

CONTROL BLOCK

(PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

0 1 P A T M I 1 1 2 0 0 0 0 0 0 0 0 0 0 0 3 4 1 1 1 1 1 1 4 5
7 8 9 14 15 25 26 30 37 CAT 38

LICENSEE CODE LICENSE NUMBER LICENSE TYPE

CON'T

0 1 REPORT SOURCE L 6 0 5 0 0 0 2 8 9 7 1 1 2 5 8 1 8 1 0 2 4 8 5 9
7 8 60 61 68 69 74 75 80

DOCKET NUMBER EVENT DATE REPORT DATE

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

02 During NRC ordered shutdown secondary chemistry analyses results
03 indicated potential of primary to secondary leakage. A bubble leakage
04 test indicated 27 leaking tubes in the "B" OTSG. A later bubble test
05 indicated 11 additional leakers. Subsequent tests on "A" OTSG indicated
06 88 tube leaks. The above symptoms appeared following RC pressurization
07 to about 45 psig and leakage at that pressure amounted to about 0.2 to
08 0.3 gpm. Health and safety of the public were unaffected.

0 9
2 8

SYSTEM CODE
C A 11
9 10

CAUSE CODE
E 12
11

CAUSE SUBCODE
D 13
12

COMPONENT CODE
H T E X C H 14
13 18

COMP SUBCODE
F 15
19

VALVE SUBCODE
Z 16
20

17
LER-RO
REPORT
NUMBER

EVENT YEAR
8 1
21 22

SEQUENTIAL
REPORT NO.
0 1 1 3
24 26

OCCURRENCE
CODE
1
27

REPORT
TYPE
X
30

REVISION
NO.
1
32

ACTION
TAKEN
B 18
33

FUTURE
ACTION
Z 19
34

EFFECT
ON PLANT
Z 20
35

SHUTDOWN
METHOD
Z 21
36

HOURS
0 0 0 0
37 40

ATTACHMENT
SUBMITTED
Y 23
41

NPRD-4
FORM SUB
Y 24
42

PRIME COMP
SUPPLIER
N 25
43

COMPONENT
MANUFACTURER
B 0 1 5 26
44 47

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

10 RCS depressurized, and contaminated secondary fluid contained. Subsequent
11 eddy current examination revealed many defective tubes, mostly within
12 2-3 inches of upper tubesheet, caused by inadvertent introduction of
13 sulfur into RCS. Chemical agent has been removed, and OTSG's repaired
14 and returned to a condition equivalent to original licensing basis.

FACILITY STATUS: 1 5 X 28
 % POWER: 0 0 0 29
 OTHER STATUS: 30
 METHOD OF DISCOVERY: B 31
 DISCOVERY DESCRIPTION: 32 Secondary Chemistry Analyses

ACTIVITY CONTENT
RELEASED OF RELEASE

1	6	Z	(33)	(14)	N/A	(35)	N/A	LOCATION OF RELEASE (36)
---	---	---	------	------	-----	------	-----	--------------------------

7 8 9 10 11 12 13 14 15

PERSONNEL EXPOSURES

NUMBER		TYPE		DESCRIPTION
0	0	0	Z	N/A

PERSONNEL INJURIES		DESCRIPTION	
NUMBER			
0	0	0	41
0	0	0	40
0	0	0	N/A

LOSS OF OR DAMAGE TO FACILITY (41)
TYPE DESCRIPTION
[1] [2] [Z] (42) N/A
8511070519 851024
PDR ADOCK 050002B9
S PDR

2 0 1 Y 44 News Release

NANCY L. LARSEN, Editor

NAME OF PREPARED: S. Kowkabany

(201)299-2373

CONTROL BLOCK

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(PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

7 8 9 LICENSEE CODE 14 15 LICENSE NUMBER 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 CAT 38

0 1 P A T M L 1 2 0 2 1 0 0 0 0 0 0 0 3 4 1 1 1 1 4 5

CON'T

REPORT SOURCE 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

0 2 | During NRC ordered shutdown secondary chemistry analyses results
0 3 | indicated potential of primary to secondary leakage. A bubble leak
0 4 | test indicated 27 leaking tubes in the "B" OTSG. A later bubble test
0 5 | indicated 11 additional leakers. Subsequent tests on "A" OTSG indicate
0 6 | 88 tube leaks. The above symptoms appeared following RC pressurization
0 7 | to about 85 psig and leakage at that pressure amounted to about 0.2 to
0 8 | 0.3 gpm. Health and safety of the public were unaffected.

