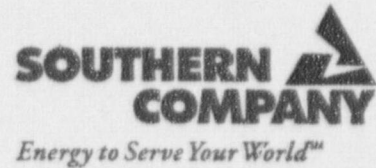


Dave Morey
Vice President
Farley Project

Southern Nuclear
Operating Company
P.O. Box 1295
Birmingham, Alabama 35201
Tel 205.992.5131

May 7, 1998



Docket No.: 50-364

10 CFR 50.73

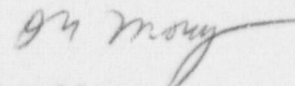
U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Joseph M Farley Nuclear Plant - Unit 2
Licensee Event Report No. 98-003-00
Steam Generator Tube Degradation and Tube Status

Ladies and Gentlemen:

Joseph M. Farley Nuclear Plant - Unit 2 Licensee Event Report No. 98-003-00, "Steam Generator Tube Degradation and Tube Status," is being submitted in accordance with Technical Specifications 4.4.6.5.a and 4.4.6.5.c. No formal commitments are identified in this letter. If you have any questions, please advise.

Respectfully submitted,


Dave Morey

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Enclosure

cc: Mr. L. A. Reyes, Region II Administrator
Mr. J. I. Zimmerman, NRR Project Manager
Mr. T. M. Ross, Plant Sr. Resident Inspector

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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 THE INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION COLLECTION BOARD, 7330 15TH AVE. S., N.W., ALBUQUERQUE, NM 87105. REGULATORY COMMISSION, WASHINGTON, DC 20555-0001. AND THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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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									
											FACILITY NAME									
0	4	9		8	0	0	3	-	0	5	0	7	9							

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	N	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(vi)
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(vii)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vi)	

NAME	TELEPHONE NUMBER									
R.D. Hill, General Manager - Nuclear Plant	AREA CODE									
	3	3	4	8	9	9	-	5	1	5

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

YES (If yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> YES	NO	SUBMISSION DATE (15)			
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-space typewritten lines) (16)

On April 11, 1998, Farley Nuclear Plant steam generator inspection results were classified as Category C-3 in accordance with Technical Specification 4.4.6.5.c. A voluntary notification report to the NRC of the C-3 inspection classification was made on April 11, 1998.

In accordance with Technical Specification 4.4.6.5.a, during the Unit 2 Twelfth Refueling Outage (U2RF12) 35 tubes were plugged, 107 tubes were sleeved and left in service, and 378 tubes were designated F*. The plugging and repair work was completed on April 24, 1998.

Eddy current inspections were performed on one hundred percent of the available tubes in all three steam generators (S/G). As a result of this inspection, more than 1% of the inservice tubes in S/G's 2B and 2C during Cycle Twelve were found to be defective, which requires inspection results in these S/G's to be classified as Category C-3. Defective indications were identified within the tubesheet, above the top of the tubesheet in the sludge pile area, and at the tube support plates. In addition to the required tube repair and plugging, several ongoing programs have been established to reduce the probability of future tube degradation.

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

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.

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Joseph M. Farley Nuclear Plant - Unit 2	0500036498	-	003	- 00	2	OF 7

TEXT (If more space is required, use additional NRC Form 366) (17)

Plant and System Identification

Westinghouse - Pressurized Water Reactor.

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

Description 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 or repaired in each S/G, and in accordance with Technical Specification 4.4.6.5.c to report Category C-3 S/G tube inspection results, and corrective measures taken to prevent recurrence.

The results of the S/G inspections were determined to be category C-3 on April 11, 1998. The S/G tube plugging and repair was completed on April 24, 1998.

Prior to the U2RF12, Southern Nuclear developed an inspection plan to inspect tubes in all three S/Gs. The inspection plan included:

- One hundred percent full length bobbin probe inspection of all available tubes with the exception of row 1 and row 2 U-bends.
- One hundred percent plus point probe inspection of all available hot leg roll transitions.
- A 20% plus point inspection of all available cold leg roll transitions.
- Plus point inspection of all available row 1 U-bends in S/G 2A.
- Plus point inspection of all available row 2 U-bends in S/G 2C.
- Plus point inspection of all sludge pile and freespan indications identified by bobbin.
- Cecco probe inspection of all sleeves, both previously installed and those installed during U2RF12.
- Tube support plate (TSP) plus point inspection program required by the TSP alternate repair criteria (ARC).
- Visual inspection of all plugs.
- Evaluation of bobbin data for 20% of the periphery and patch plate areas for TSP ligament cracking and 20% of the full bundle for TSP erosion/corrosion.
- Plus point inspection of TSPs with potential indications of TSP ligament cracking.

LICENSEE EVENT REPORT (LER)
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TEXT (If more space is required, use additional NRC Form 366) (17)

The TSP ARC program of plus point inspections was performed on the following bobbin signals: all support plate indications greater than 2.0 volts, all dents greater than 5.0 volts, all large support plate residual signals, and all TSPs with interfering signals from copper deposits.

During the TSP plus point inspection program in S/G 2B, one axial indication by plus point was identified at a TSP intersection with a large mixed residual signal as identified by bobbin. The inspection program was expanded to include the next 66 largest TSP residuals in S/G 2B. During the expansion program, no additional defects were identified at TSP intersections with large mixed residual signals. No further expansion was required.

As a result of indications found in the tubesheet during a 20% cold leg tubesheet plus point inspection program in S/G 2C, the program was expanded to include 100% of the tubesheet. No further expansion was required. Seven defective indications were identified in the cold leg of S/G 2C.

