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DENTON, H. R. Document Control Branch (Document Control Desk)

SUBJECT: Informs of program & course of action taken by util as result of 870303 steam generator tube leak & documents preliminary tube insp results discussed w/NRC on 870330.

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INDIANA & MICHIGAN ELECTRIC COMPANY

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April 9, 1987
AEP:NRC:0936G

Donald C. Cook Nuclear Plant Unit No. 2
Docket No. 50-316
License No. DPR-74
STEAM GENERATOR TUBE LEAK AND RETURN TO POWER OPERATION

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Attn: H. R. Denton

Dear Mr. Denton:

Pursuant to the request of your staff, and in accordance with Technical Specifications 4.4.5.5.a and 4.4.5.5.c, this letter is to inform you of the program and course of action taken by Indiana & Michigan Electric Company as a result of the recent Donald C. Cook Plant Unit 2 steam generator (SG) tube leak. Specifically, this letter documents preliminary tube inspection results discussed with members of your staff during a phone conversation on March 30, 1987; addresses restoration of SG tube integrity to the same level as at the beginning of the previous operating period; and presents justification for Unit 2 start-up and operation for an initial period of three months as requested by members of your staff. This letter will be followed, within approximately one month of the unit's return to power, by a complete report providing an evaluation of, and justification for an acceptable operating interval between SG inspections.

Following a continuous operating period of 226 days, Unit 2 was removed from service on March 3, 1987 due to an indicated primary-to-secondary leak in SG 22. The measured leak rate prior to initiating shutdown was 0.247 gpm, well below the Technical Specification leak rate limit of 500 gallons per day (0.347 gpm). The leaking tube in SG 22 was identified by hydrostatic testing as tube R28C53, and was confirmed by eddy current testing to have a through-wall defect in the hot-leg tubesheet crevice about 3.7 inches below the tubesheet surface. This defect is typical of the secondary-side intergranular corrosion previously identified in the Unit 2 steam generators.

To verify SG tube integrity prior to returning to service, an eddy current inspection consistent with the requirements of Technical Specification 3/4.4.5 was performed. Testing results of an initial sample of about 6 percent of the tubes in each of SGs 22 and 24 necessitated expanding the inspection to all tubes in each steam generator. A tabulation of pertinent hot-leg eddy current indications, by type and location, is included in the attachment to this letter.

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The conservative SG tube plugging criteria used during the 1986 scheduled outage were again implemented. In the hot-leg tubesheet crevice and tubesheet surface regions, all indications or other signals representing possible tube wall degradation - regardless of amplitude and voltage - were considered pluggable. At hot-leg support plate intersections, the criterion of ≥ 40 percent indicated wall penetration with a threshold voltage of 1.75 volts was used to determine pluggable indications, although some indications not meeting the threshold voltage were plugged as an additional precaution. A detailed discussion of the rationale for these criteria can be found in our letter AEP:NRC:0936E, (Westinghouse WCAP-11329).

Application of these criteria resulted in plugging 107 tubes; the attachment also provides a breakdown of pluggable indications by location: 17 tubes in SG 21, 32 tubes in SG 22, 37 tubes in SG 23 and 21 tubes in SG 24 were plugged due to secondary-side corrosion. We believe that completion of tube plugging on April 2, 1987 has restored the Unit 2 steam generator tube integrity to at least the same level as at the beginning of the previous operating period.

During the upcoming Unit 2 start-up, crevice flushing with boric acid (1000 to 2000 ppm boron) will be performed in each SG, followed by a 30 to 35 percent power soak with boric acid (50 ppm boron) and continued on-line boric acid (5-10 ppm boron) addition during power operation. Unit load will again be administratively limited to about 80 percent reactor thermal output (except for short periods of time) to reduce operating temperature. The benefits of these and other continuing remedial measures have been discussed in our letters AEP:NRC:0936C and AEP:NRC:0936E.

Given that tube integrity has been restored to the same level, and that operating conditions are expected to be generally the same, an assessment of near-term future operation based on comparison to the most recent operating period seems reasonable. Unit 2 ran continuously from July 20, 1986 to March 3, 1987, a period of 226 days, which represents approximately 181 effective full-power days (EFPDs) of operation. Steam generator primary-to-secondary leakage during the entire period was undetectable until March 2, 1987, when the leak was identified and shutdown actions were initiated. Based on that performance, the occurrence of a tube leak during start-up or in the first 3 months (about 72 EFPDs) of operation is believed to be very unlikely. Further, the recent Unit 2 tube leak occurrence substantiates our belief that leakage will be detected in time to effect a normal shutdown for repair before a tube rupture could occur. It should also be noted that to date approximately 6% of the Unit 2 SG tubes have been plugged, which is well within the accident analysis limits of an average SG tube plugging of up to 10% and a maximum plugging of one or more SGs of up to 15%.

Our preliminary evaluation of corrosion growth rate data from the just-completed eddy current inspection indicates that the growth rate model previously used as a basis for justifying operation through Cycle 6 (see AEP:NRC:0936E) is adequate. However, the method of application of the model to determine an operating interval from this point on will be reevaluated, with emphasis on minimizing the possibility of leakage. This evaluation is in progress and will be submitted within approximately one month following unit start-up.

This document has been prepared following Corporate procedures which incorporate a reasonable set of controls to insure its accuracy and completeness prior to signature by the undersigned.

Very truly yours,

M. P. Alexich
Vice President

cm

Attachment

cc: John E. Dolan
W. G. Smith, Jr. - Bridgman
R. C. Callen
G. Bruchmann
G. Charnoff
NRC Resident Inspector - Bridgman
A. B. Davis - Region III

Donald C. Cook Plant Unit 2
Steam Generator Tube Leak and Return to Power Operation
Interim Status Report

INDICATIONS OF HOT LEG SECONDARY SIDE CORROSION
March 1987 EC Inspection

	≤39%	≥40%	DI	UDS	SQR	Total
Support Plates	14	21	594	0	N/A	629
Tubesheet Surface	3	7	19	2	N/A	31
Tubesheet Crevice	0	5	2	6	42	55
Total	17	33	615	8	42	715

DI - Distorted Indication

SQR - Squirrel (a particular DI in the crevice region)

UDS - Undefined Signal

Notes: Plugging criteria are illustrated by the boundary line in the above table (107 tubes); in addition, 3 tubes were plugged due to reasons unrelated to secondary side corrosion; (2 because EC testing could not be performed, and 1 as a precautionary measure due to a distorted indication at the tubesheet roll transition); 110 total tubes were plugged.

Submittals AEP:NRC:0936C and AEP:NRC:0936E define indication types (e.g., DI, SQR) and provide rationale for plugging criteria.

Numbers in the above table represent individual tubes; for tubes with indications at multiple locations, only the indication deemed most severe is listed.