

WOLF CREEK

NUCLEAR OPERATING CORPORATION

Neil S. "Buzz" Carns
Chairman, President and
Chief Executive Officer

January 9, 1996

WM 96-0001

U. S. Nuclear Regulatory Commission
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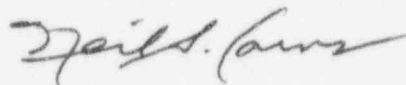
Reference: Letter ET 95-0057 dated June 23, 1995, from
R. C. Hagan to USNRC
Subject: Docket 50-482: Response to the Request for Additional
Information for Generic Letter 95-03

Gentlemen:

The referenced letter provided Wolf Creek Nuclear Operating Corporation's (WCNOC) response to NRC Generic Letter 95-03, "Circumferential Cracking of Steam Generator Tubes". On December 8, 1995, the NRC issued a Request for Additional Information (RAI), requesting additional information and clarification of WCNOC's response to Generic Letter 95-03. Attached is WCNOC's response to that request.

If you have any questions concerning this matter, please contact me at (316) 364-8831, extension 4100, or Mr. Richard D. Flannigan at extension 4500.

Very truly yours,



Neil S. Carns

NSC/jra

Attachment

cc: L. J. Callan (NRC), w/a
W. D. Johnson (NRC), w/a
J. F. Ringwald (NRC), w/a
J. C. Stone (NRC), w/a

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RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION (RAI)
GENERIC LETTER 95-03, "CIRCUMFERENTIAL CRACKING OF STEAM GENERATOR TUBES"

Question 1:

The following areas have been identified as being susceptible to circumferential cracking:

- a. Expansion transition circumferential cracking
- b. Small-radius U-bend circumferential cracking
- c. Dented location (including dented TSP) circumferential cracking
- d. Sleeve joint circumferential cracking

In your response, area d) was not specifically addressed. These areas have been identified as being susceptible to circumferential cracking as evidenced by operating experience at other recirculating steam generators. Please submit the information requested in Generic Letter (GL) 95-03 per the guidance contained in the GL for this area (and any other area susceptible to circumferential cracking). The staff realizes that some of the above areas may not have been addressed since they may not be applicable to your plant; however, the staff requests that you clarify this (e.g., no sleeves are installed; therefore, the plant is not susceptible to sleeve joint circumferential cracking).

In your response, you indicated that a small-radius U-bend motorized rotating pancake coil (MRPC) inspection program has not been performed at your plant. You also indicated that the tubes have wide-radius U-bends and are fabricated from thermally treated Alloy 600. If the small-radius U-bends are susceptible to circumferential cracking, please provide your inspection plans including expansion criteria, if applicable, for the next steam generator tube inspection outage per the guidance in GL 95-03.

Response:

Items 1.a, Expansion transition circumferential cracking, and 1.c, Dented location (including dented TSP) circumferential cracking, were discussed in WCNO's June 23, 1995 response to Generic Letter 93-05. The RAI did not request any further information on these items.

Concerning Item 1.d, Sleeve joint circumferential cracking, no sleeves have been installed in any of the Wolf Creek Generating Station (WCGS) steam generators. Therefore, WCGS steam generators are not susceptible to sleeve joint circumferential cracking.

With respect to Item 1.b, Small-radius U-bend circumferential cracking, small-radius U-bend locations have an increased potential for tube cracking due to the change in tube geometry, which increases tube stresses in this location. However, the design of the Westinghouse Model "F" steam generators installed at WCGS considerably reduces the chance of cracking in the small-radius U-bend region due to the use of Inconel 600 thermally-treated tubing (versus mill annealed tubing) and the Row 1 U-bend radius being slightly larger than older

model Westinghouse steam generators. To date, no domestic plants using Westinghouse Model "F" steam generators with Inconel 600 thermally treated tubing have reported circumferential cracking in any small-radius U-bend locations.

In the Sixth Refueling Outage (March 1993), 100% of Steam Generator B tubes were bobbin coil inspected with no cracking detected. In the Seventh Refueling Outage (September 1994), 100% of the tubes in Steam Generators A and D were bobbin coil inspected with no cracking detected. However, realizing that the bobbin coil is not the best technique available to detect circumferential cracking, WCNOG is planning on a supplemental examination of the small-radius U-bends.

