NRC FORM 366
(7-77)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT

EXHIBIT A

CONTROL BLOCK: | | | | | | | 1 6 (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

| 0 | 1 | | A | R | A | N | 0 | 2 | 2 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 3 | 4 | 1 | 1 | 1 | 1 | | | |
7 8 9 LICENSEE CODE 14 15 LICENSE NUMBER 25 26 LICENSE TYPE 30 57 CAT 58

| 0 | 1 | REPORT SOURCE | L | 6 | 0 | 5 | 0 | 0 | 0 | 3 | 6 | 8 | 7 | 1 | 0 | 1 | 3 | 7 | 9 | 8 | 0 | 8 | 1 | 5 | 8 | 4 |
7 8 60 61 DOCKET NUMBER 68 69 EVENT DATE 74 75 REPORT DATE 80

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES 10

| 0 | 2 | During Mode 6 operation, it was discovered that the "B" shutdown cooling (SDC) heat exchanger, 2E35B, radiation
| 0 | 3 | monitor indication had increased. The heat exchanger was immediately isolated on both the service water
| 0 | 4 | and reactor coolant sides. Interpretation of the SDC activity increase as it related to plant conditions
| 0 | 5 | indicated a small volume tube leak in the heat exchanger. Activity release was analyzed to be the Maximum
| 0 | 6 | Permissible Concentration (MPC). There have been no similar occurrences. This occurrence is reportable
| 0 | 7 | per Technical Specification (T.S.) 6.9.1.9.d.
| 0 | 8 |
7 8 9 80

| 0 | 9 | SYSTEM CODE | C | F | 11 | CAUSE CODE | E | 12 | CAUSE SUBCODE | B | 13 | COMPONENT CODE | H | T | E | X | C | H | 14 | COMP SUBCODE | C | 15 | VALVE SUBCODE | A | 16 |
7 8 9 10 11 12 13 18 19 20

17 LER/RO REPORT NUMBER | EVENT YEAR | 7 | 9 | 21 22 | 23 | SEQUENTIAL REPORT NO. | 0 | 8 | 6 | 24 26 | / | 27 | OCCURRENCE CODE | 0 | 3 | 28 29 | REPORT TYPE | X | 30 | 31 | REVISION NO | 2 | 32

ACTION TAKEN | D | 18 33 | FUTURE ACTION | Z | 19 34 | EFFECT ON PLANT | Z | 20 35 | SHUTDOWN METHOD | Z | 21 36 | HOURS | 0 | 0 | 0 | 0 | 22 37 40 | ATTACHMENT SUBMITTED | Y | 23 41 | NPRD-4 FORM SUB | N | 24 42 | PRIME COMP. SUPPLIER | N | 25 43 | COMPONENT MANUFACTURER | E | 2 | 7 | 0 | 26 44 47

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS 27

| 1 | 0 | The "B" SDC heat exchanger was taken out of service and visual inspection revealed that tube #74Q was the
| 1 | 1 | leaker (an outer peripheral tube). The "A" and "B" SDC heat exchangers were examined utilizing the eddy
| 1 | 2 | current method. The tubes in rows A and B (inside the U-Bend and 0.130" thickness) were examined at 200 KHz
| 1 | 3 | and tubes in rows C through Y (0.098" thickness) were examined at a 200 KHz test frequency. The test
| 1 | 4 | instrumentation sensitivity was adjusted to allow calibration of the test equipment to a tube standard
7 8 9 80

| 1 | 5 | FACILITY STATUS | H | 28 | % POWER | 0 | 0 | 0 | 29 | OTHER STATUS | Special PV Insp. | 30 44 | METHOD OF DISCOVERY | A | 31 45 | DISCOVERY DESCRIPTION | NA | 46 80 | 32
7 8 9 10 12 13

| 1 | 6 | ACTIVITY RELEASED | L | 33 | CONTENT OF RELEASE | M | 34 | AMOUNT OF ACTIVITY | 5.4x10-3 curies | 35 44 | LOCATION OF RELEASE | Cooler to service water | 36 45 80
7 8 9 10 11

| 1 | 7 | PERSONNEL EXPOSURES NUMBER | 0 | 0 | 0 | 37 | TYPE | Z | 38 | DESCRIPTION | NA | 39
7 8 9 11 12 13 80

PERSONNEL INJURIES

| 1 | 8 | NUMBER | 0 | 0 | 0 | 40 | DESCRIPTION | NA | 41
7 8 9 11 12 80

LOSS OF OR DAMAGE TO FACILITY

| 1 | 9 | TYPE | Z | 42 | DESCRIPTION | NA | 43

PUBLICITY

| 2 | 0 | ISSUED | N | 44 | DESCRIPTION | NA | 45 | NRC USE ONLY | | | | | | | | | | |
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LER No. 50-368/79-086/03x-2

