NRC Form 366 (5-92)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

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EXPIRES 5/31/95

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE(3)
PILGRIM NUCLEAR POWER STATION	05000-293	1 of 5

TITLE (4)
Reactor Core Isolation Cooling System Made Inoperable due to Anomalies during Testing

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
									N/A	05000
04	03	96	96	003	00	04	29	96	FACILITY NAME N/A	DOCKET NUMBER 05000

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more) (11)					
		20.402(b)	20.45(c)		50.73(a)(2)(iv)		73.71(b)
POWER LEVEL (10)	100	20.405(a)(1)(i)	50.36(c)(1)	x	50.73(a)(2)(v)(D)		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)(B)		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	TELEPHONE NUMBER (Include Area Code)
Jeffrey P. Calfa - Senior Regulatory Affairs Engineer	508-830-8108

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
X	BN	65	W290	Y						

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 15 single-spaced typewritten lines) (16)

On April 3, 1996, at 1015 hours, operations personnel commenced operation of the reactor core isolation cooling (RCIC) system in accordance with a surveillance test. Operators performing the surveillance noted that RCIC controller stability was less than normal and that the controller demand was higher than expected for the existing system conditions. Input from engineering was requested and engineers monitoring the system's performance noted oscillations in RCIC pump discharge pressure, speed, and flow after reviewing computer data. Operators secured RCIC system operation at approximately 1030 hours on April 3, 1996, and after discussions with the engineers declared the RCIC system inoperable at 1230 hours on April 3, 1996.

The cause of the RCIC system pump discharge pressure, speed, and flow oscillations was a malfunctioning speed control system hydraulic actuator (EG-R). The EG-R was replaced. Operators tested the RCIC system with satisfactory results and declared the RCIC system operable at 1730 hours on April 5, 1996. Additional corrective action includes investigation of the cause of the EG-R failure. Additional corrective action could result from the investigation.

The event occurred while the plant was operating at 100 percent reactor power with the reactor mode selector switch in the RUN position. The reactor vessel pressure was approximately 1035 psig with the reactor vessel water temperature at saturation temperature for the reactor pressure. This event posed no threat to the public health and safety.

BACKGROUND

The reactor core isolation cooling (RCIC) system provides makeup water to the reactor vessel following reactor vessel isolation in order to prevent the release of radioactive materials to the environment as a result of inadequate core cooling. The system consists of a steam driven turbine-pump and associated valves and piping capable of delivering makeup water to the reactor vessel. The system can be operated automatically or manually. In the automatic control mode, the speed control system hydraulic actuator (EG-R) operates in conjunction with other components to control turbine and, hence, pump speed. The EG-R is manufactured by the Woodward Governor Company (part number A9903-026).

Operators utilize procedure 8.5.5.1, "RCIC Pump Operability Flow Rate and Valve Test at Approximately 1000 psig," to satisfy technical specification and in-service testing requirements. The test requires RCIC pump discharge flow to be 400 gallons per minute (gpm), turbine speed at 4400 rpm and pump discharge pressure to be within prescribed operating bands. The 400 gpm test flow is directed to the condensate storage tank (CST) through the test return valve MO-1301-53. Operators set the system flow controller for 400 gpm and throttle valve MO-1301-53. The throttling of MO-1301-53 increases pump discharge pressure causing the RCIC flow controller to open the RCIC turbine governor valve HO-1301-159. The RCIC turbine/pump speed is adjusted as required to achieve the prescribed speed band (4350-4450 rpm) and the pump discharge pressure is recorded.

On April 3, 1996, at 0915 hours, operations personnel commenced operation of the RCIC system in accordance with Attachment 1 of procedure 8.5.5.1. During the RCIC system startup, operators had difficulty adjusting pump discharge pressure into the prescribed band. The flow controller was shifted from the automatic to the manual control mode, and an operator took manual handwheel control of MO-1301-53 as allowed by the procedure. The required pump discharge pressure was achieved and maintained. Operators returned the flow controller to the automatic control mode with no indication of the previous pressure operational anomalies. Procedure 8.5.5.1 was continued to completion with RCIC system operation being secured at 1001 hours on April 3, 1996.