It is WCNOG's belief that cracking at the small radius U-bends is not a concern at WCGS due the reasons stated earlier. However, WCNOG believes that it would be proactive to further establish and characterize the baseline for the small radius U-bend region with a method that is more sensitive to circumferential cracking. Therefore, WCNOG plans to inspect a 20% sample of the Row 1 U-bends in Steam Generators B and C in our Eighth Refueling Outage (scheduled to begin in March 1996) using a technique qualified to Appendix H of the EPRI Steam Generator Examination Guideline (e.g., 3 coil Motorized Rotating Pancake Coil (MRPC) probe, Cecco probe, Plus Point probe, etc.). In the event that cracking is identified in the Row 1 U-bend region, 100% of the Rows 1 and 2 U-bends of Steam Generators B and C will be examined for circumferential cracking using techniques qualified to Appendix H. If no further circumferential cracking is found, and the extent of circumferential cracking is considered to be bounded, no further examinations will be performed. However, if additional circumferential cracking is found, U-bend inspections will be continued for higher row numbers in Steam Generators B and C, and U-bend inspections will be initiated, starting with Rows 1 and 2 tubes, in Steam Generators A and D. These inspections will be continued in all steam generators until the region of cracking is bounded.

Question 2:

During the Maine Yankee outage in July/August 1994, several weaknesses were identified in their eddy current program as detailed in NRC Information Notice 94-88, "Inservice Inspection Deficiencies Result in Severely Degraded Steam Generator Tubes." In Information Notice 94-88, the staff observed that several circumferential indications could be traced back to earlier inspections when the data was reanalyzed using terrain plots. These terrain plots had not been generated as part of the original field analysis for these tubes. For the rotating pancake coil (RPC) examinations performed at your plant at locations susceptible to circumferential cracking during the previous inspection (i.e., the previous inspection per your Generic Letter 95-03 response), discuss the extent to which terrain plots were used to analyze the eddy current data. If terrain plots were not routinely used at locations susceptible to circumferential cracking, discuss whether the RPC eddy current data has been reanalyzed using terrain mapping of the data. If terrain plots were not routinely used during the outage and your data has not been reanalyzed with terrain mapping of the data, discuss your basis for not

reanalyzing your previous RPC data in light of the findings at Maine Yankee.

Discuss whether terrain plots will be used to analyze the RPC eddy current data at locations susceptible to circumferential cracking during your next steam generator tube inspection (i.e., the next inspection per your Generic Letter 95-03 response).

Response:

Terrain Plots and C-scan plots are interchangeable terms in the industry. WCNOC's Steam Generator Data Analysis Guideline references the use of C-scan plots.

In previous outages, C-scan plotting of all data was not specifically required by WCNOC's Steam Generator Data Analysis Guideline. However, the data analysts (Westinghouse and Rockridge) who analyzed past WCGS steam generator data recognized C-scan plotting as a good practice, and the guideline did require all C-scan data plots that were taken to be reviewed and included in the data analysis. Following discussions with the Lead Analysts from both Westinghouse and Rockridge, WCNOC concluded that C-scan plotting was typically utilized by the data analysts because it was much easier and faster than scrolling through the strip charts. Based on the foregoing, WCNOC is confident that most data analysts routinely used the C-scan plots when analyzing the RPC data. Accordingly, WCNOC does not believe that reanalysis of past RPC data using C-scan plotting is necessary to verify whether or not indications were missed. Additionally, WCGS is scheduled to be shut down for a maintenance and refueling outage starting March 2, 1996. A MRPC inspection of a minimum of 10% of the tubes in the top of the tubesheet region of Steam Generators B and C will be performed during this outage. As stated in the original response to GL 95-03, if top-of-tubesheet cracking is detected, a 100% sample of the hot legs of all four steam generators will be performed.

Following the Seventh Refueling Outage (September 1994), the Steam Generator Data Analysis Guideline was revised to include a C-scan plot of a typical top-of-tubesheet crack. Prior to the Eighth Refueling Outage (scheduled to start in March 1996), the wording in the Steam Generator Data Analysis Guideline will be changed to clarify that all RPC data collected in the Eighth Refueling Outage will be C-scan plotted, and that these plots will be used to analyze the RPC eddy current data at locations susceptible to circumferential cracking.