DEGRADATION ASSESSMENT

During U2RF11, the degradation assessment concluded that the following active degradation mechanisms (as defined by EPRI TR-107569-V1R5) were present in the Unit 2 S/G's:

- Axial outside diameter stress corrosion cracking (ODSCC) at TSP intersections
- Axial primary water stress corrosion cracking (PWSCC) at the top of tubesheet (TTS) expansion transition down to F*
- Axial ODSCC at the TTS expansion transition down to F*
- Circumferential PWSCC at the TTS expansion transition down to F*
- Circumferential ODSCC at the TTS expansion transition down to F*
- Axial ODSCC in the sludge pile and freespan region

As a result of the inspections performed during U2RF12, the following degradation mechanisms were classified as active:

- Axial ODSCC at TSP intersections
- Axial ODSCC in the sludge pile region
- Axial PWSCC at the TTS expansion transition down to F*
- Axial ODSCC at the TTS expansion transition down to F*
- Circumferential ODSCC at the TTS expansion transition
- Cold leg axial PWSCC at TTS for S/G 2C only

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TEXT (If more space is required, use additional NRC Form 366) (17)

ECT Defective Indication Summary for RF	A	B	C
Inservice tubes prior to RF	3129	3204	3195
Axial ODSCC at TSP intersections	2	1	0
Axial ODSCC in the hot leg (HL) sludge pile	1	0	3
Axial PWSCC at the TTS expansion transition down to F*	13	25	23
Axial ODSCC at the TTS expansion transition down to F*	1	1	2
Circumferential ODSCC at the TTS expansion transition down to F*	9	23	31
CL ODSCC (volumetric) at TTS expansion down to F*	0	0	1
CL axial PWSCC at the TTS expansion transition down to F*	0	0	6
Restricted sleeve	1	0	0
Parent tube flaw within one inch of sleeve weld	1	0	0

Tube repair summary	A	B	C
Inservice Tubes prior to RF	3129	3204	3195
Defective tubes during RF	28	50	64
Repair actions during RF	-	-	-
TSP sleeves installed during RF and left in service	0	0	0
30" TS sleeves installed during RF and left in service	0	0	0
20" TS sleeves installed during RF and left in service	18	39	50
12" TS sleeves installed during RF and left in service	0	0	0
Tubes plugged	10	11	14

Tube status	A	B	C
Tubes inservice prior to RF	3129	3204	3195
Sleeves in service prior to RF	559	197	433
Sleeved tubes in service prior to RF	522	195	392
Percent plugging equivalent prior to RF	8.3	5.7	6.2
Tubes returned to service during RF	0	0	0
Total in service sleeves after RF	575	236	479
Total in service sleeved tubes after RF	538	233	440
Total plugged tubes after RF	269	195	207
Plugging equivalent of sleeves - *	33	14	25
Percent plugging equivalent after RF - *	8.9	6.2	6.9

The overall average percent plugging equivalent before U2RF12 of 6.7% was increased to 7.3% after U2RF12.

* WCAP 13088 Rev 4 revised the sleeve plugging equivalent. This revision accounted for 0.25% of the 0.6 % increase in the overall plugging equivalent.

**LICENSEE EVENT REPORT (LER)
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TEXT (If more space is required, use additional NRC Form 366) (17)

CONDITION MONITORING EVALUATION SUMMARY

Based on the U2RF12 inspections results, no tubes contained indications which represented a challenge to structural or leakage integrity and all condition monitoring requirements are satisfied.

OPERATIONAL ASSESSMENT EVALUATION SUMMARY

Based on the relatively less severe indication NDE parameters observed during the U2RF12 inspection compared to the U2RF11 inspection, the application of plus point inspection technology for two successive inspections at Farley 2 has resulted in smaller, less structurally significant indications being detected at higher confidence levels than at prior inspections. It can therefore be concluded that even if growth rates experience an increase over the Cycle 12 characteristics, the enhanced detection capabilities implied by the application of the plus point probe at the TTS region would provide for increased structural and leakage integrity margins over past inspections. As no previous indications at Farley 2 represented a challenge to structural integrity or potential for a large leakage event, it can be concluded that a similar result would be expected at end of cycle (EOC) 13. A final operational assessment will be prepared in accordance with industry guidelines.

Cause of Event

Investigations and evaluations performed identified several areas where tube defects were observed. These were tube sheet and expansion transition degradation, and tube support plate.

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. A condition monitoring and operational assessment has been completed addressing the safety significance of Cycle 12 and Cycle 13 operation of Farley Unit 2 with the various types of localized tube wall degradation occurring in the steam generator tubing. Steam generator 2C was found to be the limiting S/G for Cycle 12 operation and is projected to be the limiting S/G for Cycle 13 operation. Calculations show that the voltage based repair criteria at EOC-12 will satisfy the NRC criteria for allowable leakage and burst capability. Likewise, it is concluded that Cycle 13 operation of Farley Unit 2 will continue to meet the required acceptance criteria.

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REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND
A PAPERWORK PROJECTIONS (PP) FILE (7-6 F33), OFFICE
OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

TEXT (If more space is required, use additional NRC Form 368) (17)

NRC Form 366A (4-95)

LICENSEE EVENT REPORT (LER)
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Additional Information

Similar events were reported in LERs 86-004-00 (Unit 2), 87-004-02 (Unit 2), 90-005-01 (Unit 2), 93-003-00 (Unit 2), 94-002-00 (Unit 1), 95-001-01 (Unit 2), 95-009-00 (Unit 1), 96-008-00 (Unit 2), and 97-006-00 (Unit 1).

On April 11, 1998, Southern Nuclear (SNC) made a voluntary notification of the C-3 inspection status.