniques is that inspection time is much greater than that required for a conventional pull-through ECT probe. The time required to inspect the tubes using these techniques makes it impractical to inspect each dent location.

### INSPECTION PLAN DETAILS

1. The conventional, circumferentially wound ECT pull-type probe shall be used to inspect all unplugged tubes for which an ECT indication greater than or equal to 30% was noted in either of the two previous ECT inspections.

In addition, a random sample of 2% of the tubes in the hot leg and 1% of the tubes in the cold leg of each steam generator will be inspected using the conventional, circumferentially wound ECT probe.

The number of tubes inspected under this criteria for the 1978 inspection is approximately 1,650 tubes in the A generator and 1,340 tubes in the B generator. This is, respectively, 25% and 20% of the unplugged tubes in the A and B steam generators.

2. Special inspection techniques shall be used to inspect all tube/tube support plate intersections where an ECT indication was present during the last inspection which was greater than or equal to 45% but cannot be interpreted in the current inspection due to the presence of dents.

If the number of intersections to be tested under the criteria above is less than a total (for both generators) of 600, additional intersections shall be selected for testing. The additional examination sites shall be selected from previous ECT results for areas which could not be inspected due to dents in the last inspection in descending order with respect to the depth of the ECT indication.

#### DATA ANALYSIS AND TUBE PLUGGING

The growth rate of ECT indications during the last operating cycle will be determined by comparison with results of previous inspections. Based on this growth rate, an operating allowance will be determined. This operating allowance will be subtracted from the structural wall degradation limit of 65% to determine the plugging limit. The operating allowance will be selected to accommodate the next operating cycle.

An increased operating allowance will be applied to previous ECT indications not covered by this inspection to account for the period of time since the last measurement of these indications. A different plugging limit will be arrived at for tubes thus affected. (Tubes which will require plugging as a result of the application of the increased operating allowance to previous inspection results may be inspected and a plugging decision made on the basis of the operating allowance for tubes inspected during the current outage.)

#### DISCUSSION REGARDING THE INSPECTION PLAN

Adherence to Regulatory Guide requirements has resulted in 100% inspection of tubes in the hot leg and 3-6% of the tubes in the cold leg. The inspection plan proposed would result in inspection of approximately 1,650 and 1,340 tubes in the A and B steam generators, respectively. This is 25% and 20% of the unplugged tubes in these generators.

The plan, by definition, concentrates on areas where the maximum amount and rate of corrosion have been measured.

The Palisades Plant has operated under the all-volatile chemistry regime since September of 1974. Secondary side chemistry results have been excellent and were reported to the NRC on numerous occasions. The condenser was retubed in December of 1974. Condenser performance subsequent to retubing has been good. Prompt action has been taken to locate and plug leaking condenser tubes and this has resulted in minimum input of condenser contaminants to the steam generators.



Extensive modifications to the feed-water system have been in progress for some time and are due for completion during the subsequent operating cycle. They include increased condensate storage capacity, increased demineralizer capacity for makeup water, feed-water bypass system, and a full flow condensate polishing system. These modifications have been made for the express purpose of limiting contaminant access to the steam generators and controlling the secondary water chemistry to proper administrative limits.

Operating experience with the steam generators has been excellent. No tube leakage has been identified since May of 1974. A very minor amount of primary-to-secondary leakage has been indicated by statistical analyses of counting data. There have been no indications of increase in this leakage in over two years of plant operation. Apparent rates of corrosion have decreased since conversion to volatile chemistry. Information from laboratory pot boiler tests and industry experience indicates further decrease in tube wastage rates can be expected.

While extensive inspection of tubing was previously necessary during periods of phosphate operation and conversion to volatile control, a less extensive inspection plan is appropriate now. The time required with resulting increased radiation exposure for a complete 100% examination is not warranted in view of lower rates of wastage corrosion.

Another factor to be considered is associated with the negative influence of dents on the ability of the conventional ECT to accurately interpret wastage indications at support plate intersections and the vastly expanded inspection time required with special inspection techniques.

The inspection plan as proposed will be adequate to monitor the rate of progression of known corrosion and test for the presence of new indications of corrosion. The test will also be adequate to monitor the incidence and severity of denting. Data obtained from the inspection will be more than adequate to determine the appropriate operating allowance for the subsequent cycle.