Boston Edison

Pilgrim Nuclear Power Station
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10 CFR 50.73

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U.S. Nuclear Regulatory Commission
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Docket No. 50-293
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The enclosed Licensee Event Report (LER) 96-009-00, "Group 3 Isolation Due to False High Reactor Vessel Pressure Signal During Backfill While Shut Down," is submitted in accordance with 10 CFR Part 50.73.

There are no commitments made in this report.

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

E T Boulette

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DWE/dmc/9600900

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U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

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TITLE (4)
Group 3 Isolation Due to False High Reactor Vessel Pressure Signal During Backfill While Shut Down

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 N/A	DOCKET NUMBER 05000
09	25	96	96	009	00	10	25	96	FACILITY NAME N/A	DOCKET NUMBER 05000

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

OPERATING MODE (9)	N		20.402(b)		20.45(c)	x	50.73(a)(2)(iv)		73.71(b)
POWER LEVEL (10)	000		20.405(a)(1)(i)		50.36(c)(1)		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
			20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		below and in Text,
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Douglas W. Ellis - Principal Regulatory Affairs 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 EXPECTED SUBMISSION DATE)	X	NO				

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

While shut down on September 25, 1996, at 1418 hours, a false high reactor vessel pressure signal occurred while backfilling a reactor pressure transmitter. The pressure transmitter is part of the reference leg 'A' portion of the reactor vessel water level instrumentation. The signal resulted in designed automatic responses that included the closing of the primary containment isolation control system (PCIS) group 3 isolation valves that were open for the shutdown cooling (SDC) mode of the residual heat removal (RHR) system. After initial investigation, the PCIS group 3 isolation signal was reset and the RHR system was returned to service in the SDC mode of operation. Further backfilling was terminated pending review of the event and the procedures used for backfilling the reactor water level instrumentation reference legs.

The cause of the false high reactor pressure signal was a deficiency in the procedure being used for backfilling a reactor vessel pressure transmitter associated with reference leg 'A'. Corrective action taken included revision of the procedures used for backfilling the applicable reactor vessel pressure transmitters associated with reference legs 'A' and 'B'. The reference legs 'A' and 'B' were backfilled prior to plant startup.

The event occurred while shut down with the reactor mode switch in the SHUTDOWN position . The reactor vessel (RV) pressure was zero psig with the RV water temperature at approximately 99 degrees Fahrenheit. The event posed no threat to public health and safety.

BACKGROUND

The reactor vessel (RV) instrumentation associated with this event is the feedwater reference leg portion of the RV water level instrumentation. The instrumentation includes RV water level and 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 that monitors RV 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 used to provide 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 RPS, PCIS/RBIS, ATWS, RCIC and CSCS water level signals are derived from instruments associated with condensing chambers 12A and 12B. The feedwater control system water level signals are derived from reactor water level transmitters LT-646A/647A and LT-646B/647B associated with condensing chambers 13A and 13B, respectively. The reactor vessel shutdown level signals are derived from instruments associated with condensing chamber 11.

For the PCIS group 3 circuitry, a high reactor pressure condition is sensed by reactor pressure transmitters and slave trip units. PT-263-50A is located on instrument rack C2205 that is connected to condensing chamber 13A. Slave trip unit PS-263-50A-4 receives signals from PT-263-50A and provides a high reactor pressure trip signal to the PCIS group 3 circuitry (channel 'A'). PT-263-50B is located on instrument rack C2206 that is connected to condensing chamber 13B. Slave trip unit PS-263-50B-4 receives signals from PT-263-50B and provides a high reactor pressure trip signal to the PCIS group 3 circuitry (channel 'B'). A trip signal from either slave trip unit/channel ('A' or 'B') can provide the high reactor pressure PCIS group 3 isolation function. The high reactor pressure trip setpoint is $\leq$ 76 psig.

The installation of a continuous reference leg backfill system in July 1993, via a plant modification (PDC 93-24), precludes the buildup of non-condensable gases in the reference lines associated with condensing chambers 12A and 12B. The design is intended to prevent the build up of non-condensable gases inside the reference lines, thus eliminating the possibility of inaccurate level indications created by notching during depressurization. Non-condensable gases may also be removed from the reference lines associated with condensing chambers 12A and 12B by backfilling via procedures 3.M.2-12.3 Attachment 1 (condensing chamber 12B) and 3.M.2-12.4 Attachment 1 (condensing chamber 12A). Non-condensable gases in the reference lines associated with condensing chambers 13A and 13B can be removed by backfilling via the performance of procedures 3.M.2-12.3 Attachment 2 (condensing chamber 13B) and 3.M.2-12.4 Attachment 2 (condensing chamber 13A). Non-condensable gases in the reference lines associated with condensing chamber 11 can be removed by backfilling via the performance of procedure 3.M.2-12.4 Attachment 3.

