



PECO ENERGY

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10CFR50.73

October 10, 1995  
Docket No. 50-352  
License No. NPF-39

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

SUBJECT: Licensee Event Report  
Limerick Generating Station - Unit 1

This LER reports an Unusual Event and Reactor Protection System actuation when the reactor was manually shutdown due to the inadvertent opening of a Main Steam system safety relief valve (SRV). The cause of the SRV failure was steam erosion attributed to pilot valve seat leakage.

Reference:	Docket No. 50-352
Report Number:	1-95-008
Revision Number:	00
Event Date:	September 11, 1995
Report Date:	October 10, 1995
Facility:	Limerick Generating Station P.O. Box 2300, Sanatoga, PA 19464-2300

This LER is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv).

Very truly yours,

cc: T. T. Martin, Administrator Region I, USNRC  
N. S. Perry, USNRC Senior Resident Inspector, LGS

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**LICENSEE EVENT REPORT (LER)**

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50 0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNB 7714), 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

(See reverse for required number of digits/characters for each block)

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TITLE (4) Unusual Event and RPS Actuation When the Reactor was Manually Shutdown due to the Inadvertent Opening of a Main Steam Safety Relief Valve caused by Pilot Valve Seat Leakage.

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
09	11	95	95	--008	--00	10	10	95	FACILITY NAME	DOCKET NUMBER 05000
									FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9) 1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)									
POWER LEVEL (10) 100	20.402(b)	20.405(c)	<input checked="" type="checkbox"/>	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)		50.73(a)(2)(vii)	OTHER					
	20.405(a)(1)(iii)	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text. NRC Form 366A)					
	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 J. L. Kantner, Manager - Experience Assessment, LGS	TELEPHONE NUMBER (Include Area Code) (610) 718-3400

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)		
YES (If yes, complete EXPECTED SUBMISSION DATE).	<input checked="" type="checkbox"/>	NO		MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On 09/11/95 at 1247 hours, Unit 1 was manually shutdown in response to the unexpected opening of the 'M' Main Steam safety relief valve (SRV) when the valve could not be closed within 2 minutes per Technical Specifications (TS) Section 3.4.2. Following the reactor shutdown, the TS maximum reactor coolant system (RCS) cooldown rate, of 100 °F/hour, was temporarily exceeded due to the RCS depressurization through the open SRV. Inspection of the SRV revealed steam erosion attributed to pilot valve seat leakage, resulted in the failure of the pilot valve. This produced a differential pressure across the SRV main disc, thereby opening the SRV. During this transient, the 'A' Residual Heat Removal (RHR) pump was operating in the Suppression Pool Cooling mode, and Operations personnel observed oscillations in motor current and decreasing pump flow, indicating potential suction strainer fouling. Inspection of the suction strainer identified a brown, fibrous material covering approximately 70% of the strainer. Chemical analysis identified the material as polypropylene fibers, and iron oxide and zinc oxide corrosion products. Five SRVs were replaced while the unit was shutdown. The Unit 1 Suppression Pool and its components were cleaned. Enhancements to the Foreign Material Exclusion Program are currently being implemented.

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TEXT CONTINUATION

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

Unit Conditions Prior to the Event

Unit 1 was in Operational Condition (OPCON) 1 (Power Operation) operating at 100% power and approximately 1005 psig Reactor Coolant System (RCS, EIIS:AD) pressure. The 'A' Residual Heat Removal (RHR, EIIS:BO) pump was operating in the Suppression Pool Cooling (SPC) mode of operation.

Description of the Event

On September 11, 1995 at 1245, the Unit 1 Main Control Room (MCR) received annunciation of an open Main Steam system safety relief valve (SRV, EIIS:RV). Position indication lights based upon acoustic monitoring indicated that the 'M' SRV was open. Operations personnel confirmed that the 'M' SRV was open and entered procedure OT-114, "Inadvertent Opening of a Safety Relief Valve." Initial attempts to close the 'M' SRV were unsuccessful, and the reactor was manually shutdown at 1247 hours, a Reactor Protection System actuation (RPS, EIIS:JC), in accordance with Technical Specifications (TS) Section Action 3.4.2.b.

At 1250 hours, per procedure ERP-101, 'Classification of Emergencies,' the Shift Manager declared an Unusual Event (UE) on Unit 1 due to the stuck open SRV. Also at this time, Operations personnel placed the 'B' RHR pump in the SPC mode of operation. At approximately 1300 hours, RCS pressure reached 550 psig and operations personnel closed the Main Steam Isolation Valves to assist in reducing the depressurization rate of the reactor vessel. At 1307 hours, the 'M' SRV indicated closed when the reactor pressure reached 410 psig, but reactor pressure continued to decrease. With reactor pressure at 410 psig, the cooldown rate was approximately 130° F per hour, thereby exceeding the TS Section 3.4.6.1 limit of 100° F per hour. During the event the Suppression Pool temperature reached a maximum of 124° F.

At 1320 hours, Operations personnel observed oscillations in the 'A' RHR motor current and decreasing pump flow, indicating possible suction strainer fouling. The RHR System Manager was contacted and at 1320 hours the 'A' RHR pump was secured and declared inoperable at the direction of Shift Supervision. At 1345 hours, following initial evaluation by the System Manager, Shift Supervision directed a restart of the 'A' RHR pump (i.e., in SPC mode), and no abnormal indications

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were observed. Following the plant shutdown and initial troubleshooting, the 'M' SRV was removed and sent offsite for inspection/testing to determine the cause for the inadvertent opening.

