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W3F1-2000-0158
A4.05
PR

November 16, 2000

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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Reporting of Licensee Event Report

Gentlemen:

Attached is Licensee Event Report (LER) 00-011-00 for Waterford Steam Electric Station Unit 3. This report provides details of the discovery of evidence of Reactor Coolant System (RCS) pressure boundary leakage. The leakage was identified during Refuel 10 outage inspections. The Refuel 10 outage began at approximately midnight on October 13, 2000. The leakage is being reported pursuant to 10CFR50.73(a)(2)(i)(B) for the plant having operated in violation of the plant's Technical Specifications. It is not known exactly when during the cycle the leakage actually occurred.

This submittal contains no commitments. If you have any questions or require additional information, please contact O.P. Pipkins at (504) 739-6707.

Very truly yours,

Everett P Perkins Jr

E.P. Perkins, Jr.
Director,
Nuclear Safety Assurance

EPP/OPP/rtk
Attachment

IE22

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NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001
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 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. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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TITLE (4)
RCS Pressure Boundary Leakage Due to PWSCC and Leaking MNSA Clamps.

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	DOCKET NUMBER
									N/A	N/A
10	17	00	00	011	00	11	16	00	FACILITY NAME N/A	DOCKET NUMBER N/A

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more) (11)							
			20.2201(b)		20.2203(a)(2)(v)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)	0		20.2203(a)(2)(i)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
			20.405(a)(1)(ii)		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)		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	TELEPHONE NUMBER (Include Area Code)
Name / Title Oscar P. Pipkins / Senior Licensing Engineer	(504) 739-6707

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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-spaced typewritten lines) (16)

This LER documents three separate cases of Reactor Coolant System (RCS) pressure boundary leakage discovered during Waterford 3's Refuel 10 outage. The first case of leakage was discovered during inspections on October 17, 2000 and involved evidence of leakage at a Pressurizer heater sleeve (F-4). The other two cases of leakage were discovered during inspections on October 19, 2000 and involved evidence of leakage at two of the three MNSA clamps that had been installed during the Refuel 9 outage as temporary repairs of leaking RCS nozzles. The conditions are being reported as violations of Technical Specification 3.4.5.2a, which allows no RCS pressure boundary leakage. Although it can not be determined exactly when the leakage actually occurred, in one case, it is believed to have occurred some time after a planned outage conducted during June 2000. Inspections (with insulation on) conducted during that earlier outage did not identify MNSA clamp leakage. The three leakage cases were due to 1) Primary Water Stress Corrosion Cracking (PWSCC), 2) a MNSA clamp flange not being flat against the pipe and 3) a MNSA clamp seating itself, respectively. These conditions have been corrected by plugging the pressurizer heater sleeve, and by removing the MNSA clamps and making permanent weld repairs on the nozzles. The leakage did not compromise the health and safety of the general public. The conditions are not considered Safety System Functional Failures (SSFF).

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TEXT *(If more space is required, use additional copies of NRC Form 366A) (17)*

REPORTABLE OCCURRENCE

On October 17, 2000, evidence of Reactor Coolant System (RCS) pressure boundary leakage was discovered at a heater sleeve on the Pressurizer. The discovery was made during inspections conducted during the Refuel 10 outage. The NRC Operations Center was notified of this condition via ENS within four hours of discovery in accordance with 10CFR50.72(b)(2)(i) for being degraded while shutdown. Later, on October 19, 2000, evidence of two other cases of RCS leakage was discovered at two of the three MNSA clamps that had been temporarily installed on RCS hot leg nozzles during Refuel 9. The NRC Operations Center was notified via ENS within four hours of discovery in accordance with 10CFR50.72(b)(2)(i) for being degraded while shutdown. The conditions represented violations of Technical Specification 3.4.5.2 and the associated action statement for operating with RCS pressure boundary leakage. It is indeterminate as to when the leakage actually occurred during the cycle. Therefore the conditions are being reported in accordance with 10CFR50.73(a)(2)(i)(B) on the basis of the apparent operation during the past cycle with RCS pressure boundary leakage.

INITIAL CONDITIONS

At the time of discovery, the plant was in Mode 5, shutdown for the Refuel 10 outage. The MNSA clamps had been installed as temporary leakage repairs during the Refuel 9 outage (during the first quarter of 1999), with plans in place to remove the MNSAs and perform permanent weld repairs during the Refuel 10 outage.

EVENT DESCRIPTION

On October 17, 2000, during Waterford 3's Refuel 10 outage, while performing bare metal inspection of the area around Pressurizer [PZR] heater sleeve number F-4, a small amount of boric acid was discovered. The boric acid is believed to be evidence of leakage associated with Primary Water Stress Corrosion Cracking (PWSCC) of the Inconel Alloy 600 heater sleeve. PWSCC is intergranular stress corrosion cracking (IGSCC) in the primary water environment.

During Refuel 9, Entergy found evidence of Alloy 600 nozzle cracking due to PWSCC. The corrective action plan from that discovery included updates to the Waterford 3 Inconel Alloy 600 PWSCC program, based on new operating experience information. The updated program included plans for Refuel 10 Pressurizer heater sleeve inspections, which identified the heater sleeve leakage.