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

Prior to the event, activities were in progress for a plant startup. A plant shutdown had been completed on September 18, 1996, for repair of the reactor building closed cooling water system loop 'B' heat exchanger (reference LER 96-008-00). After achieving cold shutdown and the opening of the reactor head vent valves, the reactor vessel shutdown level reference leg instrumentation piping associated with condensing chamber 11 was backfilled in accordance with procedure 3.M.2-12.4 (rev. 4) Attachment 3, "Condensing Chamber - 11 Backfill." On September 25, 1996, as part of procedure 2.1.1 (rev. 83) Attachment 1, "Startup Checklist - OPER -01," a pre-evolution briefing for the backfill of the reference legs/sensing lines associated with condensing chambers 13A and 13B was conducted. Procedure 3.M.2-12.4 (rev. 4) Attachment 2, "Condensing Chamber - 13A Backfill," was performed before procedure 3.M.2-12.3 (rev. 6) Attachment 2, "Condensing Chamber 13B Backfill." Procedure 3.M.2-12.4 Attachment 2 (Condensing Chamber 13A) is for backfilling the sensing lines of reactor water level transmitters LT-646A and -647A and reactor pressure transmitters PT-263-49A and -50A. These transmitters are located on instrument rack C2205. Procedure 3.M.2-12.3 Attachment 2 (Condensing Chamber 13B) is similar but involves different reactor water level transmitters and reactor pressure transmitters that are located on instrument rack C2206. For a backfill, one of three backfill methods may be via: the use of a demineralized water source; or, the use of a booster pump; or, the use of more than one flow path at any one time.

After isolating reactor water level transmitters LT-646A and -647A and reactor pressure transmitters PT-263-49A and -50A, the sensing line of each transmitter is to be backfilled. The transmitter to be backfilled is un-isolated, backfilled, and then re-isolated. After the backfills are completed, each transmitter is returned to its normal configuration. For the backfills to be performed on September 25, 1996, the plant demineralized water source was to be used for the backfills. The pressure of the demineralized water source is approximately 110 psig. The sensing line of transmitter PT-263-50A is the first of the sensing lines to be backfilled. At section [13], the sensing line for reactor pressure transmitter PT-263-50A was being backfilled at the time of the event. Moreover, at the time of the event, system conditions included the following. The residual heat removal (RHR) system was in the shutdown cooling (SDC) mode of operation with the loop 'A' pumps in service and with the RHR valves MO-1001-47, -50, -28A and -29A in the open position. The reactor reactor mode selector switch was in the SHUTDOWN position. The reactor water cleanup (RWCU) system was not in service.

EVENT DESCRIPTION

On September 25, 1996, at 1418 hours, a false high reactor pressure signal occurred while shut down. The signal resulted in an isolation signal to the group 3 portion of the PCIS. The isolation signal resulted in the automatic closing of the primary containment system (PCS) group 3/RHR system SDC suction line isolation valves MO-1001-50, and -47, and the loop 'A' return isolation valve MO-1001-29A, and the automatic trip of the RHR system loop 'A' pumps 'A' and 'C' as designed. Valve MO-1001-28A, in-series with valve MO-1001-29A, remained open as designed because it does not receive a PCIS group 3 isolation signal. The RWCU system was not affected because the related PCS Group 6 isolation valves do not receive a group 3 isolation signal.

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

After initial investigation, licensed operator actions included the following activities. By 1505 hours, the PCIS isolation signal was reset and the RHR system loop 'A' was returned to service in the SDC mode with the reactor vessel water temperature at approximately 111 degrees F. The backfills were terminated pending a critique of the event and review of procedures 3.M-2-12.3 and 3.M.2-12.4.

Problem Report 96.9490 was written to document the event. The NRC Operations Center was notified in accordance with 10 CFR 50.72 at 1532 hours on September 25, 1996.

The event occurred while shut down. The control rods were in the inserted position and the reactor mode selector switch was in the SHUTDOWN position. The reactor vessel pressure was zero psig with the reactor water temperature at 99 degrees F, and the reactor vessel water level was approximately +57" (narrow range).

A critique was held on September 26, 1996. The critique was attended by applicable personnel including the Instrumentation & Control (I&C) technicians who were performing the backfilling procedure.

CAUSE

The cause of the event was the backfill of PT-263-50A while the RHR system was in the SDC mode. The backfill was being performed in accordance with procedure 3.M.2-12.4 Attachment 2. The attachment did not include a note or caution indicating the RHR system should not be in the SDC mode when backfilling the sensing lines of reactor pressure transmitter PT-263-50A. Similarly, procedure 3.M.2-12.3 Attachment 2 also did not include a note or caution that the RHR system should not be in the SDC mode when backfilling the sensing lines of reactor pressure transmitter PT-263-50B.

