

# INDIANA & MICHIGAN POWER COMPANY

P. O. BOX 18  
BOWLING GREEN STATION  
NEW YORK, N. Y. 10004

Donald C. Cook Nuclear Plant Units 1 and 2  
Docket Nos. 50-315 and 50-316  
License Nos. DPR-58 and DPR-74

June 7, 1979

AEP:NRC:00216

Mr. James G. Keppler, Regional Director  
Office of Inspection and Enforcement  
U.S. Nuclear Regulatory Commission  
Region III  
799 Roosevelt Road  
Glen Ellyn, Illinois 60137

Dear Mr. Keppler:

This letter and the accompanying report in the form of six attachments supplement Mr. D. V. Shaller's letter of May 26, 1979 concerning the small cracks identified in the main feedwater elbows at the Donald C. Cook Plant Units 1 and 2. The report, submitted in accordance with Technical Specification 6.9.1.8.i, details the results of AEP's investigation into this matter, the corrective actions taken, the test program to be implemented on the feedwater system, and a safety evaluation of this event.

On May 19, 1979 Unit No. 2 was brought to cold shutdown condition to determine the source of non-radioactive water that was building up in the containment sump. Investigation on May 20, 1979 revealed small cracks in elbows of the main feedwater lines to steam generators 1 and 4. Mr. Shaller informed Mr. K. R. Baker, NRC Region III Inspector, of these findings that same day.

In each of the four steam generator secondary lines, a vertical 14-inch carbon steel feedwater pipe is welded to a 14-inch by 16-inch reducer, which in turn is welded to a 16-inch carbon steel elbow. This 16-inch elbow is welded directly to a 16-inch low alloy nozzle on the steam generator. The cracks were found in the 16-inch feedwater elbows adjacent to the feedwater elbow/steam generator nozzle welds. These cracks initiated outside of the heat affected zones of the welds.

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Examination of the elbows has indicated the cracks initiated at the top of the inner surface of the elbow at a machined discontinuity required for the weld-end preparation.

Radiographic examinations of the nozzle/feedwater line weld regions for Unit 2 steam generators Nos. 2 and 3 showed indication of cracks in the same area of the elbows. The same areas in Unit 1 were subsequently radiographed and indications were found in the 16-inch elbows of the feedwater lines to steam generators No. 2, 3 and 4. This discovery of crack indications was promptly reported to Region III. We were not able to detect the presence of indications in the 16-inch elbow to steam generator No. 1 in Unit 1 using radiographic techniques because of the unique conditions of the backing ring. Subsequent liquid penetrant examination indicated cracking in this elbow.

The wall thickness of the 16-inch elbow is approximately 50 percent greater than that of the steam generator nozzle. To compensate for this difference in wall thickness, the weld preparation included machining and beveling a step on the inside of the elbow to match the thickness of the steam generator nozzle at the point of the weld. Stresses concentrated in this thinner section adjacent to the weld and were magnified at the point of discontinuity.

The highest design stress point in the feedwater line inside the containment is at the 90° 14-inch elbows at the bottom of the vertical riser. The 14-inch elbows are in the same vertical plane as the affected 16-inch elbows. Five of the 14-inch elbows were radiographed. No indications were found.

Samples of the cracked areas of the 16-inch elbows were sent to two laboratories for metallurgical examination. Reports from the metallurgical examinations showed that the crack propagation was caused by high-cycle fatigue assisted by corrosion. Further details of the metallurgical examination are described in Attachment 2.

After removal of the 16-inch elbows, the inside of the Unit 2 steam generator nozzles were examined by the liquid penetrant method. Light pitting and intermittent linear indications were noted on the nozzle counterbores. Subsequent visual inspection of the Unit 1 nozzles showed similar pitting in the nozzle counterbore region.

We are replacing the 16-inch elbows to all steam generators in Units 1 and 2. These new elbows do not have the sharp discontinuities on the pipe inner surface, and the strength of the elbow in the weld area has been increased. The pits and indications on the steam generator nozzles

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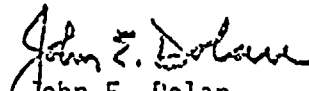
are being blended out. The stress concentration at the nozzle counter-bore is being reduced with the addition of a 1/2-inch radius fillet.

We are implementing a program to determine the characteristics of the high cycle fatigue. This program includes the installation of strain, temperature, pressure and vibration instrumentation at significant points on the piping system of two feedwater lines in Unit 2. Details of the new 16-inch elbow, the nozzle repairs and instrumentation are in Attachment 5.

The safety implications of this event at Cook Nuclear Plant have been carefully analyzed by our safety review committees. It was concluded that the condition identified did not adversely affect the health and safety of the general public. It was concluded that the return of the units to power with the newly designed elbows will have no adverse effect on the general public. Operation of Unit 2 with the instrumentation program will indicate whether there is any need for further corrective action. A safety evaluation is given in Attachment 6.

We expect to begin startup of Unit 2 by June 13, 1979 and Unit 1 by June 20, 1979.

Very truly yours,

  
John E. Dolan  
Vice President

JED kb  
Attachments

cc: R. C. Callen  
G. Charnoff  
R. S. Hunter  
R. W. Jurgensen  
N. C. Moseley, NRC  
D. V. Shaller, Bridgman  
R.E. Masse RO:III  
P.W. Steketee, Esq.  
R. Walsh, Esq.  
G. Charnoff, Esq.  
R.C. Callen MPSC  
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