

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) **Susquehanna Steam Electric Station - Unit 1** DOCKET NUMBER (2) **0 5 0 0 0 3 8 7** PAGE (3) **1** OF **0 4**

TITLE (4) **Update to Main Steam Line Leak Detection Differential Temperature System Design Deficiencies**

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 NAMES	DOCKET NUMBER(S)		
07	27	88	88	016	01	12	03	91	SSES - Unit 2	0 5 0 0 0 3 8 8		
										0 5 0 0 0		

OPERATING MODE (9) **1**

POWER LEVEL (10) **1 0 0**

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

20.402(b)	<input type="checkbox"/>	20.406(c)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	<input type="checkbox"/>	73.71(b)	<input type="checkbox"/>
20.406(a)(1)(i)	<input type="checkbox"/>	50.36(c)(1)	<input checked="" type="checkbox"/>	50.73(a)(2)(v)	<input type="checkbox"/>	73.71(c)	<input type="checkbox"/>
20.406(a)(1)(ii)	<input type="checkbox"/>	50.36(c)(2)	<input type="checkbox"/>	50.73(a)(2)(vii)	<input type="checkbox"/>	OTHER (Specify in Abstract below and in Text, NRC Form 366A)	
20.406(a)(1)(iii)	<input type="checkbox"/>	50.73(a)(2)(ii)	<input type="checkbox"/>	50.73(a)(2)(viii)(A)	<input type="checkbox"/>		
20.406(a)(1)(iv)	<input type="checkbox"/>	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(viii)(B)	<input type="checkbox"/>		
20.406(a)(1)(v)	<input type="checkbox"/>	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(ix)	<input type="checkbox"/>		

LICENSEE CONTACT FOR THIS LER (12)

NAME **J. J. Meter - Engineer II** TELEPHONE NUMBER **7 1 7 5 4 2 - 1 8 7 3**

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)  NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

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

On July 26, 1988 a deficiency was detected on Unit 1 and 2 of the Susquehanna Steam Electric Station with the Main Steam Line Leak Detection System. The Differential Temperature (DT) subsystem of the subject Leak Detection System was determined to be inoperable on both Unit 1 and 2 because installation of the trip channel elements were such that an actual DT condition would not have been detected. The appropriate corrections were made by rewiring the circuits on July 27, 1988. Further evaluation determined that the location of the temperature elements which input to the Main Steam Line Leak Detection System DT Subsystem on Unit 2 rendered the isolation setpoints nonconservative. The Unit 2 temperature elements were relocated to their proper position. A Steam Leak Detection task team was formed and evaluated all steam leak detection systems at the station. Root causes for main steam leak detection problems were the lack of a leak detection system focal point, no expected values for leak detection indicators during normal operation were provided and therefore "zero" was accepted, and startup testing could only simulate process variables. Engineering responsibilities were assigned to leak detection. Normal values for leak detection systems were established. Modifications were made to several systems. A design basis review of steam leak detection resulted in issuance of four Technical Specification Change Requests on steam leak detection systems: deletion of Residual Heat Removal (RHR) leak detection isolation, deletion of delta temperature leak detection functions, and setpoint changes to Reactor Water Cleanup (RWCU), High Pressure Cooling Injection (HPCI), Reactor Core Isolation Cooling (RCIC) and main steam pipe tunnel instrumentation. No further LER updates on Steam Leak Detection System Setpoint/Design Issues are expected.

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TEXT CONTINUATION

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FACILITY NAME (1)  Unit 1 Susquehanna Steam Electric Station	DOCKET NUMBER (2)  0   5   0   0   0   3   8   7	LER NUMBER (6)			PAGE (3)		
		YEAR 8   8	SEQUENTIAL NUMBER —   0   1   6	REVISION NUMBER —   0   1	0   2	OF	0   4

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

INTRODUCTION

The purpose of this report is to provide a summary of the actions taken on Steam Leak Detection issues at the Susquehanna Steam Electric Station. It will serve as the supplemental report for the following Licensee Event Reports (LERs):

- 88-013-00 Docket No. 50-387 License No. NPF-14
- 88-016-00 Docket No. 50-387 License No. NPF-14
- 88-017-01 Docket No. 50-387 License No. NPF-14
- 87-008-00 Docket No. 50-388 License No. NPF-22
- 87-009-00 Docket No. 50-388 License No. NPF-22
- 88-013-00 Docket No. 50-388 License No. NPF-22

On July 26, 1988 a deficiency was identified on the Unit 1 and Unit 2 Main Steam Line (MSL) (EIIS: SB) Leak Detection System. Inspection revealed that the MSL Differential Temperature (DT) portion of the Leak Detection System was installed such that the circuit would not detect a DT condition. Subsequent investigation revealed that the location of the temperature sensors was incorrect, resulting in a negative (-) differential temperature, which indicated as zero, as reported in LER 88-016-00. This problem was immediately corrected by reversing the wiring in the DT logic thus providing a positive (+) differential temperature as desired and, in the case of Unit 2, also relocating the temperature elements.

