10 CFR 50.73

BOSTON EDISON
Pilgrim Nuclear Power Station
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BECo Ltr. 94-014

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

Docket No. 50-293
License No. DPR-35

The enclosed Licensee Event Report (LER) 94-001-00, "High Pressure Coolant Injection System Inoperable Due to Unplanned Isolation During Surveillance Testing", is submitted in accordance with 10 CFR Part 50.73.

Please do not hesitate to contact me if there are any questions regarding this report.

E T Boulette
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DWE/bal/94011

Enclosure: LER 94-001-00

cc: Mr. Thomas T. Martin
Regional Administrator, Region I
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U.S. NUCLEAR REGULATORY COMMISSION

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LICENSEE EVENT REPORT (LER)

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

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

TITLE (4)

High Pressure Coolant Injection System Inoperable Due to Unplanned Isolation During Surveillance 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
01	04	94	94	001	00	02	03	94	N/A	05000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

OPERATING MODE (9)	N		20.402(b)		20.405(c)	X	50.73(a)(2)(iv)
POWER LEVEL (10)	100		20.405(a)(1)(i)		50.36(c)(1)	X	50.73(a)(2)(v)(D)
			20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)
			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)

	73.71(b)
	73.71(c)
	OTHER (Specify in Abstract below and in Text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Douglas W. Ellis - Senior Compliance Engineer	(508) 830-8160

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 EXPEC[TED] SUBMISSION DATE)	X	NO				

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

On January 4, 1994, at 1834 hours, the High Pressure Coolant Injection (HPCI) System became inoperable and a seven day Technical Specification (3.5.C.2) Limiting Condition for Operation (LCO) was entered. The HPCI System became inoperable because the HPCI turbine steam supply isolation valves closed during a scheduled calibration test of related Analog Trip System (ATS) units. The HPCI System was declared operable and returned to normal standby service at 0326 hours on January 5, 1994. Applicable systems were verified operable during the period the HPCI System was inoperable.

The cause was a false low Reactor Vessel pressure signal. The cause of the signal was investigated but could not be determined with certainty. The investigation concluded the most probable cause was human performance. Corrective action taken included feedback to Instrumentation & Control (I&C) technicians and supervisors regarding this event. Corrective action planned includes procedure improvement and I&C technician training.

The event occurred while at 100 percent reactor power. The reactor mode selector switch was in the RUN position. The Reactor Vessel (RV) pressure was 1029 psig with the RV water temperature at 545 degrees Fahrenheit. The event posed no threat to the public health and safety.

BACKGROUND

The Reactor Vessel (RV) instrumentation includes RV water level, RV coolant flow rates and differential pressure, and RV internal pressure. The Drywell instrumentation includes Drywell pressure. By design, this safety-related instrumentation is arranged into separate, redundant Channels 'A' and 'B'. Each instrument channel is connected to piping extending into primary containment. The Analog Trip System (ATS) is part of the instrumentation monitoring RV and Drywell parameters. The ATS consists of transmitters, master trip units, slave trip units, and trip relays. The transmitters are housed on instrument racks located outside primary containment. The transmitters convert the parameter being monitored into signals. The signals are converted into indications and/or trip functions to related systems. The systems include the Reactor Protection System (RPS), Anticipated Transient Without Scram (ATWS) System, Primary Containment Isolation Control System (PCIS)/Reactor Building Isolation Control System (RBIS), Core Standby Cooling Systems (CSCS), and Reactor Core Isolation Cooling (RCIC) System.

The ATS cabinets contain the master trip units, slave trip units, trip relays, and power supplies. Typically, each transmitter provides signals to a master trip unit. The signal is proportional to the parameter being monitored. The master trip unit converts the signals into an indication and/or trip function. Slave trip units provide functions similar to the master trip units. Slave trip units receive signals from the transmitter via the related master trip unit. The setpoints of the master trip units and slave trip units are individually calibrated.

The CSCS includes the High Pressure Coolant Injection (HPCI) System that is designed to automatically initiate if a low-low RV water level condition or high Drywell pressure condition occurs. The system is also designed to automatically isolate if certain conditions occur, including low RV pressure. The low RV pressure condition is signalled to the HPCI System control circuitry via channel 'A' relays 23A-51A and 23A-51C. Relays 23A-K51A and 23A-K51C are controlled by ATS slave trip units PS-263-50A-3 and PS-263-52A-2, respectively. These relays and trip units are located in ATS cabinet C2233A section 'B'. The channel 'B' relays are similarly controlled by separate trip units and relays located in ATS cabinet C2233B section 'B'. By design, both normally de-energized relays in instrument Channel 'A' and/or Channel 'B' must be in an energized state for the low RV pressure isolation function to occur.

