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10 CFR 50.73

Docket No. 50-348

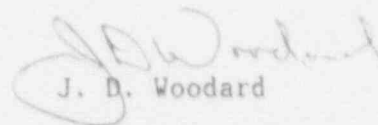
U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

Joseph M. Farley Nuclear Plant - Unit 1  
Licensee Event Report No. LER 91-003-00

Gentlemen:

Joseph M. Farley Nuclear Plant, Unit 1, Licensee Event Report No. LER 91-003-00 is being submitted in accordance with 10 CFR 50.73. If you have any questions, please advise.

Respectfully submitted,



J. D. Woodard

JDW/BHW:map 0223

Enclosure

cc: Mr. S. D. Ebnetter  
Mr. G. F. Maxwell

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## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Joseph M. Farley Nuclear Plant - Unit 1 DOCKET NUMBER (2) 05000348 PAGE (3) 1 OF 5

TITLE (4)  
Steam Generator Tube Degradation

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	YEAR	SEQ NUM	REV	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)	
04	30	91	91	003	00	05	13	91		05000	

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (11)									
POWER LEVEL	000	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)						
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)						
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	X OTHER (Specify in						
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	Abstract below)						
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	Report per Tec						
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	Spec4.4.6.5a&c						

## LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
D. N. Morey, General Manager - Nuclear Plant	AREA CODE 205 899-5156

## COMPLETE ONE LINE FOR EACH FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORT TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORT TO NPRDS

## SUPPLEMENTAL REPORT EXPECTED (14)

YES(If yes, complete EXPECTED SUBMISSION DATE)	X NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	X				

## ABSTRACT (16)

The following report is being submitted in accordance with Technical Specification 4.4.6.5.a and c.

During the Unit 1 Tenth Refueling Outage (U1RF10), eddy current inspections were performed on 100% of the available tubes in all three steam generators (SGs). As a result of this inspection a total of 214 tubes previously in service (2.13% of the total number of tubes inspected) were found to be defective which requires inspection results to be classified as Category C-3. Plugs were removed from a total of 228 previously plugged tubes in three SGs and these tubes were returned to service. Following these actions, the percentage of tubes plugged in each SG is 4.22%, 2.27% and 3.10% in SGs 1A, 1B and 1C, respectively.

In addition to the required tube plugging, several ongoing programs have been established to reduce the probability of future tube degradation.

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## TEXT

Plant and System Identification

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System codes are identified in the text as [XX].

Summary of Event

During the Unit 1 Tenth Refueling Outage (U1RF10), eddy current inspections were performed on 100% of the available tubes in all three steam generators (SGs). As a result of this inspection a total of 214 tubes previously in service (2.13% of the total number of tubes inspected) were found to be defective which requires inspection results to be classified as Category C-3. Plugs were removed from a total of 228 previously plugged tubes in three SGs and these tubes were returned to service. Following these actions, the percentage of tubes plugged in each SG is 4.22%, 2.27% and 3.10% in SGs 1A, 1B and 1C, respectively.

Description of Event

Prior to the U1RF10, Alabama Power Company developed an eddy current inspection plan to inspect all non-plugged tubes in all three SGs. The eddy current inspection plan included: 100% full length bobbin probe inspection of all available tubes, 100% rotating pancake (RPC) probe inspection of the hot leg transition zone of the Westex expansion area (+ 3 inches at the top of the tubesheet) of all available tubes, RPC inspection of Row 1 and Row 2 U-bends (after heat treatment), RPC inspection of all distorted indications and RPC inspection of all greater than or equal to 40% through wall indications. Ultrasonic testing was performed on the larger circumferential cracks in the transition zone of the Westex expansion area of SGs 1A and 1C.

All Row 1 tubes had been preventively plugged during the Unit 1 Third Refueling Outage due to several Row 1 tubes having been identified as leaking tubes. During U1RF10, plugs were removed from 228 Row 1 tubes. All the U-bends of the unplugged tubes in Row 1 and Row 2 were heat treated to reduce stresses in short radius U-bends. These 228 Row 1 tubes were successfully returned to service. Plugs were also removed from 51 Row 1 tubes which had to be replugged due to defective indications: 18 in SG 1A, 22 in SG 1B and 11 in SG 1C. These indications were all in the U-bend area with the exception of four tubes in SG 1A which had defective wear indications in the tube lane blocking device area. The tube lane blocking devices were previously removed.

As a result of the RPC and ultrasonic testing, 9 tubes in SG 1A and 2 tubes in SG 1C had stabilizers installed in the hot leg. Tube plugging was completed on April 29, 1991.

