NRC FORM 366 (4-95) U.S.NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)
Joseph M. Farley Nuclear Plant - Unit 2

DOCKET NUMBER (2): 0 5 0 0 0 3 6 4

PAGE (3): 1 OF 6

TITLE (4)
Steam Generator Tube Degradation and Tube Status

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME
04	05	95	95	- 001	- 01	06	14	96	FACILITY NAME

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
N		20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER LEVEL (10)		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
000		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	X OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME: R. D. Hill, General Manager - Nuclear Plant

TELEPHONE NUMBER: AREA CODE 3 3 4 8 9 9 - 5 1 5 6

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)

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

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-space typewritten lines) (16)

This report is being submitted in accordance with Technical Specification 4.4.6.5.a to report the number of tubes plugged, repaired, designated F*, or designated L* in each steam generator (S/G), and in accordance with Technical Specification 4.4.6.5.c to report the results of steam generator tube inspections which fall into Category C-3.

During the Unit 2 Tenth Refueling Outage (U2RF10), eddy current inspections were performed on one hundred percent of the available tubes in all three steam generators with the exception of the row 1 through row 4 U-bends in S/G's 2A and 2C, and the sleeves in S/G's 2B and 2C. As a result of this inspection a total of 89 tubes in service during Cycle Ten (1.04 percent 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 90 previously plugged tubes and these tubes were returned to service by using current data analysis guidelines and Technical Specification acceptance criteria. As a result of this inspection and a subsequent re-evaluation performed in April 1996, 264 tubes were designated F* and 6 tubes were designated as L*. Following these actions, the equivalent tube plugging percentage of tubes plugged in each steam generator is: 9.39 percent in 2A, 5.94 percent in 2B, and 6.02 percent in 2C. This results in an overall equivalent tube plugging of 7.12 percent.

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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Plant and System Identification

Westinghouse - Pressurized Water Reactor.

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

Summary of Event

This report is being submitted in accordance with Technical Specification 4.4.6.5.a to report the number of S/G tubes [AB] that have been plugged, repaired, designated F*, or designated L* in each S/G, and in accordance with Technical Specification 4.4.6.5.c to report the results of S/G tube inspections which fall into Category C-3.

During U2RF10, eddy current inspections were performed on one hundred percent of the available tubes in all three S/Gs with the exception of the row 1 through row 4 U-bends in S/G's 2A and 2C, and the sleeves in S/G's 2B and 2C. As a result of this inspection a total of 89 tubes in service during Cycle Ten (1.04 percent 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 90 previously plugged tubes. These tubes were returned to service by using current data analysis guidelines and Technical Specification acceptance criteria. As a result of this inspection and a subsequent re-evaluation performed in April 1996, 264 tubes were designated F* and 6 tubes were designated as L*. Following these actions, the equivalent tube plugging percentage in each S/G is:

2A S/G 9.39 percent 2B S/G 5.94 percent 2C S/G 6.02 percent

Overall 7.12 percent

The S/G tube plugging was completed on April 13, 1995.
The results of the S/G inspections were determined to be category C-3 on April 5, 1995.

Description of Event

During U2RF10, plugs were removed from 90 tubes. The tubes were successfully returned to service by using current data analysis guidelines.

Prior to the U2RF10, SNC developed an eddy current inspection plan to inspect all non-plugged tubes in all three S/Gs. The eddy current inspection plan included:

- one hundred percent full length bobbin probe inspection of all available tubes (except Row 1, 2, 3, and 4 U-bends).
- bobbin inspection of all available row 3 and 4 U-bends in one S/G. S/G 2B was selected for U2RF10.
- one hundred percent rotating pancake (RPC) probe inspection of all available hot leg roll transitions.
- rotating pancake (RPC) inspection of all available row 1 and 2 U-bends in one S/G. S/G 2B was selected for U2RF10.
- RPC inspection of all distorted indications.
- Cecco probe inspection of all sleeves in one S/G. S/G 2A was selected for U2RF10.

In addition, as part of a 2.0 volt interim plugging criteria for tube support plates, an RPC inspection was performed on the following bobbin signals: all support plate indications greater than 1.5 volts in S/G's 2A and 2B, all support plate indications greater than 1 volt in S/G 2C, all dents greater than 5.0 volts, and all large mixed residual signals. This program consisted of 245 tube support plate intersections.