EVENT DESCRIPTION

On January 4, 1994, at 1834 hours, an unplanned automatic actuation of the Group 4 (four) portion of the Primary Containment Isolation Control System (PCIS) occurred during a scheduled surveillance test. The actuation resulted in the automatic closing of the HPCI turbine steam supply isolation valves MO-2301-4 and -5 and caused the HPCI System to become inoperable.

The event occurred during a calibration check of analog trip units that provide low RV steam pressure trip signals to the circuitry that was actuated. The event occurred at step [8](f)(2) of Procedure 8.M.1-32.6 (Rev. 9) Attachment 1, "ECCS Analog Trip Cabinet C2233A Section B - Top Card File Calibration".

The HPCI System was left in the isolated configuration and the I&C technicians who were performing the activity backed out of the surveillance test. The Reactor Core Isolation Cooling System, Automatic Depressurization System, Residual Heat Removal System/Low Pressure Coolant Injection (LPCI) mode, and Core Spray System were verified operable in accordance with Technical Specification 3.5.C.2.

Problem Report 94.9004 was written to document the event. The NRC Operations Center was notified in accordance with 10 CFR 50.72 at 2158 hours on January 4, 1994. A critique was convened at 2130 hours on January 4, 1994. The critique was attended by applicable personnel including the I&C technicians who were performing the surveillance. After initial investigation and corrective action, the HPCI System was declared operable and returned to normal standby service at 0326 hours on January 5, 1994.

The event occurred during power operation while at 100 percent reactor power. The reactor mode selector switch was in the RUN position. The RV pressure was approximately 1029 psig with the RV water temperature at 545°F.

<u>CAUSE</u>

The cause of the HPCI System becoming inoperable was the unplanned actuation of the Group 4 (four) circuitry. The actuation caused the HPCI turbine steam supply isolation valves MO-2301-4 and MO-2301-5 to close automatically due to a low RV pressure signal.

The cause of the low RV pressure signal was investigated but could not be determined with certainty. The investigation revealed the signal occurred approximately six seconds after the ATS cabinet C2233A calibration unit knob was depressed at procedure step [8](f)(2). By depressing the knob, low RV pressure signals were generated as expected from master trip unit PIS-263-50A and related slave trip units including PS-263-50A-3 (controls relay 23A-K51A). Alone, this action should not have caused the event because the in-series, normally de-energized relay 23A-K51C (controlled by PS-263-52A-2) would have to be in an energized state for the isolation function to occur. Based on circuit design, troubleshooting, and interviews with the I&C technicians who were conducting the activity, the investigation identified three possible causes of the event: the cabinet C2233A calibration unit; a malfunction of relay 23A-K51C; and human performance. Of the possible causes, the most probable cause is believed to be human performance i.e., a continuity check of relay 23A-K51C instead of relay 10A-K32A at step [8](f)(3).

- Human performance was investigated. The investigation concluded human performance was the most probable cause of the event. The state of relays (e.g., 23A-K51C) is verified in several procedural steps. For a step, the relay state is determined by a continuity check of relay contacts (e.g., M1-T1). The continuity check is accomplished using a test device (Fluke) at selected terminals. The investigation revealed the procedure was not specific regarding how the continuity check was to be accomplished. Interviews and demonstration revealed differences in the method used for a continuity check. Some checks are accomplished using the voltmeter function while other checks are accomplished using the ohmmeter function of the test device. The investigation concluded some checks should be accomplished using the voltmeter function while other checks should be accomplished using the ohmmeter function of the test device.

Moreover, verbal communication is necessary for performing parts of the surveillance procedure. The ATS cabinet C2233A is located approximately 40 feet from the ECCS panels including Panel C932. The RHR System channel 'A' relay 10A-K32A is located at Panel C932. Normally de-energized relay 10A-K32A (controlled by master trip unit PIS-263-50A) becomes energized as a consequence of depressing the calibration knob at step [8](f)(2). The energized state of relay 10A-K32A is checked at step [8](f)(3). The investigation concluded a continuity check of relay 23A-K51C contacts M1-T1 was performed instead of checking relay 10A-K32A at step [8](f)(3) due to less than clear communication. This action would have allowed current to flow through the test device in parallel to relay 23A-K51C contacts M1-T1 and, in conjunction with the energized state of relay 23A-K51A (controlled by slave trip unit PS-263-50A-2), resulted in the event six seconds after depressing the calibration knob at step [8](f)(2). The investigation concluded human performance was the most probable cause of the event.