On October 19, 2000, during bare metal inspection of the RCS Hot Leg nozzles [NZL], boric acid residue was found on two of the three MNSA clamps that had been installed during Refuel 9 (RC MMNSA301104D and RC MMNSA501102B). The three MNSA clamps had been installed as temporary repairs until permanent repairs could be made during Refuel 10. Although it can not be determined exactly when the leakage occurred, in one case (RC MMNSA501102B) the leakage is believed to have occurred some time after a planned outage conducted during June 2000. Inspections (with insulation on) conducted during that earlier outage did not identify evidence of leakage.

CAUSAL FACTORS

The root cause of the Pressurizer heater sleeve F-4 failure is PWSCC. Alloy 600 sleeve material is susceptible to PWSCC. Industry experience has shown that Pressurizer heater sleeves are susceptible to PWSCC. Causal factors include:

Pressurizer Heater Sleeves:

1. Design configuration and analysis: Material selection less than adequate.

2. Equipment specification, manufacture and construction: All of the Pressurizer heater sleeves were mechanically reamed to remove high spots on the bores or to enlarge the bores. This process imposed additional inside diameter surface stresses and possibly even cold worked the bores of these sleeves, making them more susceptible to PWSCC.

MNSA Clamps:

Indications are that the MNSA clamp leakage could have resulted, in one case, from the flange not being flat against the pipe. The tilting of the flange could have caused binding of the seal components during the compression step. This binding would have prevented the full axial load to be developed by torquing the bolts. In the other case, the MNSA leakage could have been brief, initial leakage that occurred while the clamps seated.

CORRECTIVE ACTIONS

Pressurizer Heater Sleeve F-4 Failure:

1. Plugged Pressurizer heater sleeve F-4 prior to heat-up. (Complete)

2. Performed Inconel Alloy 600 inspections of all of the Pressurizer heater sleeves during the Refuel 10 outage. (Complete)

The existing Inconel Alloy 600 Inspection Program is considered adequate based on Waterford's operating history and programs for controlling primary water chemistry and maintaining chemistry parameters, including pH and oxygen concentration. The chemistry program ensures that the ingress of the impurities that accelerate corrosion are minimized.

MNSA Clamps Leakage:

All three MNSA clamps were removed and permanent weld repairs were made on the leaking RCS Hot Leg nozzles during the Refuel 10 outage.

Summary of Refuel 10 Actions Completed and Remaining Associated With PWSCC:

In a letter (W3F1-2000-0007) to the NRC Staff dated March 28, 2000, Entergy Staff summarized the long-term solution plan for addressing RCS Inconel 600 Nozzle Cracking. In that letter, it was stated that during the Refuel 10 outage, Entergy planned to perform permanent weld repairs on eight Inconel 600 nozzles, two on the top of the pressurizer and six on the RCS hot legs. These repairs were completed as planned (see bullet list below). The following was performed during Refuel 10:

- Inspected all eight Pressurizer nozzles – No leakage identified. (Weld repaired two of the four total nozzles on top of the Pressurizer during Refuel 10 as a preventative measure. The other two had been weld repaired during Refuel 9.)
- Inspected all thirty Pressurizer heater sleeves – One leaking sleeve identified. (Plugged leaking sleeve.)
- Inspected all nineteen RCS hot leg nozzles – Leakage identified on two of the three MNSA clamps. (Weld repaired six hot leg nozzles, including all three nozzles that previously had MNSA clamps installed.)
- Inspected all twelve RCS cold leg nozzles – No leakage identified.
- Inspected all eight Steam Generator nozzles (four nozzles per generator) – No leakage identified.

Nozzles on the reactor vessel head are scheduled to be inspected during Refuel 11, including 91 CEDM nozzles, 10 ICI instrument nozzles, four segments of leakage monitoring tubes and three segments of vent pipe. Note that there are two leakage monitoring tubes consisting of 4 segments (two per tube) and one vent pipe consisting of three segments.

SAFETY SIGNIFICANCE

Pressurizer Heater Sleeve F-4 Failure:

The failure of the F-4 sleeve was not significant to safety. The minor boric acid residue found is indicative of only trace amounts of through wall leakage, with no significant radiological impact. PWSCC cracking has been extensively studied by the industry and found to result in axial crack growth. The axial crack orientation associated with PWSCC makes ejection of a Pressurizer heater sleeve highly unlikely. Circumferential cracking would potentially challenge the structural integrity of the RCS pressure boundary, but domestic experience has shown that PWSCC forms only axial cracks. Cracks would be expected to initiate within two inches of the Inconel Alloy 600 welds at the inboard end of the Pressurizer heater sleeve and not continue to propagate into the carbon steel base material. Thus, PWSCC would not have been expected to cause any loss of Pressurizer structural integrity and is not safety significant.

MNSA Clamp Leakage:

The MNSA Clamp leakage was not an indication of further loss of nozzle structural integrity. The condition had minimal safety significance.

The RCS leakage conditions did not constitute Safety System Functional Failures (SSFF).

SIMILAR EVENTS

LER 99-002-00 documented PWSCC related RCS pressure boundary leakage discovered during Refuel 9. Inspections and repairs performed during Refuel 10 were a continuation of the program in place at Waterford 3 to handle PWSCC.

ADDITIONAL INFORMATION

Energy Industry Identification System (EIIS) codes are identified in the text within brackets [ ].