Consumers Power Company

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January 30, 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

PROPOSED TECHNICAL SPECIFICATIONS CHANGE
STEAM GENERATOR TUBE PLUGGING CRITERIA

By letter dated February 6, 1975, the Commission established a steam generator tube plugging criterion for our Palisades Plant which required that tubes with 50% or more wall thinning be removed from service by plugging. At meetings held between the NRC and Consumers Power Company both before and after the establishment of this criterion, it was apparent that a detailed analysis considering the combined loadings produced during a hypothetical Loss of Coolant Accident and a Safe Shutdown Earthquake would be required before any changes in the tube plugging criterion could be made.

Accordingly, Consumers Power Company has arranged for such an analysis to be conducted by the Nuclear Steam Supply System vendor (NSSS - Combustion Engineering) and has had the program and results of the analysis reviewed by a private consultant (MPR Associates). The preliminary results of this analysis were presented at the NRC during a meeting held on January 15, 1976. Based on comments and suggestions received at that meeting, appropriate revisions were made and the report completed. This report will be submittted under separate cover.

Based on the results of this analysis, a proposed Technical Specifications change has been prepared and is attached. As indicated in the proposed change, some additional information will be required. The results of the eddy current testing program, currently in progress, will provide information to establish an operating allowance. This allowance, along with consideration of when the next eddy current inspection is to be conducted will be used to modify the requested tube plugging criteria.

Plant secondary water chemistry has been exceptionally good during the past operating period (see our letter to DRL dated August 5, 1975). Analysis of the feed-water and steam generator blowdown water has not indicated any condenser leakage and we have maintained secondary water chemistry well within our specifications. We have concluded that it is unlikely that local chemical concentration could result in caustic cracking of steam generator tubes. While we have not observed caustic stress corrosion cracking in the Palisades steam generators, it is recognized that some limit on steam generator tube leakage would be desirable to insure that if cracking were to occur they would be detected and removed from service before they reached an unacceptable size. An analysis and testing program to develop this type of information is being conducted by our NSSS vendor and the results will be transmitted when they are available (about February 15, 1976).

In addition to the above, any other significant observation resulting from eddy current testing of the steam generators or other inspections conducted during this outage will be presented for your information and/or review.

David A. Bixel

David A. Bixel
Assistant Nuclear Licensing Administrator

CONSUMERS POWER COMPANY
Docket No 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. Change

A. Delete Section 4.14.1.

(This requirement will be completed prior to plant start-up.)

B. Change Section 4.14.3 to read as follows:

"4.14.3 Any steam generator tubes with eddy current indication of more than 64%* wall thinning shall be removed from service by plugging. Such indication may be confirmed by averaging during a given inspection, but such averaging shall be based on not less than three readings, in which case an average indication of more than 64%* thinning results in tube plugging."

*Note: This number represents the minimum acceptable tube wall and may be revised to incorporate an operating allowance. This allowance will be developed based on the results of the present eddy current inspection, the operating time between inspections and other appropriate considerations.

C. Change proposed Section 3.1.5(d) (proposal in our request dated July 7, 1975) as follows:

"3.1.5(d) The primary to secondary leakage in each steam generator shall not exceed 0.4** gpm for any period greater than 24 consecutive hours."

**Note: This number represents the maximum permitted leakage which is requested. This number may be revised based on results of a study of leakage due to tube wall cracks and/or other appropriate considerations. This study is currently in progress and will be submitted approximately mid February 1976.

D. Delete Appendix C, Part 2(a) and (c).

(These requirements are considered to be completed.)

E. Delete Appendix C, Part 2(b).

(These requirements are revised and proposed to be inserted into Section 6.)

Add new Section 6.9.1 d as follows:

"d. Semiannual Steam Generator Chemistry Report. Semiannual reports on the steam generator secondary water chemistry shall be submitted to the Division of Reactor Licensing. These reports shall contain a graph or plot showing the following as a function of time for both steam generators:

(1) Phosphate and Sulphate Concentration

(2) Conductivity (μ mhos/cm)

(3) PH"

F. Change Section 3.1.1 e (2) to read as follows:

Hydrostatic tests shall be conducted in accordance with applicable paragraphs of Section XI ASME Boiler & Pressure Vessel Code (1974). Such tests shall be conducted with sufficient pressure on the secondary side of the steam generators to restrict primary to secondary pressure differential to a maximum of 1380 psi. Maximum hydrostatic test pressure shall not exceed 1.1 Po plus 50 psi where Po is nominal operating pressure.

G. Change Section 3.1.1 e (3) to read as follows:

"(3) Primary side leak tests shall be conducted at normal operating pressure. The temperature shall be consistent with applicable fracture toughness criteria for ferritic materials and shall be selected such that the differential pressure across the steam generator tubes is not greater than 1380 psi."

H. Change the basis of Section 3.1.1 by replacing the third through fifth paragraphs with the following:

"Calculations have been performed to demonstrate that a pressure differential of 1380 psi can be withstood by a tube uniformily thinned to 36% of its original nominal wall thickness (64% degradation), while maintaining:

(1) A factor of safety of three between the actual pressure differential and the pressure differential required to cause bursting.

(2) Stresses within the yield stress for Inconel 600 at operating temperature.

(3) Acceptable stresses during accident conditions.

