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SUBJECT: Submits info re results of Sept 1987 steam generator tube eddy current insp & presents justification for continuing operation through end of current fuel cycle.

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Donald C. Cook Nuclear Plant Unit 2
Docket No. 50-316
License No. DPR-74
OPERATION OF UNIT 2 THROUGH THE END OF THE CURRENT FUEL CYCLE

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

Attn: T. E. Murley

November 24, 1987

Dear Dr. Murley:

This submittal provides information regarding the results of the steam generator (S/G) tube eddy current inspection performed at the Donald C. Cook Nuclear Plant Unit 2 during September 1987, and presents justification for continuing operation through the end of the current fuel cycle (5.2 effective full power months (EFPMs) since restart in October 1987) with no scheduled interim shutdown for S/G inspection.

Our submittal of May 22, 1987 (AEP:NRC:0936J) documented Cook Unit 2 S/G experience through March 1987, and introduced the practice of dealing with statistical extremes rather than with average tube degradation in predicting corrosion rates for those tubes experiencing degradation. The May 22 submittal concluded that operation for a period of 4.7 EFPMs from start-up in April 1987 would, in addition to meeting all criteria of Regulatory Guide 1.121, offer no significant probability of in-service steam generator tube leakage. A commitment was made to perform a steam generator inspection within 4.7 EFPMs of operation.

The 4.7 EFPMs operating interval was desirable because it represented the mid-point of the remaining fuel cycle plus an allowance to provide some flexibility in scheduling the S/G inspection outage. However, Unit 2 was electively removed from service after approximately 3.0 EFPMs to investigate potential concerns associated with anchoring of reactor coolant pump hatch bolts. Since the pump hatch investigation would take some days to complete, we decided to also initiate the S/G inspection outage to minimize the composite outage time.

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A complete eddy current inspection of the hot legs of all four steam generators was performed between September 12 and September 26, 1987. Data analysis and tube plugging criteria were identical to the criteria used during the March 1987 inspection. A total of 60 tubes were plugged due to secondary side intergranular corrosion, and an additional 18 tubes were plugged due to primary side indications at the tubesheet roll transition. Complete inspection results are summarized in the attachment to this letter.

Points of interest in the inspection results include the following:

- The number of distorted indications (DIs) reported at tube support plate intersections decreased significantly from the March 1987 inspection results (470 vs. 830). The apparent explanation for the decrease is that the recent signals are "clearer," thus allowing more definitive interpretation of signals that previously would have been categorized as DIs. The clearer data may be attributed to the removal of deposits by continuing secondary side boric acid treatment.

- The incidence of primary side indications at tubesheet roll transitions (located approximately 18 inches below the secondary face of the tubesheet), first detected in 1986, appears to be slowly progressing, but the progression rate is not of serious concern since the Cook 2 steam generators will soon be replaced. As a precaution, all indications - regardless of depth - were plugged.

Comparison of Inspection Results to Model Projection

The model used in our May 22 submittal to develop the projected end-of-interval tube bundle condition for 4.7 EFPMs was re-evaluated for the actual interval of 3.0 EFPMs, and the new projection of the extent of S/G tube degradation was compared to the actual September 1987 inspection results, as shown below.

Pluggable Indications

	Tubesheet Crevice	Tubesheet Surface	Tube Support Plates	Total
Projected	75	36	1	112
Actual	36	11	13	60

Overall, the actual number of pluggable indications is significantly less, by nearly 50 percent, than predicted by the model. Of even more significance are the comparisons by area, which show that large over-predictions were made in the tubesheet crevice and surface regions. These are the areas in which all tube leaks due to secondary side corrosion have occurred. The under-prediction of pluggable indications at tube support plate intersections is likely a result of the same phenomenon that resulted in fewer reported DIs at support plates; that is, clearer data allowed for sizing of some pre-existing flaws which had previously been called DIs.

Because of I&M's conservative plugging practice which removed all indications in the vicinity of the tubesheet from service, new degradation growth rates cannot be reliably calculated for the tubesheet crevice and surface regions. Additionally, the change in clarity of data at support plates has made new growth rate calculations pointless. However, comparison of predicted to actual results suggest that either the model is conservative or the tube degradation rate has been reduced as a result of corrective measures. In either case, the above results indicate that application of our current model tends to overpredict tube degradation.

We conclude that, while revised inputs (e.g., growth rates, depth correlation curves, and probability of detection) are not available to reliably adjust the model, the apparent changes are in conservative directions, and the original model will predict conservative end-of-interval conditions. In view of the inherent and apparent conservatisms in the model, the 5.2 EFPMs remaining in the current fuel cycle represent an insignificant change to the 4.7 EFPM interval previously justified, and is an appropriate operating interval in view of minimizing the potential for significant in-service steam generator tube leakage.

In the unlikely event that extreme tube wall penetration would occur as a random event not predicted by probabilistic analysis, we believe that I&M's leak rate monitoring program and the Technical Specification leak rate limit will ensure leak-before-break conditions and that an orderly shutdown can be affected. I&M's administrative policy of shutting down before reaching the actual leak rate limit adds additional margin to leak-before-break considerations.

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

Sincerely,

M. P. Alexich
Vice President

cm

Attachment

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

Indications of Hot Leg Secondary Side Corrosion

September 1987

A. Including only the most significant indication per tube, total for all 4 SGs.

Location		<40%	≥40%	DI	UDS	SQR	Total
Tubesheet Crevice	*	0	11	16	1	8	36
Tubesheet Surface		0	4	7	0	--	11
Tube Support Plates		39	13	348	0	--	400
Total		39	28	371	1	8	447

*Tubes inside boundary were plugged

B. Including multiple indications per tube, total for all 4 SGs.

Location	<40%	≥40%	DI	UDS	SQR	Total
Tubesheet Crevice	0	11	16	1	8	36
Tubesheet Surface	0	4	8	0	--	12
Tube Support Plates	42	13	470	0	--	525
Total	42	28	494	1	8	573