- The ATS cabinet C2233A calibration unit was investigated. Troubleshooting revealed 3-5 volt spikes when the calibration knob was depressed. This could have caused slave trip unit PS-263-52A-2 to provide a momentary trip signal causing relay 23A-K51C to momentarily energize. Slave trip unit PS-263-52A-2 is related to master trip unit PIS-263-52A. Neither PIS-263-52A nor slave trip units including PS-263-52A-2 were being checked at step [8](f)(2). The ATS cabinet C2233A calibration unit is common to all trip units in C2233A. Therefore, it is possible relay 23A-K51C energized because of a momentary trip signal from PS-263-52A-2 due to the calibration unit. Prior to returning the HPCI System to standby service on January 5, 1994, the calibration unit was checked in-situ. The testing included depressing the calibration knob and did not cause relay 23A-K51C to energize. After the calibration unit was replaced, the replaced unit was bench tested. The testing indicated the voltage spikes would not have caused relay 23A-K51C to energize. The investigation eliminated the calibration unit (Rosemount model 710DU) as the probable cause.

- A possible malfunction of normally de-energized relay 23A-K51C (Agastat model EGP-B-002) was investigated. The relay's normally open contacts M1-T1 were verified closed at step [8](e)(84) and trip unit PS-263-52A-2 (controls 23A-K51C) was restored to normal service at step [8](e)(94). The procedure does not include a check of the state of relay 23A-K51C after step [8](e)(84) and prior to step [8](f)(2). Contacts M1-T1 could have remained closed after PS-263-52A-2 was returned to normal service. Prior to returning the HPCI System to standby service on January 5, 1994, relay 23A-K51C was visually inspected and electrically tested with satisfactory results. The investigation eliminated relay 23A-K51C as the probable cause.

CORRECTIVE ACTION

On January 25 and 27, 1994, I&C technicians and supervisors received feedback regarding this event, continuity checks and the potential for parallel current paths during a continuity check, and the importance of communication.

The calibration unit was replaced as a preventive action and the HPCI System was declared operable and returned to standby service at 0326 hours on January 5, 1994.

The HPCI System was removed from service for planned maintenance on January 11, 1994, at 1140 hours. The NRC Operations Center was notified in accordance with 10 CFR 50.72 at 1204 hours. The system was removed from service to replace relay 23A-K51C as a preventive action. After the replacement and satisfactory post work testing, the HPCI System was declared operable and returned to standby service at 1427 hours on January 11, 1994. Subsequent visual inspection and electrical tests of the formerly installed relay 23A-K51C were satisfactory.

Corrective action planned includes revision of Procedure 8.M.1-32.6 and companion ATS trip unit calibration procedures (8.M.1-32.5, 8.M.1-32.7, and 8.M.1-32.8) regarding continuity checks. I&C personnel will be trained on the revised procedures as part of the routine training program.

SAFETY CONSEQUENCES

This event posed no threat to the public health and safety.

The Reactor Core Isolation Cooling System, Automatic Depressurization System, Core Spray and RHR (LPCI mode) Systems were verified operable as specified by Technical Specification 3.5.C.2 during the period the HPCI System was inoperable.

This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv) because the actuation, although a designed response to a sensed low RV pressure condition, was not planned. This report is also submitted in accordance with subpart (a)(2)(v)(D) because the HPCI System was inoperable during the period the HPCI turbine steam isolation valves were closed while the related circuitry was not reset.

SIMILARITY TO PREVIOUS EVENTS

A review was conducted of Pilgrim Station LERs submitted since January 1984. The review focused on LERs submitted in accordance with 10 CFR 50.73 subparts (a)(2)(iv) or (a)(2)(v) involving a similar event or cause. The review, although identifying previous unplanned Group 4 isolation events, revealed no similar event or cause.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

COMPONENTS	CODES
Relay (23A-K51C)	RLY
Valve, Electrically Operated (MO-2301-4 & 5)	20
SYSTEMS	
High Pressure Coolant Injection (HPCI) System	BJ