The maximum steam generator operating transient differential pressure is expected to occur during a loss of load transient. The loss of load accident, initiated at a nominal reactor coolant system pressure of 2100 psia and a nominal high pressurizer pressure trip of 2400 psia is analyzed in Section 14.12 of the FSAR. Results of this analysis indicate that the maximum steam generator differential pressure is 1530 psi (assuming that reactor control is in the automatic mode, and that steam dump, bypass and pressurizer relief valves function). This pressure differential is approximately 11% greater than that allowed during normal operation, so that substantial safety margin exists between this pressure differential and the pressure differential required for tube rupture."

I. Change Section 4.4 a to read as follows:

a. Whenever the primary coolant system is closed after it has been opened, the system shall be leak tested at not less than 1835 psig prior to the reactor being made critical. A test temperature shall be selected such that secondary (saturation) pressure will limit the differential pressure across the steam generator tubes to not greater than 1380 psi.

J. Change the basis of Section 4.4 by replacing the second paragraph with the following:

"Calculations have been performed to demonstrate that a pressure differential of 1380 psi can be withstood by a tube uniformly thinned to 36% of its original nominal wall thickness (64% degradation), while maintaining:

a) A factor of safety of three between the actual pressure differential and the pressure differential required to cause bursting.

b) Stresses within the yield stress for Inconel 600 at operating temperature.

c) Acceptable stresses during accident conditions."

II. Discussion

An analysis to determine the minimum acceptable steam generator tube wall has been conducted by the Nuclear Steam Supply System (NSSS) vendor and is being transmitted under separate cover. This analysis, using conservative assumption, demonstrates that the minimum acceptable tube wall thickness is equivalent to a wall thinning of 64%. In addition, the analysis considered the combined loadings produced during a hypothetical Loss of Coolant Accident (LOCA) and Safe Shutdown Earthquake (SSE). The analysis also assured that appropriate safety margins would be maintained during normal operation.

The Technical Specifications Change proposed in this request uses the minimum wall thinning justified by the analysis. It is recognized that an operating allowance may be required to assure that the minimum wall is maintained between inspection internals. We expect to develop this operating allowance based on the results of the present eddy current inspection, consideration of the operating time between inspection and other appropriate considerations. This allowance will be presented as soon as the analysis of the present inspection program is completed.

A discussion of the individual changes follows below:

A. The plant has been shut down in accordance with this requirement and an inspection of the steam generator tubes has begun. The requirements of this part will be completed prior to plant start-up.

B. This change revises the plugging limit to a maximum of 64%. As discussed elsewhere, this represents a minimum acceptable tube wall and may require modification (inclusion of an Operating allowance) based on the results of the present eddy current inspection, etc.

C. Our present Technical Specifications (Appendix B, Item 2) specify a maximum leakage rate in a steam generator of 0.3 gpm. The 0.3 gpm limit was imposed during 1972 based on consideration of certain operating transients and the assumption of clad collapse due to

fuel densification. At that time, the entire reactor core was composed of unpressurized fuel. In our request dated July 9, 1975, we proposed that this limit be incorporated in the Appendix A Technical Specifications because clad collapse was no longer considered a possibility and a stringent primary to secondary leakage limit was deemed desirable during the transition from phosphate to all volatile secondary water chemistry. The 0.4 gpm proposed limit is based on allowable leakage rates which have been established at other facilities to limit crack length and thus ensure tube integrity considerations. The leakage limit will provide assurance that tube cracks will be detected and repaired before they reach lengths that are unacceptable. This limit will provide an approximate maximum for each steam generator and is used as an upper limit in this proposed change. Consumers Power and the NSSS vendor are preparing additional justification for a maximum leakage rate based on a program of tube crack analysis and testing. The result of this analysis and any modification of the maximum leakage rate which may be suggested by the analysis will be presented when it becomes available (about February 15, 1976).

D. Consumers Power has conducted a flushing program including power cycling from plateaus up to and including 90%. We have, in addition, completed a plant operating run of about 135 effective full-power days. The steam generator chemistry and operating results to date lead us to conclude that the flushing program has been successfully completed.

The requirements for reporting of steam generator tube leakage specified in Part (c) have also been completed.

E. Chemistry data will continue to be taken to monitor steam generator chemistry conditions. Because of our past operating experience, we conclude that a semiannual report of chemistry conditions as proposed under Item E will provide adequate information for NRC monitoring and relieve the plant staff of the requirements of monthly report preparation.

F. G. H. I. & J. These changes maintain the operating flexibility required to perform the tests and permit testing of the primary system in accordance with Section XI ASME Boiler & Pressure Vessel Code (1974). The hydrostatic tests will be conducted at not less than 1.10 times the system nominal operating pressure (1.0 for leak tests) and at a temperature not less than that required to meet the fracture toughness criteria applicable to ferritic material of system components.

Conduct of the test at higher temperatures will reduce the pressure transients across the steam generator tube wall while meeting the requirements for testing of the primary system.

III. Conclusion

This change has not been reviewed by our Palisades Plant Review Committee or the Safety and Audit Review Board. These reviews will be conducted as information becomes available and we will advise you should any of the proposed changes be deemed inappropriate.

Consumers Power Company

By C R Bilby

C. R. Bilby, Vice President

Sworn and subscribed to before me this 30th day of January 1976.

Sylvia B Ball

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