10 CFR 50.73

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION
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J. DOERING, JR.
PLANT MANAGER
LIMERICK GENERATING STATION

July 20, 1992

Docket Nos. 50-352
50-353
License Nos. NPF-39
NPF-85

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

SUBJECT: Licensee Event Report
Limerick Generating Station - Units 1 and 2

This LER reports a condition prohibited by Technical Specifications (TS) due to failure to adequately perform the TS Surveillance Requirements on the Unit 1 and Unit 2 Residual Heat Removal heat exchangers and the associated ACTION statement not being met. This event is also an event where a single cause or condition caused two independent trains to become inoperable in a system designed to remove residual heat or mitigate the consequences of an accident.

Reference:	Docket Nos. 50-352 50-353
Report Number:	1-92-013
Revision Number:	00
Event Dates:	October 26, 1984 (Unit 1) July 10, 1989 (Unit 2)
Reportability Date:	June 24, 1992
Report Date:	July 20, 1992
Facility:	Limerick Generating Station P.O. Box 2300, Sanatoga, PA 19464-2300

This LER is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(b) and 10CFR50.73(a)(2)(vii)(B).

Very truly yours,

J. A. Muntz for
J. DOERING

KOS:cah

cc: T. T. Martin, Administrator, Region I, USNRC
T. J. Kenny, USNRC Senior Resident Inspector, LGS

IE22 1/1

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Limerick Generating Station, Unit 1	0 5 0 0 0 3 5 2	1 OF 0 6

TITLE (4) This LER reports a condition prohibited by Tech. Spec. due to failure to adequately perform the Surv. Reqts. on the Unit 1 and Unit 2 Residual Heat Removal Heat Exchangers.

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)
									Limerick Unit 2	0 5 0 0 0 3 5 3
0 6	2 4	9 2	9 2	– 0 1 3	– 0 0	0 7	2 0	9 2		0 5 0 0 0

OPERATING MODE (9)	POWER LEVEL (10)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
4	0 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	X 50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
G. J. Madsen, Regulatory Engineer, Limerick Generating Station	AREA CODE 2 1 5 3 2 7 - 1 2 0 0

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

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

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	NO				

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

On June 24, 1992, following discussions between station management, engineering, licensing, and NRC personnel, the station management concluded that Technical Specifications (TS) Surveillance Requirement (SR) 4.6.2.3.b has not been satisfied since the startup of both Unit 1 and Unit 2. Contrary to the TS SR that there be 10,000 gpm flow through the heat exchangers, the measurement of flow through the Residual Heat Removal (RHR) heat exchangers using installed instrumentation included flow through a closed heat exchanger bypass valve which was discovered to be leaking during performance of a Surveillance Test (ST) procedure. The cause of the event was an original design error. The installed system instrumentation allowed only measurement of total combined flow through the heat exchanger and bypass valve. This led to a misunderstanding of the intent of the TS SR. Analysis of test data and plant operating conditions have been performed on the four Unit 1 and Unit 2 RHR heat exchangers and all four have been determined to have been operable for heat removal capability under all required conditions. Flow restricting orifices were removed on all four (4) RHR suppression pool return lines to achieve greater than 10,000 gpm through each heat exchanger. The quarterly RHR ST procedures for both Unit 1 and Unit 2 will be revised prior to the next test performance to ensure recirculation flow of 10,000 gpm through each heat exchanger. A TS change will be requested to clarify the wording of the TS SR regarding the required flow and flow path.

Unit Conditions Prior to Discovery of Event:

Unit 1 was in Operational Condition (OPCON) 4 (Cold Shutdown) at 0% Power Level. Two Shutdown Cooling mode loops of the Residual Heat Removal (RHR, EIIS:BO) system were required to be OPERABLE or the operability of an alternate method of decay heat removal must be demonstrated.

Unit 2 was in OPCON 1 (Power Operation) at 100% Power Level. Two independent loops of the Suppression Pool Cooling (SPC) mode of the RHR system are required to be operable in OPCON 1 with each loop consisting of an operable RHR pump and an operable flow path.

There were no structures, systems, or components out of service or being tested which contributed to this event. The integrated RHR/RHR Service Water system heat transfer tests were being performed to demonstrate heat exchanger (EIIS:HX) operability.