A one-hour notification was made to the NRC at 1250 hours on September 11, 1995, concerning the declaration of the UE and of the manual reactor shutdown per the requirements of 10CFR50.72(a)(1)(i), 50.72(b)(2)(ii), and 50.72(b)(1)(i)(A). The UE notification was updated at 1450 hours to indicate that the reactor vessel continued to slowly depressurize and that the plant was proceeding to cold shutdown. The UE notification was further updated at 1521 hours to indicate that the 100° F per hour cool down rate had been exceeded. At 0227 hours on September 12, 1995, reactor pressure had been reduced to below 75 psig and one loop of shutdown cooling was placed in service. The Emergency Director (Shift Manager) completed the event recovery checklist and terminated the UE at 0227 hours. At 0430 hours Unit 1 was in cold shutdown with reactor coolant at 194° F. This report is being submitted in accordance with the requirements of 10CFR50.73(a)(2)(iv).

Analysis of the Event

MCR Operations personnel successfully controlled the manual plant shutdown using the appropriate plant procedures, and all control rods fully inserted as designed. There was no release of radioactive materials to the environment as a result of the inadvertent opening of the 'M' SRV and subsequent manual plant shutdown.

This event is bounded by the accident analysis discussed in the Updated Final Safety Analysis Report Sections 15.1.4 and 15.6.1, inadvertent opening of one SRV. The TS Action Statements associated with this event (i.e., 3.4.2.b, 3.4.6.1, 3.5.1.b, 3.6.2.2.a, and 3.6.2.3.a) were successfully met since the reactor mode switch was placed in the shutdown position within two minutes following identification of the event and the plant was in cold shutdown within the following 24 hours.

All plant systems responded as designed to this event with the exception of the 'A' RHR pump due to the suction strainer fouling. An operability and reportability evaluation concluded that even without the 'A' RHR pump and with an additional single active failure, the Emergency Core Cooling System (ECCS) and Primary Containment heat removal functions were still capable of performing their design safety



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functions. Based on Suppression Pool inspections, the suction strainer fouling only impacted the 'A' RHR pump. Since the fouling of the suction strainer occurred over an extended period of time and the 'A' RHR pump was running prior to and during the event, it is not possible to determine exactly when the 'A' RHR pump became inoperable. The 'A' RHR pump may have been inoperable prior to the indication of suction strainer fouling, but without further information, it has been concluded that the 'A' RHR pump became inoperable during this event.

Cause of the Event

1. The 'M' SRV failure was caused by the following:
  - a. Steam erosion attributed to pilot valve seat leakage, resulted in the failure of the pilot valve seat. This produced a differential pressure across the SRV main disk, thereby opening the main disk of the SRV. This SRV had been leaking since the start of the current fuel cycle (i.e., March 1994) as indicated by elevated SRV tailpipe temperatures.
  - b. The 'M' SRV was allowed to remain in service based on an incorrect Engineering assessment (i.e., in March 1994) which concluded that the 'M' SRV had main seat leakage rather than pilot valve seat leakage. This assessment was based upon the fact that all previous SRV leakage at LGS was main seat leakage.
2. The TS RCS cooldown rate and TS Suppression Pool temperature limit were exceeded as a result of the inadvertent opening of the 'M' SRV.
3. Inspection of the 'A' RHR suction strainer identified a brown, fibrous material covering approximately 70% of the strainer. Chemical analysis identified the material as polypropylene fibers, and iron oxide and zinc oxide corrosion products. The polypropylene fibers are not a constituent of any permanent Primary Containment equipment.

The cause of the 'A' RHR pump suction strainer fouling was foreign material in the Suppression Pool which accumulated on the suction strainer. During operation, some material is

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believed to have accumulated on the strainer. The 'M' SRV discharge resulted in deposition of additional material on the strainer. The foreign material resulted from the Foreign Material Exclusion (FME) Program not being comprehensive enough for the Suppression Pool. The Unit 1 Suppression Pool was scheduled for its first cleaning since commercial operation (i.e., February 1986), during the sixth Unit 1 refueling outage planned to start in January 1996.

Corrective Actions

1. The 'M' SRV was replaced on September 15, 1995. Four other SRVs were removed and replaced due to leakage indication. Upon removal, these 4 other SRVs were found to have main seat leakage. A program to perform increased monitoring of the SRVs has been implemented.
2. Clean-up activities for the Unit 1 Suppression Pool were completed. The Unit 2 Suppression Pool had been cleaned prior to initial startup and during the February 1995 refueling outage. Some foreign material was found in the Unit 2 Suppression Pool in 1995; however, no significant concerns were identified related to either unit.
3. The RHR pumps were successfully tested and declared operable prior to reactor startup. A program to monitor the differential pressure of the Suppression Pool suction strainers has been implemented.
4. FME accountability tracking during unit outages has been initiated for the Suppression Pool and Primary Containment. A detailed review of the FME Program is currently being performed and further enhancements are planned.
5. On October 6, 1995, a response detailing the LGS proposed action plans concerning the Main Steam SRV and the Suppression Pool ECCS suction strainer monitoring programs was issued to the NRC.

Previous Similar Occurrences

No previous events of this type have occurred at LGS.