



**INDIANA & MICHIGAN ELECTRIC COMPANY**

DONALD C. COOK NUCLEAR PLANT  
P.O. Box 458, Bridgman, Michigan 49106  
(616) 465-1901

December 12, 1983

50-316

DMB

Mr. J.G. Keppler, Regional Administrator  
United States Nuclear Regulatory Commission  
Region III  
799 Roosevelt Road  
Glen Ellyn, IL 60137

Dear Mr. Keppler:

The purpose of this letter is to inform you of the actions taken by Indiana and Michigan Electric Company during an unscheduled Unit 2 outage that commenced on October 15, 1983.

After reaching an indicated primary to secondary leak rate of 0.206 GPM at 2007 hours on Saturday, October 15, 1983, a decision was made to remove the Donald C. Cook Nuclear Plant's Unit 2 from service.

However with the leak rate increasing, Plant Management made the decision to investigate the cause, prior to reaching the technical specification limits.

Based on Plant surveillance data the source of leakage was believed to be in Steam Generator No's 21, 22 and 23. No leakage was detected in Steam Generator No. 24. Westinghouse Nuclear Services Integration Division was brought in to provide: 1) support services for helium leak testing conducted by plant personnel, 2) to perform limited Eddy Current Testing verifying helium leak test results, and 3) to mechanically plug any leaking tubes that were detected by these examinations.

The unit was drained to half-loop and the primary side of the Steam Generators was opened on October 21. After experiencing some difficulty in pressurizing the secondary side of Steam Generator No. 21 with helium, and also having problems with channel head ventilation on Steam Generator No. 22, helium leak testing got underway on Steam Generator No's 21 and 22 on October 24. Testing of Steam Generator No. 23 began on October 25. The following tubes were identified as leakers by helium testing:

<u>S/G No. 21</u>	<u>S/G No. 22</u>	<u>S/G No. 23</u>
Row 1, Column 84	Row 1, Column 73	Row 1, Column 24
Row 1, Column 88		Row 1, Column 25

As verifications of the helium testing, Westinghouse performed Eddy Current Testing (ECT) on the leaking tubes and all tubes

IE01  
1/0

8401230319 831212  
PDR ADDCK 05000316  
S PDR

DEC 22 1983

adjacent to the leakers. ECT confirmed inside diameter indications in the U-Bend region of each of the leakers. None of the other tubes tested showed indications. ECT results were as follows:

<u>S/G No.</u>	<u>Tube No.</u>	<u>Defect Location</u>
21	Row 1, Column 84 Row 1, Column 88	U-Bend, Hot Leg Tangent Point U-Bend, Apex
22	Row 1, Column 73	U-Bend, Cold Leg Tangent Point
23	Row 1, Column 24 Row 1, Column 25	U-Bend, Cold Leg Tangent Point U-Bend, Cold Leg Tangent Point

The above five (5) tubes were mechanically plugged by Westinghouse on October 26 and 27. Following removal of the nozzle covers and a channel head cleanliness inspection, the generators were released for closing.

The unit went critical at 0544 hours and entered Mode 1 at 0643 on November 7, 1983. Steam Generator No. 21 still showed some activity following tube plugging.

#### November 7, 1983

The unit was brought out of service again, on November 7, 1983, at 2128 hours after reaching an indicated primary to secondary leak rate of approximately .293 GPM in Steam Generator No. 21.

#### November 10, 1983

The primary manway was reopened and a visual examination of the tubesheet was performed with the Steam Generator full of water. The visual examination identified a positive leaking tube on the hot leg side in Row 16, Column 40. Temporary plugs were inserted into the leaking tube, both hot and cold leg tubesheets, so that the Steam Generator secondary side could be pressurized with helium. Twenty-four (24) tubes surrounding the known leaker were tested with no signs of leakage, also the Row 1 and 2 tubes and a complete scan of the tubesheet was inspected with no indication of leaking tubes. After completion of helium testing, the Steam Generator was degassed and the temporary plugs removed.

Eddy Current Testing commenced on November 12, 1983 to identify the mechanism and location of the known failure. An Eddy Current Inspection of a 5X5 tube grid around the leaker showed that all tubes in the test area were dented at the top of the tubesheet on the hot leg side and two (2) of the tubes had pluggable indications just above the tubesheet (Row 14, Column 40 and Row 14, Column 41 - both 87% defects) along with the Row 16, Column 40 throughwall defect.

Although Eddy Current Testing could not positively identify the tube degradation mechanism, stress corrosion cracking (or a

Mr. J.G. Keppler, Regional Administrator  
December 12, 1983  
Page 3 of 4

similar corrosion phenomenon) is believed to be the probable cause. Since tube denting is considered a precursor to corrosion-induced tube degradation, the Eddy Current Inspection Program was expanded to include all dented tubes in the sludge pile region of Steam Generator No. 21. Additionally, when a review of Steam Generator No. 21 Eddy Current Data from April, 1981 showed that all three (3) of the pluggable tubes had previously exhibited a "suspect" or "unidentified" tubesheet signal similar to that now seen on other Steam Generator No. 21 tubes, a complete review of recent ECT Data for Steam Generator No. 23 (1982) and No. 24 (1981) was initiated to see if similar signals were present. Eddy Current Testing of the pertinent areas of Steam Generator No. 22 had not been performed since 1979, so it was decided to open Steam Generator No. 22 for a limited ECT inspection.

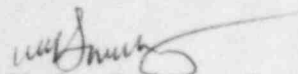
A careful review of new and previous data by both the on-site Zetec Data Analyst and by Westinghouse Steam Generator Technology Division personnel resulted in the discovery of numerous suspect ECT signals in all four (4) Unit 2 Steam Generators. However, the final conclusion was that suspect tubesheet signals cannot be definitely linked to tube degradation at this time. Westinghouse recommends performing metallographic analysis of tube samples, during the upcoming Unit 2 refueling outage tentatively scheduled during the first quarter of 1984, to properly characterize these signals and determine their importance.

On Steam Generator No. 21, a total of 728 tubes in the sludge pile region were inspected full length. Hot leg side dents were found at the top of the tubesheet in 388 tubes, but no tube degradation other than the three (3) previously mentioned defects were found. The three (3) defective tubes were mechanically plugged on both the hot and cold legs.

On Steam Generator No. 22, a total of 572 tubes in the sludge pile region were inspected full length. Dents were found at the top of the tubesheet on the hot leg side of 19 tubes. The only incidence of tube degradation was a 39% (non-pluggable) indication at the #4 anti-vibration bar intersection of tube Row 10, Column 31.

Additionally, all Row 1 tubes on Steam Generator No. 21 and No. 22 not previously plugged were Eddy Current Tested through the U-Bend region, with no indications being found.

Respectfully,

  
W.G. Smith, Jr.  
Plant Manager

/sja

cc: See Attached Distribution List

Mr. J.G. Keppler, Regional Administrator  
December 12, 1983  
Page 4 of 4

cc: B.A. Svensson  
E.L. Townley  
R.F. Hering  
M.P. Alexich  
J.G. Feinstein  
S.H. Steinhart  
O.R. Tattoli/J.R. Jensen/D.R. Hafer  
R.F. Kroeger  
J.F. Stietzel  
E.R. Swanson  
R.L. Otte  
File