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Description of Event (continued)

The following is a summary of the tube status for each individual SG:

	SG 1A	SG 1B	SG 1C
Plugged prior to U1RF10	106	106	127
Determined defective during U1RF10 (excluding Row 1)	113	42	59
Replugged Row 1 tubes due to defective indications	18	22	11
Returned to service during U1RF10	76	71	81
Total plugged after U1RF10	143	77	105
% plugged after U1RF10	4.22	2.27	3.10

There were four major degradation mechanisms for the tubes found defective during this inspection: PWSCC in the Wextex expansion area, OD SCC above the top of the tubesheet in the sludge pile area, OD SCC at support plates and SCC in short radius U-bends.

Wextex Expansion Area

There were 75 defective indications in the Wextex expansion area (which includes the tubesheet and transition zone): 44 in SG 1A, 12 in SG 1B and 19 in SG 1C. Circumferential cracks in the transition zone were identified in 23 tubes in SG 1A, 3 tubes in SG 1B and 10 tubes in SG 1C. Due to the extent of the circumferential cracks, 9 tubes in SG 1A and 2 tubes in SG 1C were stabilized. The transition zone was inspected by a 100% bobbin inspection and for the first time by a 100% RPC inspection (+ 3 inches at the top of the tubesheet).

Above the Top of the Tubesheet

There were 45 defective indications above the top of the tubesheet in the sludge pile area: 14 in SG 1A, 6 in SG 1B and 25 in SG 1C.

Tube Support Plate

There were 116 defective indications at support plate intersections: 72 in SG 1A, 24 in SG 1B and 20 in SG 1C.

Short Radius U-bends

Two Row 2 tubes, both in SG 1A, were plugged due to indications in the short radius U-bends. In addition, the following Row 1 tubes were replugged due to defective indications in the U-bends: 14 in SG 1A, 22 in SG 1B and 11 in SG 1C. Circumferential cracks were located in this area for five Row 1 tubes.

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Cause of Event

Investigations and evaluations performed identified four areas where tube defects were observed: PWSCC in the Wextex expansion area, OD SCC above the top of the tubesheet within the sludge pile area, OD SCC at support plates and SCC in the short radius U-bends.

Reportability Analysis and Safety Assessment

This event is being reported in accordance with Technical Specification 4.4.6.5.a and c.

In the past, Alabama Power Company has used a minimum voltage criteria in the analysis of bobbin probe eddy current data. This outage, elimination of the minimum voltage criteria resulted in an increased number of tubes which were evaluated as defective at the tube support plates. In addition, the first 100% RPC inspection of the transition zone of the Wextex expansion area in the tubesheet increased the plugging percentage compared to previous inspections. These enhancements to the inspection program had a significant impact on the number of tubes evaluated as being defective this outage. The higher number of tubes plugged this outage is not expected to be indicative of future tube plugging rates.

The health and safety of the public were not affected.

Corrective Action

Tubes have been plugged as required. Eleven (11) tubes were stabilized. In addition, the following actions have been taken in order to reduce the probability of future tube degradation:

1. A program of boric acid addition is being continued to reduce the potential for OD SCC.
2. A program of morpholine addition is being continued to reduce the potential for sludge accumulation.
3. The Westinghouse pressure pulse cleaning process was used in all three SGs to remove contaminants from the crevices between the tubes and support plates.
4. The Westinghouse U-bend heat treat process has been completed on all Row 1 and Row 2 tubes returned to service to reduce the potential of U-bend SCC.



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Corrective Action (continued)

5. During the Unit 1 Fifth and Sixth Refueling Outages, many of the secondary components containing copper were replaced with components containing stainless steel.
6. Tube lane blocking devices were previously removed.

Additional Information

Similar events were reported in Unit 2 LERs 86-004-00, 87-004-02 and 90-005-01.  
No components failed during this event.

TABLE 1

	Steam Generator		
	A	B	C
Number of Tubes Probed	3358	3353	3342
Number of Pluggable Tubes (excluding Row 1)	113	42	59
Number of Defective Indications in Wextex Expansion Area	44	12	19
Number of Defective Indications above Tubesheet in Sludge Pile Area	14	6	25
Number of Defective Indications at Support Plates	72	24	20
Number of Defective Indications in Short Radius U-bends (excluding Row 1)	2	0	0

The sum of the number of defective indications at the different locations does not equal the number of pluggable tubes since some tubes had multiple indications.