7 8

SYSTEM CODE 9 10 11

CAUSE CODE 11 12

CAUSE SUBCODE 12 13

COMPONENT CODE 13 14

COMP SUBCODE 14 15

VALVE SUBCODE 15 16

17 LER/RO REPORT NUMBER

EVENT YEAR 21 22

SEQUENTIAL REPORT NO. 23 24 25 26

OCCURRENCE CODE 27 28 29

REPORT TYPE 30 31

REVISION NO. 32

ACTION TAKEN 33 34 35

FUTURE ACTION 35 36 37

EFFECT ON PLANT 37 38 39

SHUTDOWN METHOD 39 40 41

HOURS 41 42 43 44

ATTACHMENT SUBMITTED 45 46 47

NPRO-4 FORM SUB 48 49 50

PRIME COMP SUPPLIER 51 52 53

COMPONENT MANUFACTURER 54 55 56

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

10 RCS depressurized, and contaminated secondary fluid contained. Subsequent
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14 and returned to a condition equivalent to original licensing basis.

FACILITY STATUS % POWER OTHER STATUS METHOD OF DISCOVERY DISCOVERY DESCRIPTION

1 5 9 28 10 11 12 29 NRC Order 30 31 Secondary Chemistry Analyses 32

ACTIVITY CONTENT
RELEASED OF RELEASE

1 6 2 3 4

1 2 3 4 5 6 7 8 9 10 11 12

AMOUNT OF ACTIVITY (35)

N/A

LOCATION OF RELEASE (36)

N/A

PERSONNEL EXPOSURES										
NUMBER		TYPE		DESCRIPTION						
1	2	3	4	5	6	7	8	9	10	
		0	0	17	2	38	N/A			

PERSONNEL INJURIES		NUMBER		DESCRIPTION	
1	2	3	4	5	6
				40	41

1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	

PRIORITY
ISSUED TO DESCRIPTION (45) News Release NRC USE ONLY

NHC 1051 (2011) 5

NAME OF PREPARATION

0000-0001-9300-9300

LICENSEE EVENT REPORT

CONTROL BLOCK

(PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

0 1 P I A T M L 1 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 3 4 1 1 1 1 1 1 4 5
7 8 9 LICENSE CODE 14 15 LICENSE NUMBER 25 26 LICENSE TYPE 30 57 CAT 58

CON'T

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0 9 SYSTEM CODE CAUSE CODE CAUSE SUBCODE COMPONENT CODE COMP SUBCODE VALVE SUBCODE
C A 11 E 12 0 13 H T E X C H 14 F 15 Z 16
17 LER-NO REPORT NUMBER 21 EVENT YEAR 22 23 SEQUENTIAL REPORT NO. 24 25 OCCURRENCE CODE 26 27 REPORT TYPE 28 29 REVISION NO. 30 31
ACTION TAKEN 32 FUTURE ACTION 33 EFFECT ON PLANT 34 SHUTDOWN METHOD 35 HOURS 36 ATTACHMENT SUBMITTED 37 38 NRC-4 FORM SUB 39 PRIME COMP SUPPLIER 40 41 COMPONENT MANUFACTURER 42 43 44 45 46 47

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

1 0 RCS depressurized, and contaminated secondary fluid contained. Subsequent
1 1 eddy current examination revealed many defective tubes, mostly within
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1 3 sulfur into RCS. Chemical agent has been removed, and OTSG's repaired
1 4 and returned to a condition equivalent to original licensing basis.

1 5 FACILITY STATUS 28 0 0 0 29 NRC Order 30 METHOD OF DISCOVERY 31 Secondary Chemistry Analyses 32 DISCOVERY DESCRIPTION 33

1 6 ACTIVITY CONTENT 34 35 N/A 36 LOCATION OF RELEASE 37

1 7 PERSONNEL EXPOSURES 38 39 N/A 40

1 8 PERSONNEL INJURIES 41 42 N/A 43

1 9 LOSS OF OR DAMAGE TO FACILITY 44 45 N/A 46

2 0 PUBLICITY 47 48 News Release 49

NAME OF PREPARER

S. Kowkabany

PHONE

(201) 299-2373

NARRATIVE REPORT
TMI-1
LER 81-013/01X-1

I. Current Activities

TMI-1 was shut down early in 1979 for refueling and had remained in the cold shutdown condition since the TMI-2 accident at the direction of NRC.

II. Leading Circumstances

Following secondary chemistry analyses results indicative of primary-to-secondary leakage, a bubble leakage test was applied to the Once Through Steam Generator tubing with nitrogen pressure applied from the secondary side.

III. Description of the Occurrence

In anticipation of bringing the TMI-1 reactor critical and returning to service, hot functional tests were performed in August-September 1981. This testing did not indicate any problems with the OTSG's. In early November 1981 during pressurization for additional tests, primary to secondary leaks were detected by secondary side chemistry analysis.

OTSG tube leakage was initially suspected when OTSG secondary side chemistry sample results showed decreasing pH and increasing activity. These symptoms appeared following Reactor Coolant System pressurization to about 45 psig for additional testing. The additional testing was then discontinued and the Reactor Coolant System depressurized and partially drained in preparation for bubble leak testing to locate the tube or tubes which were leaking. Primary to secondary leakage with the Reactor Coolant System pressurized to about 45 psig amounted to about 0.2 to 0.3 gpm.