Background

Since the startup of both units, Surveillance Test (ST) procedures ST-6-051-231 through 234-1 and 2, "A (B, C, D) RHR Pump, Valve and Flow Test," have been used to satisfy Technical Specifications (TS) Surveillance Requirement (SR) 4.6.2.3.b. This SR states, "The Suppression Pool Cooling mode of the RHR system shall be demonstrated OPERABLE, by verifying that each of the required RHR pumps develops a flow of at least 10,000 gpm on recirculation flow through the RHR heat exchanger, the suppression pool and the full flow test line when tested pursuant to Specification 4.0.5." This SR invokes the Inservice Testing (IST) SR on the RHR pumps (i.e., TS 4.0.5) by demonstrating that they can achieve at least their design safety function flow rate when aligned in the SPC mode (i.e., a flowpath of high flow resistance). Performance of the ST procedure confirms a flow of at least 10,000 gpm through the RHR pump while aligned in the SPC mode of the RHR system using installed instrumentation.

In response to Generic Letter (GL) 89-13 "Service Water System Problems Affecting Safety-Related Equipment," Limerick Generating Station (LGS) committed to demonstrating heat exchanger operability through the performance of integrated RHR/RHRSW system heat transfer tests. Since March, 1991, heat exchanger performance has been tested using procedure ST-1-012-390-0, "RHR Heat Exchanger Heat Transfer Test." There had been no previous failures of these test procedures.

Description of the Event:

On May 5, 1992, while performing procedure ST-1-012-390-0, station personnel determined that the Unit 1A RHR Heat Exchanger had failed the heat transfer capacity test due to heat exchanger fouling and was declared inoperable for the SPC mode. The RHR Shutdown cooling mode was demonstrated operable for Decay Heat Removal prior to this heat transfer test. They also determined that the 1A RHR Heat Exchanger Bypass Valve HV-C-051-1F048A (see Figure 1) was leaking

through the valve. Under test conditions with 6000 gpm through the 1A RHR pump, flow was determined to be 1400 gpm through the closed bypass valve and the remaining 4600 gpm through the heat exchanger. The SPC mode was not considered to be inoperable with less than 10,000 gpm flow through the 1A Heat Exchanger due to the plant staff's interpretation of the basis of this TS SR. The site interpretation, with support from engineering, was that the SR required verification that each of the required RHR pumps develops a flow rate of at least 10,000 gpm when aligned to the SPC mode flowpath, thus demonstrating a viable pump and viable SPC mode flowpath. This SPC flowpath was interpreted to include the RHR heat exchanger and bypass valve and the flow was measured using the installed instrumentation (i.e., FI-51-1R603A).

Subsequent to the 1A RHR heat exchanger test, the 1B RHR Heat Exchanger heat transfer test was performed satisfactorily. However, the 1B RHR Heat Exchanger Bypass Valve was also leaking through the valve.

On June 22, 1992, procedure ST-1-012-390-0 was performed on the Unit 2 2A RHR Heat Exchanger as part of the investigation of the generic concern of Heat Exchanger fouling and degradation and suspected bypass flow. The 2A Heat Exchanger heat transfer test was performed successfully, however, the bypass valve was also leaking. While discussions concerning the interpretation of TS SR continued, the 2A Heat Exchanger was conservatively declared inoperable on June 22, 1992 at 1036 hours

On June 23, 1992, the NRC site Resident Inspectors questioned the station's interpretation of TS SR 4.6.2.3.b. The NRC position was that the actual flow through the heat exchanger would need to be maintained above a minimum level in order to ensure the heat transfer capability of the heat exchanger. Discussions were held between station management, engineering, licensing, and NRC personnel on June 24, 1992. The NRC response was that a measured flow of 10,000 gpm flow through the heat exchanger must be confirmed in order to satisfy the SR. Following these discussions with the NRC, on June 24, 1992 at 1345 hours, the station management concluded that all four (4) RHR SPC modes, including the 2B RHR SPC mode which had not been tested, should be declared inoperable due to the failure to adequately perform the TS SR.

In accordance with TS Section 4.0.3, the TS ACTION associated with the second inoperable Unit 2 RHR Heat Exchanger was permitted to be delayed for up to 24 hours to allow performance of the ST procedure. TS Section 3.6.2.3 ACTION b states in part that "with both Suppression Pool Cooling loops inoperable, be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 12 hours."

The time from when the 2A RHR SPC mode was declared inoperable until both Unit 2 heat exchangers were tested and confirmed to be operable was within the required TS Section 3.6.2.3 ACTION time limits.

