50.55(e) Report
Docket Nos. 50-460/513

Washington Public Power Supply System

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Nuclear Regulatory Commission
Region V
Suite 202 Walnut Creek Plaza
1990 N. California Boulevard
Walnut Creek, California 94596

July 2, 1981
GO-1-81-194

Attention: Mr. B. H. Faulkenberry
Chief, Reactor Construction
Projects Branch

Subject: PROJECTS 1 AND 4
DOCKET NOS. 50-460 AND 50-513
POTENTIALLY REPORTABLE CONDITION 10CFR50.55(e)
DECAY HEAT REMOVAL HEAT EXCHANGER TUBING

References: 1) Telecon TJ Houchins, Supply System to DF Kirsch, Region V Nuclear Regulatory Commission dated January 17, 1981

2) GO-1-81-25, dated January 30, 1981, DW Mazur to RH Engelken, Director

In reference 1) the Supply System informed your office of the potentially reportable deficiency under 10CFR50.55(e) and reference 2) was an interim report in the subject condition.

Attachment A includes a brief description as to how the potential deficiency was discovered, and the investigation methodology used to evaluate the possible deficiency. Project Engineering has reviewed all the pertinent test data derived from our investigation and determined that the seam welded tubing used in the decay heater removal heat exchangers manufactured by Ametek, Schutte and Koerting Division, Whitlock and Bethayres plants for Babcock & Wilcox meet the applicable ASME code requirements. Based on the information provided in Attachment A it has been concluded that the originally reported "Potential" deficiency does not satisfy the necessary criteria of 10CFR50.55(e) to be considered reportable, therefore this is a final report and no further action will be taken by the Supply System.

If you have any questions or desire further information, please advise.

Very truly yours,

D. W. Mazur
Program Director
WNP-1/4

DWM:MER:lm
Attachment

cc: CR Bryant, Bonneville Power Administration/399

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S1/1

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ATTACHMENT A

WNP-1/4
Docket Nos: 50-460 and 50-513
Reportable Condition 10 CFR 50.55(e) (Potential)
Decay Heat Removal Heat Exchanger Tubing
Final Report

BACKGROUND

The Supply System had an experience at its WNP-3/5 site which identified a potential problem that could have been generic to certain types of seam welded heat exchanger tubing. For this reason it was decided to investigate the integrity of seam welded tubing used in the decay heat removal heat exchangers supplied to WNP-1/4 by Babcock & Wilcox Company. These heat exchangers were manufactured for Babcock & Wilcox by Ametek, Schutte and Koerting Division, Whitlock and Bethayres Plants. Preliminary examination of selected tubes had shown indications of imperfections along the seam weld area. The results of this preliminary inspection were the basis for the Supply System informing your office of a potentially reportable deficiency under 10 CFR 50.55(e) (Telecon dated January 17, 1981, and letter dated January 30, 1981).

ACTION TAKEN

The Supply System requested Babcock & Wilcox's participation in the evaluation program and in March 1, 1981, an inspection was conducted on pre-selected tubes to demonstrate the Supply System's testing methodology that was used in detecting the tubing imperfections. To formally characterize the type of defects that were being detected, it was decided to perform a destructive examination. One representative tube from each of the tube manufactures (Trent Tubing and Greenville Tubing) was removed from the heat exchangers on April 1, 1981. The evaluation program at this point was separated into the following three areas of investigation:

(1) Were the indications in the tubing not being picked up by the tubing manufacturer as a result of the tubing manufacturer violating the ASME requirements for non-destructive examination?

(2) Were the indications really there and how accurate was the Supply System eddy current testing methodology?

(3) If the indications were there, were they injurious to the tubes?

The tubing manufacturers were also visited in April, 1981. The tubing manufacturers utilized Eddy Current Standards that comply with the minimum requirements of the ASME Boiler and Pressure Vessel Code, Section III. The standard utilized by Greenville contained indications 1 inch long, 1/16 inch wide and .004 inch deep on the O.D. and I.D. and a 1/16 inch diameter through wall hole.. The 1971 Edition, Winter 1972 Addenda of the ASME Boiler and Pressure Vessel Code, to which the heat exchangers were manufactured, required an I.D. and O.D. notch as above and the 1/16 inch diameter through wall hole. Greenville could detect the indications in their standard. The indications in the standard utilized by Trent Tubing were smaller

also meeting the requirements of the ASME Code. The Trent Tubing eddy current examination was therefore more stringent than is required by ASME. The final result of the audits at Trent and Greenville confirmed the tube vendors did conform to the minimum requirements of the ASME Boiler and Pressure Vessel Code for inspection of the SA-249 tubing.

The tubes removed from the heat exchanger were eddy current examined at Babcock's and Wilcox's Lynchburg Research Center (LRC) utilizing an I.D. coil and an O.D. coil. The eddy current equipment was set up utilizing an ASME minimum standard and utilizing an LRC standard that closely approximates a lack of fusion in the weld. When using the ASME standard it was found that the previously identified indications (utilizing Supply System methodology) fell within the acceptable limits of the standard and therefore the tubing inspection at the tubing vendor would not have detected any rejectable conditions either.

A metallographic examination of tube areas containing the indications was performed for the purpose of: (1) identifying the existence and type of physical conditions at the site of the indication previously identified by the Supply System and Babcock and Wilcox eddy current testing and, (2) determining the character and size of any physical conditions. The sectioning results yielded real features of intermittent O.D. and I.D. weld centerline porosity and a condition which is described as I.D. weld corner undercut with a round bottom configuration. The depths associated with the centerline porosity appeared to be considerably smaller than the evaluated eddy current signal. The size of the weld corner undercut was similar to that corresponding to the evaluated eddy current signal. The actual section depth of the evaluated indications were up to 18% through-wall and there was no case in which the actual depth exceeded the eddy current indicated depth. The Supply System's testing methodology was capable of adequately identifying this type of small volume defects but which are not in excess of the acceptable range of the applicable ASME Code standard.

An ASME Code stress analysis (per Article NB-3200) was performed to address any potentially injurious characteristics arising from the identified indications. This analysis showed that all stresses, at design conditions and operating conditions, are within the Code allowable limits. Secondary performance thermal conditions were applied to the analysis for added conservatism in the assessment of normal operation. A Code fatigue analysis was not necessary since the general stress state and the projected load cycles are relatively low. In addition, an analysis assessing the stress corrosion cracking and fatigue crack propagation potential of the type of flaws detected in the tubing was performed. Results of this analysis showed that the derived fracture stress intensities do not exceed assumed activation threshold intensity levels; therefore, stress corrosion cracking and fatigue crack propagation are not active failure mechanisms for axial flaws in these heat exchanger tubes that are less than 75% of the tube wall thickness.

CONCLUSION

The program undertaken by the Supply System and Babcock & Wilcox to investigate the potential deficiency concludes that the Decay Heat Removal Heat Exchangers furnished for WNP-1/4 are capable of performing their intended function without presenting a threat to the safety of the plant or without a threat to public health and safety. On this basis, this condition is not considered reportable.