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LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)

Limerick Generating Station, Unit 1

DOCKET NUMBER (2)

05000052

PAGE (3)

1 OF 3

TITLE (4)

Unit 1 HPCI failed to start during the performance of a surveillance test

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
06	23	1999	1999	-- 008 --	00	07	23	1999	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)		20.2201(b)		20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)		20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)		20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)		20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)		50.36(c)(1)	X 50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)	50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME

K. P. Bersticker, Manager - Experience Assessment

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 EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
C	BJ	65	W290	Yes					
X	BJ	FCV	W290	Yes					

SUPPLEMENTAL REPORT EXPECTED (14)

☐ YES
(If yes, complete EXPECTED SUBMISSION DATE).☒ NOEXPECTED
SUBMISSION
DATE (15)

MONTH DAY YEAR

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

On June 23, 1999, at 0407 hours, Unit 1 HPCI failed to start during the performance of a surveillance test (ST). At the time of the failure, Unit 1 HPCI was inoperable for planned maintenance. HPCI failed to start when the turbine control valve did not open in response to a manual initiation signal. Investigation into the event determined that corrosion products caused binding in the Hydraulic Actuator (EGR). The EGR was replaced, the ST was re-performed and HPCI was declared operable on June 25, 1999.

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LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
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Limerick Generating Station Unit 1	05000				2 OF
	-352	1999	008	00	3

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

Unit Conditions Prior to the Event:

Unit 1 was in Mode 1 (RUN) operating at 100 percent reactor power when the event was discovered (EHS:RCT). There were no other systems, structures, or components inoperable that contributed to the event.

Description of the Event:

The HPCI system was run following a scram on April 20, 1999. On April 23, 1999, an inspection was initiated due to the presence of water in the oil system. Maintenance personnel drained, cleaned, and dried the oil reservoir. Critical HPCI components, including the turbine bearings, were inspected, with no damage found. Control oil lines to the EGR were disconnected, drained, and blown dry.

The oil was replaced, water absorbing filters were installed, and the oil was re-circulated using the auxiliary oil pump until moisture levels were within acceptable limits. An assumption was made that the flushing and subsequent HPCI runs would be sufficient to remove any remaining water from the system. On April 24, 1999 during the plant start up after the scram, HPCI was run once for a 150# run and again at rated pressure with no problems encountered.

On June 23, 1999 HPCI failed to start during the performance of periodic surveillance testing. The HPCI turbine control valve failed to open in response to a manual initiation signal. Troubleshooting identified binding within the EGR had prevented the turbine control valve from opening. The EGR was removed and replaced. An inspection and failure analysis was performed and corrosion products were found in the EGR. These corrosion products were determined to be the result of water that had been introduced into the oil system, trapped in the EGR, and not previously removed.

Water from the turbine steam glands had entered the oil through the bearing cavities during the HPCI run following the April 20, 1999 scram. The water from the steam glands was caused by excess water volume in the barometric condenser which resulted from an improper pressure setting on valve PCV-056-1F035. This Pressure Control Valve (PCV) controls the pressure of the water entering the barometric condenser sprays. Troubleshooting, after the failure, found the PCV pressure setting out of adjustment. A high setting on this valve of 70 psig had allowed more water to enter the barometric condenser than was removed. The PCV was reset to its required setting, 58 psig, and on June 25, 1999, at 2030 hours, the ST was re-performed with satisfactory results. The Unit 1 HPCI system was then declared operable.

Analysis:

The HPCI system is an engineered safety feature designed to inject water into the reactor at rated pressure and in sufficient volume to maintain core coverage in the event of a LOCA. The principal component is a turbine-driven high pressure, high volume multi-stage centrifugal pump.

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The steam supply to the turbine comes directly from the reactor vessel thus ensuring availability regardless of the condition of AC electric power supplies. With the failure of the EGR to function the HPCI turbine would not start and was therefore unable to perform its function. This failure to start qualifies as an event reportable under 10 CFR 50.73 (a)(2)(v) as a condition that alone could have prevented the fulfillment of the safety function.

Prior to the event, the Unit 1 HPCI was operable after satisfactory performance of a rated pressure surveillance test on April 24, 1999 at 1710 hours while conducting a plant start up. At the time of discovery, Unit 1 RCIC, RHR, Core Spray, and ADS were operable and remained operable until June 25, 1999 at 2030 hours when HPCI was demonstrated operable after satisfactory completion of all work and performance of a pump, valve and flow surveillance test.

The actual consequences of the failure to start are minimal since conditions had not existed that would have caused the HPCI system to operate. Additionally, no other Unit 1 Emergency Core Cooling Systems were inoperable during the period when the HPCI system was inoperable.

Cause of the Event

There were two causes for this event. The cause of the failure to run was corrosion product binding of components within the EGR due to water being introduced into the HPCI turbine oil. The internal components of the EGR made it susceptible to trapped moisture. The trapped moisture remained in the EGR after the oil flush and resulted in corrosion products that prevented it from operating. No other components in the oil system were determined to be susceptible. The water in the oil resulted from a PCV that had malfunctioned due to an incorrect pressure setting. This PCV had been rebuilt and adjusted on June 06, 1998. The improper PCV setting was determined to be either the result of human error or valve set point drift.

An additional cause of this event is a failure to replace the EGR when water was first introduced into the oil system due to an incorrect assumption that all residual moisture in the oil system would be removed from the performed maintenance and subsequent oil flush using water absorbing filters.

Corrective Actions:

The EGR was replaced and the PCV pressure was set to the correct pressure. A pump, valve and flow ST was performed with satisfactory results. A review of other HPCI components susceptible to corrosion was performed with no additional concerns identified.

The work instructions for preventive maintenance on the PCV have been revised to include an independent verification and sign-off for valve setting. Maintenance procedures have also been revised to include replacement of the EGR whenever a HPCI event results in water intrusion into the oil system. During the next pump, valve and flow ST the PCV pressure setting will be rechecked; and if the setting has drifted outside of its set point tolerance, the PCV will be replaced.

Previous Similar Occurrences:

None