Occurrence Date: 10/13/79

Cause Description and Corrective Actions (Continued)

containing known defects. Due to the initial inspection results, 100% of the tubes in each heat exchanger were examined. Tables I and II list tubes which exhibited tube wall degradation. Twelve tubes were plugged in 2E35A and 19 tubes were plugged in 2E35B. Five of the tubes plugged in the "B" heat exchanger were plugged for precautionary measures, as they surrounded the "leaker" (tube #74Q). Additional eddy current examinations were conducted on the "A" heat exchanger for further information on the SDC condition. The tube support plate signals received during examination are large in magnitude relative to a signal generated from a small volume defect. To optimize the phase separation between tube flaws and support plate signals, a test frequency of 150 KHz was used. At this frequency a defect signal will tend to distort the configuration of the tube support plate signal. Further, to enhance the ability to detect flaws, an electronic device known as a signal subtraction unit was employed. This unit substracts a stored clean support plate signal from the distorted signal being analyzed, leaving the defect signal which can then be analyzed to determine the depth of the flaw. Rows F through Y were inspected, because of the greater U-bend radius which allowed for probing through the bend. No additional defects were identified. Following the examination of 2E35B, a section of tube #74Q containing the fracture surface and a section of tube #32Y which contained two defect indications were extracted from the heat exchanger for failure analysis. Metallurgical analysis of the presence of periodic markings, or arrest marks, on the fracture surface of tube #74Q with a small adjacent region of ductile fracture, indicate fatigue as the mode of final failure. Most of the fracture surface contained little or no fractografic information because of wear damage which occurred during or after the fracture; therefore, rootcause of the failure could not be established. Tube #32Y contained three chloride stress corrosion cracks which initiated in a region of localized intergranular attack. Transgranular cracks then begin to penetrate the tube wall and are highly branched. The localized intergranular attack is involved in the initiation process of the cracks, originating from a combination of possible factors (material sensitization, presence of chlorides in cooling water, stress in tubes, and operating in a temperature range conducive to chloride stress cracking). As a result of an engineering evaluation, the SDC heat exchanger tube bundles have been replaced with an alloy which is not susceptable to chloride stress corrosion cracking. The tube material selected was AL-6X, a materia manufactured by Alleghany-Ludlum. The tube bundle for heat exchanger 2E35B was replaced during the 1981 refueling outage. The tube bundle for heat exchanger 2E35A was replaced during the 1982 refueling outage.

TABLE I

SHUTDOWN COOLING HEAT EXCHANGER 2E-35-A

Line	Row	Location	% Degradation
63	D	5B + 8	72
10	L	4T ± 3*	20
74	N	7B	70
76	N	7B	55
76	N	6B	80
73	P	7B	76
75	P	7T	55
75	P	7B	55
75	P	6B	65
75	P	5B	55
18	Q	7T - 1	20
50	Q	7T + 4	30
72	Q	7B	50
74	Q	5T	55
74	Q	7T	55
74	Q	6B	55
74	Q	7B	55
70	S	7T	55
70	S	7B	80
27	V	3T - 10	27

*Line 10 Row L anomaly is 6 inches long.

12 Tubes Pluged.

Location interpretation: Number indicates the support # starting with the tube sheet which is designated as 0, Letter is T for Top Half or B for Bottom Half of bundle, and the ± # is inches away from indicated support.

TABLE II

SHUTDOWN COOLING HEAT EXCHANGER 2E-35-B

Line	Row	Location	% Degradation
10	C	6T - 8	89
18	C	6B - 6	93
36	C	5B + 6	92
36	C	5B + 5	78
36	C	5B - 5	88
68	C	5T - 8	94
72	C	5T + 13	70
14	E	5T - 5	90
21	F	6B - 13	94
29	F	4T + 15	79
77	F	5B - 13	95
79	F	5B - 13	88
48	G	1B + 1	81
10	Q	6B - 6	86
74	Q	8B + 1	20
74	Q	7T	100
32	Y	3T + 3	83
32	Y	3T + 2	70
32	Y	3T - 5	87

14 Tubes Plugged + 5 Tubes Surrounding 74Q

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August 15, 1984

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U. S. Nuclear Regulatory Commission
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Washington, D.C. 20555

Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Licensee Event Report
No. 79-086/03X-2

Gentlemen:

In accordance with Arkansas Nuclear One - Unit 2 Technical Specification 6.9.1.9.d, attached is the subject report concerning the discovery of a tube leak in the "B" shutdown cooling heat exchanger (2E35B). This is a revision to a previous submittal dated November 21, 1980.

Very truly yours,

John R. Marshall
Manager, Licensing

JRM:RJS:ac

Attachment

cc: Mr. Norman M. Haller, Director
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U. S. Nuclear Regulatory Commission
Washington, DC 20555

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