In accordance with the requirements of the draft generic letter, a tube pull of three tube support plate intersections was performed in S/G 2C. A single axial indication of 1.87 volts by bobbin probe inspection was located at the first tube support. No indications were identified at the second and third tube supports.

The following is a summary of the tube status for each S/G:

	S/G - 2A	S/G - 2B	S/G - 2C
Tubes plugged prior to U2RF10	290	181	239
Sleeved tubes in-service prior to U2RF10	78	56	141
Percent plugging equivalent prior to U2RF10	8.68	5.41	7.23
Tubes determined defective during U2RF10	41	19	29
Tubes returned to service during U2RF10	18	1	71
Total in-service sleeves after U2RF10	112	58	170
Total in-service sleeved tubes after U2RF10	77	56	140
Total plugged tubes after U2RF10	314	199	198
Percent plugging equivalent after U2RF10	9.39	5.94	6.02
Designated F* tubes	27	38	199
Designated L* tubes	0	1	5

There were three active degradation mechanisms for the tubes found defective during this inspection. These were: primary water stress corrosion cracking (PWSCC) in the roll transition zone of the tubesheet, outer diameter stress corrosion cracking (ODSCC) in the sludge pile region, and ODSCC at the tube support plates. These are similar to the mechanisms reported in LERs 86-004-00 (Unit 2), 87-004-02 (Unit 2), 90-005-01 (Unit 2), 92-005-00 (Unit 1), 93-003-00 (Unit 2), and 94-002-00 (Unit 1). Table 1, under Additional Information, provides a summary of the above indications.

Tubesheet

A total of 85 defective indications were identified (from above the top of the roll transition to the F* elevation): 41 in S/G 2A, 17 in S/G 2B and 27 in S/G 2C. This area was inspected by a one hundred percent bobbin inspection and on the hot leg by a one hundred percent RPC inspection. All defective tubes were plugged.

Above the Top of the Tubesheet

There were two defective indications above the top of the tubesheet in the sludge pile area: 1 in S/G 2B and 1 in S/G 2C.

Tube Support Plate

There was one defective indication identified at a tube support plate in S/G 2C utilizing the 2 volt tube repair criteria.

Anti-vibration Bar (AVB) area

There was one defective indication at the location of an old AVB in S/G 2B. This indication is considered an inspection transient and not an active degradation mechanism.

Sleeved Tubes

One sleeved tube in S/G 2A was plugged. Due to a bulge in the wall of the tubesheet sleeve, the sleeved portion of the tube could not be inspected.

Cause of Event

Investigations and evaluations performed identified four areas where tube defects were observed. These were the PWSCC in the tubesheet area, ODSCC above the top of tubesheet within the sludge pile area, ODSCC at the tube support plates, and wear in the AVB area.

Reportability Analysis and Safety Assessment

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

The health and safety of the public was not affected.

Corrective Action

The S/G tubes have been plugged as required. 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 ODSCC.

2. A program of morpholine, monoethanolamine (ETA) or other advanced amines, per EPRI guidelines, is being continued to reduce the potential for sludge accumulation. Also, hydrazine addition to reduce Oxygen concentration in the secondary side of the S/Gs has been increased per new EPRI guidelines.

3. The Westinghouse pressure pulse cleaning process was used in all three S/Gs to remove contaminants from the crevices between the tubes and support plates.

4. The Westinghouse/Framatome shot peening process was utilized during the Unit 2 Fifth Refueling Outage in the hot leg tubesheet area of all non-plugged tubes to relieve residual stresses from the hard rolling process.

5. The Westinghouse U-bend heat treat process was performed on all Row 1 and 2 tubes in service during U2RF7 to reduce the potential of U-bend SCC.

6. During the Unit 2 Second, Third and Fourth Refueling Outages, many of the secondary components containing copper were replaced with components containing stainless steel.

Additional Information

Similar events were reported in Unit 2 LERs 86-004-00, 87-004-02, 90-005-01, 93-003-00, and 94-002-00.

TABLE 1
Summary of Indications

	S/G - 2A	S/G - 2B	S/G - 2C
Number of Tubes Probed, Tech Spec Inspection	2752	3151	2646
Number of Inservice Defective Tubes	41	19	29
Number of Defective Indications in the Tubesheet	41	17	27
Number of Defective Indications in the sludge pile		1	1
Number of Defective Indications at support plates			1
Number of Defective Indications at old AVB areas		1	