DESCRIPTION OF SUBSEQUENT EVENTS

In response to the above event, a task team was formed to review the design of, and walkdown all other steam leak detection systems for similar problems, provide root causes for any discrepancies, and develop necessary corrective actions. Efforts to evaluate/review the temperature leak detection requirements for Reactor Water Cleanup (RWC) (EIIS: CE), as described in LERs 88-013-00, 88-017-01, 87-008-00, 87-009-00, 88-013-00, were combined with the above mentioned task team.

The following steam leak detection systems were reviewed for design adequacy and a walkdown of temperature element location was performed:

- Main Steam Line (MSL) (EIIS: SB)
- Reactor Water Cleanup (RWC) (EIIS: CE)
- High Pressure Cooling Injection (HPCI) (EIIS: BJ)
- Reactor Core Isolation Cooling (RCIC) (EIIS: BN)
- Residual Heat Removal (RHR) (EIIS: CE)

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		8   8	-   0   1   6	-   0   1	0   3	OF 0   4

TEXT (If more space is required, use additional NRC Form 308A's) (17)

In addition to the MSL leak detection errors, other problems were identified such as those associated with the Unit 1 RWCU and the Unit 1 HPCI/RCIC pipe area as described in LER 88-017-01.

CAUSES FOR LEAK DETECTION PROBLEMS

The task team performed a root cause analysis with the goal of determining how a design error remained undetected through startup and several years of operation. The following root causes were identified:

- 1) Systems were treated as subsystems - Each steam leak detection system was grouped with the parent system. For example, the HPCI steam leak detection system was considered part of the HPCI system and it was the responsibility of the HPCI system engineer. This type of system definition resulted in steam leak detection responsibility being spread among several individuals with no steam leak detection focal point.
- 2) Testing was performed by simulating process variables - The steam leak detection systems were subject to a preoperational test whereby a heat gun was used to heat the temperature sensor (either the high ambient or the high leg of the differential) and an isolation was confirmed. This type of test was performed since actually introducing a steam leak or heating a room was not practical. Had performance of such a test been possible, these design errors would have been detected.
- 3) Normal expected values were not provided - Operations personnel were not given "expected values" for the MSL DT indication. As a result, zero was accepted as a normal value.

CORRECTIVE ACTIONS

Plant modifications were implemented where necessary to ensure that all steam leak detection temperature elements are now properly located and will perform their intended safety function. All steam leak detection systems were classified as a single system with engineering responsibilities clearly defined. Normal expected values for all steam leak detection systems have been established. All remaining plant subsystems contained in multiple systems were reviewed in light of the above root causes for any generic implications. No problems were noted.

A steam leak detection temperature setpoint design basis review was also performed. This design basis work confirmed that all steam leak detection setpoints, except for Residual Heat Removal (RHR), are conservative and the operability of these systems is not in question. The design basis review demonstrated that a Technical Specification Change was in order to delete the RHR steam leak detection isolation function. The design basis review also

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		YEAR 8   8	SEQUENTIAL NUMBER —   0   1   6	REVISION NUMBER —   0   1	0   4	OF 0   4

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demonstrated that Technical Specification Changes were necessary to enhance system performance and/or reduce the risk of spurious actuations.

The following Technical Specification Change Requests contain the technical justification for the above changes and have been submitted to the Nuclear Regulatory Commission and are pending approval:

- \* Deletion of RHR steam leak detection  
Amendment 137 to NPF-14  
Amendment 91 to NPF-22
- \* RWCU/HPCI/RCIC Setpoint changes  
Amendment 138 to NPF-14  
Amendment 92 to NPF-22
- \* Turbine Building Main Steam Line Tunnel Setpoint changes  
Amendment 145 to NPF-14  
Amendment 99 to NPF-22
- \* Deletion of Differential Steam Leak Detection Amendment 127 to NPF-14 and Amendment 79 to NPF-22.

No further updates to referenced LERs are expected to be submitted on Steam Leak Detection system setpoint/design issues at Susquehanna Steam Electric Station.