After conferring with systems engineers, operations decided to test the system in accordance with Attachment 2 of procedure 8.5.5.1. Attachment 2 of procedure 8.5.5.1 is an abbreviated 'check out' test used at the discretion of the nuclear watch engineer for activities such as system analysis. Operations commenced operation of the RCIC system in accordance with Attachment 2 of procedure 8.5.5.1 at approximately 1015 hours on April 3, 1996. During steady state operations, systems engineers observed oscillations in RCIC pump discharge pressure, speed, and flow and reviewed emergency plant indicating computer (EPIC) data. The system engineer observations included satisfactory RCIC turbine oil level and no indication of air entrainment in the oil. Unlike previous system problems, the oscillations commenced as soon as the turbine achieved rated conditions. Operators secured RCIC system operation at approximately 1030 hours on April 3, 1996, following collection of the EPIC data.

Simultaneous to the second test of RCIC, operators completed their review of the first RCIC test that was completed at 1001 hours. The operators noted the RCIC discharge pressure was 1193 psig which is slightly above the high end of the prescribed band (1181 psig). Problem report (PR) 96.9156 was written to document the pressure problem.

EVENT DESCRIPTION

On April 3, 1996, at 1230 hours, the RCIC system was declared inoperable and a 14 day Technical Specification 3.5.D.2 limiting condition for operation (LCO) was entered. The system was declared inoperable based upon the results of the second test that began at 1015 hours and the noted instabilities. The NRC operations center was notified in accordance with 10 CFR 50.72 at 1317 hours on April 3, 1996. PR 96.9156 was also used to document the conditions noted during the second RCIC test that began at 1015 hours. Maintenance request (MR) 19600786 was written for troubleshooting and repair.

The event occurred while the plant was operating at 100 percent reactor power with the reactor mode selector switch in the RUN position. The reactor vessel pressure was approximately 1035 psig with the reactor vessel water temperature at saturation temperature for the reactor pressure.

CAUSE

The cause of the RCIC system pump discharge pressure, speed, and flow oscillations observed during the test that began at 1015 hours was a malfunctioning speed control system hydraulic actuator (EG-R).

Following the issuance of MR 19600786, engineers developed a troubleshooting plan. Operations was requested to and operated the RCIC system a third time, in accordance with Attachment 2 of procedure 8.5.5.1. Engineers monitored inputs and outputs of the RCIC flow controller and the selector switch for determining the mode of control (i.e. automatic versus manual). The engineers noted the controller output became saturated at rated system operating conditions. No other abnormalities were noted. Operations secured RCIC system operation in accordance with procedure 8.5.5.1. Maintenance personnel checked the calibration of the speed control electric governor (EG-M) and the flow controller and found both devices to be within satisfactory calibration limits.

Operations was requested to and operated RCIC a fourth time in accordance with procedure 8.5.5.6, "RCIC Pump and Valve Operability From Alternate Shutdown Panel." This test is conducted from the system's alternate shutdown panel. Engineers again observed the RCIC flow controller became saturated at rated operating conditions. The RCIC pump could not achieve rated flow of 400 gpm during the test at the alternate shutdown panel with the flow controller in the automatic control mode. Operators were requested and operated RCIC a fifth time to measure EG-R null voltage. The null voltage was found slightly out of specification and was adjusted. At rated operating conditions the output voltage signal from the EG-M was unexpectedly observed to be positive (versus null) and flow controller output again became saturated. The output voltage signal from the EG-M was the result of the EG-R not properly responding to controller demand.

Engineers used a process of elimination to determine that the EG-R was the cause of the system parameter anomalies. Maintenance personnel removed and replaced the EG-R via MR 19600786. The RCIC system was operated to adjust the EG-R null voltage and observe flow controller performance. The system operated satisfactorily with no oscillation of parameters, no saturation of the controller, and satisfactory null voltage of the EG-R at rated conditions. Operators then operated the system from the alternate shutdown panel at rated conditions and verified proper flow controller performance. Operators then performed Attachment 1 of procedure 8.5.5.1 and demonstrated system operability.