On November 21, 1981, leakage through the OTSG tubes was observed. Initial bubble testing indicated about 27 leaking tubes in the "B" OTSG. A later bubble test on November 28, 1981 identified eleven additional leaking tubes in the "B" OTSG. Bubble tests in the "A" OTSG identified 88 leaking tubes in that OTSG.

Subsequently, detailed eddy current examinations revealed many defective tubes. The vast majority (approximately 95%) of the defects occurred within the top 2-3 inches of the 24 inch thick upper tubesheet (UTS).

IV. Any Significant Events Which Happened as a Result of the Original Occurrence

None

V. Previous Events

No previous OTSG leaks.

VI. Root Cause of the Occurrence

Metallographic examination of portions of removed tubes confirmed that the tube failures were initiated from the primary side (ID) of the tubes in the form of circumferential stress-assisted intergranular cracks. The active chemical impurity causing the corrosion was sulfur in reduced forms, mainly sodium thiosulfate which had been introduced inadvertently into the Reactor Coolant System.

VII. Immediate Corrective Action

Since the unit was in a cold shutdown condition, immediate corrective action was to depressurize the Reactor Coolant System and contain the contaminated secondary fluid.

VIII. Long Term Corrective Action

GPUN conducted an extensive program to return the TMI-1 OTSGs to service which included the following aspects:

- A. Determination of the causative agents.
- B. Examination of the remainder of the Reactor Coolant System.
- C. OTSG examinations to determine extent of degradation.
- D. OTSG repair.
- E. Cleanup of the contaminant.
- F. Establishment of new layup guidelines
- G. Procedures to prevent a reintroduction of contaminants during operation.
- H. Post repair testing.
- I. Plant performance evaluation subsequent to OTSG repairs.

Each of these items was discussed in detail in TR-008 "Assessment of TMI-1 Plant Safety for Return to Service After Steam Generator Repair" (see letter 5211-83-256 dated 9/14/83), which formed a basis for NUREG-1019, "Safety Evaluation Report Related to Steam Generator Tube Repair and Return to Operation, Three Mile Island Nuclear Station, Unit No. 1," November 1983, and NUREG-1019, Supplement 1, December 1984.

To repair the defective OTSG tubes within the UTS, GPUN applied a kinetic expansion technique. The kinetic expansion repair technique was applied to all unplugged tubes within the UTS to ensure that all potentially degraded tubes within the UTS had been sealed. Tubes with defects not repairable by kinetic expansion were removed from service by plugging. Sodium thiosulfate has been drained, flushed, and disconnected from the Reactor Building Spray System and extremely tight operational chemistry controls have been implemented since 1981. A

VIII. Long Term Corrective Action (Continued)

sulfur conversion and removal process to clean the surfaces of the Reactor Coolant System was also conducted. A detailed safety evaluation describing the results of the failure analysis, the evaluation of the methods of repair, and the operational, safety and environmental impact of operating the repaired steam generators was provided in Topical Report TR-008.

In conclusion, the TMI-1 OTSG's were returned to a condition equivalent to the original licensing basis, as discussed in TR-008 Rev. 3 and NUREG-1019, Rev. 0 and Rev. 1.

Subsequently, indications were discovered during eddy current testing in November 1984. As discussed in LER 84-007-01, which was submitted May 31, 1985, the most probable and reasonable explanation for the new indications during the 1984 examination is the enhanced detectability of preexisting indications. GPUN concluded in LER 84-007-01 that the corrosion failure mechanism identified in TR-008 is still the correct description of what the OTSG's have undergone. The precautions taken to prevent reoccurrence have been adequately observed and are effective; no new material attack has been observed.



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TELEX 84-2386
Writer's Direct Dial Number:

October 24, 1985
5211-85-2173

Dr. Thomas E. Murley
Region I, Regional Administrator
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, Pa. 19406

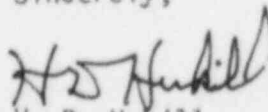
Dear Dr. Murley:

Three Mile Island Nuclear Station Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
LER 81-013/01X-1 (OTSG Tube Leakage)

This letter transmits Licensee Event Report (LER) No. 81-013/01X-1. LER 81-013/01T-0 which was submitted December 9, 1981 identified that bubble leakage tests of the Once Through Steam Generator tubing uncovered leaking tubes in both OTSG-A and OTSG-B. This event was considered reportable per Technical Specification 6.9.2.A (3).

While GPUN has responded to this issue through extensive correspondence and discussion with the NRC since that time, a review of our records has shown that this LER has not been closed formally. LER 81-013/01X-1 summarizes information previously submitted, including our assessment of the root cause of the event and corrective actions. Public health and safety were unaffected.

Sincerely,


H. D. Hukill
Director, TMI-1

HDH/SK/spb

Attachment

cc: R. J. Conte, Senior Resident Inspector, NRC
J. F. Stolz, Chief, Operating Reactors Branch No. 4

2338f/0385A