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 3

TITLE (4)
Reactor Water Cleanup System Isolation on High Differential Flow

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)
											0 5 0 0 0
0 7	0 5	8 6	8 6	—	0 3 3	— 0 1	0 8	2 7	9 3		0 5 0 0 0

OPERATING MODE (9)	4	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 0	20.402(b)	20.405(c)	X 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 (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	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
	AREA CODE
James L. Kantner, Experience Assessment Manager, LGS	2 1 5 3 2 7 - 1 2 9 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)	X NO				

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

On July 5, 1986, at 1855 hours, the Reactor Water Cleanup (RWCU) system isolated as a result of high differential flow between the system's inlet and outlet flow sensing element. The reactor was shutdown and the RWCU system was discharging to the condenser without operation of RWCU pumps. While maintaining a RWCU flow of 50 gpm, the system inlet flow instantaneously increased to 150 gpm and the system isolated on high differential flow after the designed time delay elapsed. With the 'B' Residual Heat Removal loop in shutdown cooling operation, the gravity feed RWCU inlet flow was reduced. Reduced inlet flow combined with a flow restriction caused by the non-running RWCU pump and the draw of the condenser allowed voids to form in the piping. Collapse of voids in the piping caused the spike in the RWCU inlet flow rate. Control room operators attempted to restore the RWCU system to its normal dump flow path and the RWCU system isolated two more time on high differential flow. Service was restored at 0035 hours on July 6, 1986, after the RWCU system was filled and vented. The system procedures for RWCU operation in the dump to the condenser mode have been revised to address gravity feed through the pump bypass line to prevent the flow restriction which resulted in voids forming in the piping.

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

Unit Conditions Prior to the Event:

Operating Mode 4 (Cold Shutdown)
Reactor Power 0%

Description of the Event:

On July 5, 1986, at 1 65 hours an isolation of the Reactor Water Cleanup (RWCU) system occurred. The 'B' Residual Heat Removal (RHR) loop was operating in the shutdown cooling mode when the RWCU system was placed in the blowdown mode (dump flow to the condenser). The flow through the RWCU system to the condenser was driven by reactor vessel standing head (atmospheric) pressure through the 'A' RWCU recirculation pump, without the pump in operation. While maintaining a RWCU dump flow of 50 gpm, the system inlet flow instantaneously increased to 150 gpm and a high differential flow alarm occurred. Operators in the main control room attempted to reduce system flow by closing dump flow control valve HV-C-44-1F033. The inlet flow remained high and the operators then attempted to isolate the RWCU system. During this process, the 45-second time delay elapsed and the system automatically isolated on high differential flow.

The EIIS code for the affected system, Reactor Water Cleanup, is CE.

Consequences of the Event:

There were no adverse consequences resulting from this event because reactor water level and chemistry were not affected by the RWCU system isolation The possible consequences at a higher reactor power level would be minimal because isolation of the RWCU system from the reactor vessel prevents a malfunction of the RWCU system from affecting reactor chemistry or primary containment integrity Reactor chemistry is not significantly affected by the RWCU system being out-of-service for short periods of time.

Cause of the Event:

The RWCU system isolation was a result of high differential flow between the system's inlet and outlet flow sensing elements. This high differential flow was a result of the RWCU system configuration and concurrent operation of the RHR system. The six-inch RWCU inlet piping is a branch off of the 20-inch RHR piping. With the 'B' RHR loop in operation, the gravity fed RWCU

inlet flow was reduced due to lower driving head. The reduced RWCU inlet flow, combined with a condenser vacuum of 22 inches Hg drawing flow from the RWCU system, and the flow restriction created by the non-running RWCU pump resulted in voids in the piping because the line up did not allow the piping to remain filled and pressurized. Also, RWCU pump discharge check valve 44-1F012A may have temporarily closed due to changing system flows and restricted passage of inlet flow for a short period of time. Collapse of the piping voids, which could have been caused by the opening of 44-1F012A, resulted in the RWCU inlet flow spike.

Cause Code: Design Deficiency (B)

Corrective Actions:

Control room operators attempted to restore the RWCU system to its normal dump flow path, but the system immediately isolated on high differential flow again. Operators were dispatched to inspect the RWCU system and no gross leakage was observed. Another attempt to restore the RWCU to the normal dump path resulted in a third high differential flow isolation. The RWCU system was then filled and vented in accordance with system procedure S44.3.A titled "Fill and Vent Reactor Water Cleanup System." The RWCU system was successfully restored to its normal dump flow path at 0035 hours on July 6, 1986, in accordance with system procedure S44.7.A, "Restoration of RWCU System After Group III Isolation."

Actions Taken to Prevent Recurrence:

System Procedure S44.4.A, "RWCU System Blowdown Using RWCU Recirc Pumps," has been revised to address blowdown when a RWCU pump is operating. System Procedure S44.4.C, "RWCU System Gravity Blowdown," has been issued to address gravity blowdown but requires that flow be through the pump bypass line. This ensures the least flow restriction to provide adequate flow given the low driving force, to minimize the potential for the creation of voids in the RWCU system piping and reduce the possibility that the check valve may close.

Previous Similar Occurrences:

Limerick LERs 85-082, 85-072, and 85-002 reported RWCU system isolations caused by high differential flow between the inlet and outlet of the system resulting from different root causes.