When this report was prepared, engineers were analyzing the EG-R that was removed from the system to determine the root cause of the EG-R problem.

The high discharge pressure noted during the first test that began at 0915 hours on April 3, 1996, was due to system characteristics while in the test lineup. Procedure 8.5.5.1 allows for manual hand-wheel operation of MO-1301-53 for testing purposes to achieve the testing parameters. The high pump discharge pressure does not occur during normal system operation because it results from test conditions that only exist when the test return valve MO-1301-53 is being throttled for testing. The sole purpose of this operation is to achieve the in-service testing system reference parameters. Operation at an elevated pressure is acceptable during testing. System operability was not impacted by the conditions of the 0915 hour test on April 3, 1996.

CORRECTIVE ACTION

An investigation and troubleshooting plan was implemented. The EG-R was removed and replaced via MR 19600786. RCIC was returned to standby service at approximately 0200 hours on April 15, 1996. The RCIC system was declared operable on April 5, 1996, at 1730 hours.

When this report was prepared, engineering personnel were investigating the cause of the malfunction of the EG-R which was removed from the system. Additional corrective action could result from the investigation. A supplemental report will be submitted if significant new information is discovered as a result of the investigation.

SAFETY CONSEQUENCES

This event posed no threat to public health and safety.

This event did not constitute a demand start failure of RCIC. During the period the RCIC system was inoperable, the high pressure coolant injection (HPCI) system was operable in accordance with Technical Specification 3.5.D.2.

This report is submitted in accordance with 10 CFR 50.73(a)(2)(v)(D) because the RCIC system was made inoperable.

SIMILARITY TO PREVIOUS EVENTS

A review was conducted of Pilgrim Station licensee events reports (LERs) submitted since 1984. The review focused on LERs involving the RCIC system and apparent problems with the RCIC speed control system hydraulic actuators (EG-Rs). The review identified LERs 91-020-00 and 93-013-00.

LER 91-020-00 reported a manual trip of the RCIC turbine due to speed oscillations that occurred during a surveillance test after approximately 12 minutes of steady operation. The cause of the oscillations was believed to have been a mechanical failure of the EG-R. Corrective actions taken included replacement of the EG-R and the removed actuator was sent to the manufacturer for testing and examination. The EG-R was refurbished by the manufacturer and returned to stock as a spare. The oil supplied to the EG-R was tested, flushed, and refilled. Analysis of the oil sample indicated the oil was in satisfactory condition.

LER 93-013-00 reported the RCIC turbine was declared inoperable due to speed oscillations that occurred during a surveillance test after approximately 13 minutes of steady operation. The cause of the oscillations was believed to be a mechanical failure of the EG-R. The failed actuator was removed from service and a replacement EG-R was installed and calibrated. The RCIC system was tested with satisfactory results after the EG-R replacement.

LER 94-004-01 reported an automatic primary containment isolation control system group 5 closure of the RCIC steam supply isolation valves. The cause of the isolation was a high steam flow signal due to RCIC turbine governor control valve binding in the open position. Testing after valve maintenance identified a RCIC turbine speed oscillation condition which occurred after RCIC operation for time periods of at least 15 minutes. The cause of the turbine speed oscillation condition was air entrainment in the system oil. Vents were added to the oil sump and system oil pressure was reduced to correct the problem. It is believed that the air entrainment was the cause of the turbine speed oscillations of LERs 91-020-00 and 93-013-00 and not EG-R failures as originally reported. The condition described in this report (LER 96-003-00) is different from the oscillations reported in the earlier reports (LERs 91-020-00 and 93-013-00) in that the oscillations for this report appeared as soon as the system achieved rated conditions and do not appear to be related to air entrainment which took at least 12 minutes to develop.

ENERGY INDUSTRY IDENTIFICATION (EIIS) CODES

COMPONENTS	CODES
control, speed governor	SC 65

SYSTEMS

reactor core isolation cooling (RCIC) system	BN
high pressure coolant injection (HPCI) system	BJ