Unit 1 TS Section 3.6.2.3 did not require the RHR heat exchangers in the SPC mode to be Operable in the Shutdown condition since the SPC mode is only

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

required in OPCONs 1, 2, and 3. RHR heat exchanger heat transfer with heat exchanger bypass flow was sufficient to support both the shutdown cooling and SPC modes of operation.

The heat exchangers on both Unit 1 and Unit 2 had not been tested to ensure 10,000 gpm through the heat exchanger alone since original plant startup (i.e., October 26, 1984 for Unit 1 and July 10, 1989 for Unit 2). Therefore, the Limiting Condition for Operation and its associated ACTION statement was not met, and thereby a condition prohibited by TS occurred. This is also an event where a single cause or condition caused two independent trains to become inoperable in a system designed to remove residual heat or mitigate the consequences of an accident. As a result, this condition is reportable under the requirements of 10CFR50.73(a)(2)(i)(B) and 10CFR50.73(a)(2)(vii)(B).

Analysis of the Event:

There were no actual adverse consequences and no actual release of radioactive material as a result of this event.

Analysis of test data and plant operating conditions have been performed on the four Unit 1 and Unit 2 RHR heat exchangers and all four have been determined to have been capable to remove the required heat load in the SPC mode under all required conditions. The analyses used the worst cases for tube fouling, Spray Pond temperatures, flow through the heat exchangers, and leakage flow through the bypass valve in making the operability determination. The SPC modes have been determined to be inoperable only for failure to properly perform the SR. The RHR pumps satisfied the IST acceptance criteria. Accordingly, the RHR Heat Exchangers were never inoperable for Shutdown Cooling due to bypass flow.

Cause of the Event:

The cause of the event was an original design error in that the installed system instrumentation allowed only measurement of total combined flow through the heat exchanger and the bypass valve. Without the use of temporary flow instrumentation, the flow through the heat exchanger alone could not be measured. This led to a misunderstanding of the intent of TS SR 4.6.2.3.b from original licensing of both units until the intent was clarified by the NRC on June 24, 1992. The station personnel understanding was that the test required by TS SR 4.6.2.3.b was a test of pump performance through a viable SPC flowpath and that the heat transfer test was required in accordance with our commitments to GL 89-13.

Corrective Actions:

Following the discovery that the 2A RHR Heat Exchanger Bypass Valve was leaking through, actions were started to remove a flow restricting orifice (i.e., FO-121A, B, C, and D) (EIIS:OR) from the Full Flow Test/Suppression Pool Cooling return line downstream of each of the RHR Heat Exchangers (see Figure 1). The removal of these orifices was to allow increased system flow in an attempt to

achieve greater than 10,000 gpm through each heat exchanger. These actions were pursued in parallel with the discussions with the NRC. On June 24, 1992 at 1930 hours the 2A RHR SPC mode was declared operable, following satisfactory completion of the revised flow test performed after removal of the flow restricting orifice using a temporary change to the plant. These orifices were part of the original design on Unit 2 and installed on Unit 1 via Modification 5791 to improve the reliability of the Full Flow Test/Suppression Pool Cooling Return valve. After the 2A RHR SPC mode was declared operable, the similar orifice in the 2B Suppression Pool Return line was removed and the 2B SPC mode was declared operable at 0445 hours on June 25, 1992. At all times during the removal of the flow orifices, there was at least one SPC loop available. The shutdown TS ACTION statement on Unit 2 was exited when both heat exchangers became operable.

The similar orifices in the Unit 1 RHR systems were subsequently removed and tested prior to startup from the refueling outage.

The quarterly RHR ST procedures for both Unit 1 and Unit 2 will be permanently revised prior to the next ST performance to ensure recirculation flow of 10,000 gpm through the heat exchanger prior to the next ST performance.

A TS change will be requested from the NRC to clarify the wording of TS SR 4.6.2.3.b regarding the required flow and flow path.

Previous Similar Occurrences:

There have been no previous similar occurrences of design errors which led to a misunderstanding of the intent of TS SR. However, LER 1 89-042 reported a condition prohibited by TS due to the misinterpretation of a TS SR by station personnel. The corrective actions from that event involved the Control Rod Drive system and were specific to the ST and SR in question. Those corrective actions would not have prevented this event.

Tracking Codes: B16 - Design does not facilitate testing

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FIGURE 1
SUPPRESSION POOL COOLING MODE OF 1A RHR (TYPICAL)