During the August - November 1994 outage, a plant modification (PDC 94-12) was implemented. The modification replaced the source of the high reactor pressure signal to the PCIS group 3 circuitry from PS-261-23A and -23B, that were connected to the recirculation system piping, to ATS slave trip units PS 263 50A-4 and -50B-4. The replacement was made, in part, to reduce group 3 isolations and, in part, to address Generic Letter 89-10 related considerations regarding differential pressure for valves MO-1001-47 and -50 that are gate type valves. The modification was reviewed for impact. The impact reviews identified impact to Technical Specifications, operations and alarm response procedures, surveillance procedures, drawings, vendor manual, etc. The impact reviews, however, did not identify procedures 3.M.2-12.3 or 3.M.2-12.4 as being impacted.

Procedures 3.M.2-12.3 and 3.M.2-12.4 were revised after the 1994 outage. Essentially, each procedure had previously contained only one attachment for backfilling the reference lines associated with the respective condensing chambers. The revisions of the procedures were made in early 1995. For each procedure, the revisions separated the backfills into individual attachments corresponding to the respective condensing chamber. The revisions of procedure 3.M.2-12.3 (to rev. 6) and 3.M.2-12.4 (to rev. 3) were approved on April 28, 1995. The revisions, however, did not include a note or caution that the sensing lines of PT-263-50A and -50B should not be backfilled while the RHR system is in the SDC mode.

The backfill of the sensing lines of PT-263-50A on September 25, 1996, is believed to be the first backfill of PT-263-50A (-50B) with the RHR system in the SDC mode since implementation of the modification (PDC 94-12) during the outage in 1994.

CORRECTIVE ACTION

Corrective action taken included the following:

Procedures 3.M.2-12.3 (rev. 6) and 3.M.2-12.4 (rev. 4) were editorially revised and issued on September 27, 1996. The revisions included the addition of precautions and cautions to the procedure. The precaution and limitations section of the procedures added, as a precaution, that backfilling the condensing chamber, i.e., 13A or 13B, may initiate a group 3 isolation. The revision to Attachment 2 added a caution, in the beginning portion of the section for backfilling the sensing lines of reactor pressure transmitter PT-263-50A (-50B), to notify the nuclear watch engineer to secure the RHR system from the SDC mode.

The event was discussed with I&C technicians and supervisors during I&C shop meetings on September 27 - 28, 1996.

With the exception of the sensing lines of PT-263-49A and -49B and PT-263-50A and -50B, the reference legs associated with condensing chambers 13A and 13B were backfilled on September 27 - 28, 1996, in accordance with procedures 3.M.2-12.3 (rev. 6) Attachment 2 and 3.M.2-12.4 (rev. 4) Attachment 2 as part of plant startup activities. Specifically, the backfills were performed via the sensing lines of reactor water level transmitters LT-646A and -647A on instrument rack C2205 and via the sensing lines of reactor water level transmitters LT 646B and -647B on instrument rack C2206. The backfills were performed separately, with the applicable reactor water level and pressure transmitters isolated, and by use of the booster pump method. Because the backfills were performed with the applicable pressure transmitters isolated, the backfills were performed with the RHR system in the SDC mode of operation.

Problem Report 96.0474 was written to document that the PDC 94-12 impact reviews did not identify procedures 3.M.2-12.3 and 3.M.2-12.4 as impacted. The problem report was written for purposes of common cause data analysis.

SAFETY CONSEQUENCES

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

The event was the designed response to a high reactor vessel pressure condition sensed by pressure transmitter PT-263-50A via its related ATS slave trip unit PS-263-50A-4 and associated circuitry.

The RHR system SDC mode of operation has a power generation design basis only. The SDC mode of operation functions to reduce the RV water temperature to 125 degrees Fahrenheit approximately 20 hours after a shutdown for refueling or servicing activities.

Alternate methods for heat removal are available and described in procedure 2.4.25 (currently rev. 17), "Loss of Shutdown Cooling." The methods include feed and letdown alternatives using systems that include the condensate system, reactor water cleanup system, and the main condenser.

This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv) because the PCIS group 3 isolation signal, although a designed response to a (false) high reactor pressure signal, was not planned or expected.

SIMILARITY TO PREVIOUS EVENTS

A review was conducted of Pilgrim Station licensee event reports (LERs) submitted since January 1984. The review focused on LERs submitted in accordance with 10 CFR 50.73(a)(2)(iv) involving a PCIS group 3 isolation signal or similar event. The review identified similar events reported in LERs 93-026-00 and 94-003-00.

For LER 93-026-00, a low reactor vessel (RV) water level signal (approximately +12 inches) occurred during hot shut down conditions on November 8, 1993, at 1203 hours. The reactor mode selector switch was in the REFUEL position for startup checks that were in progress. The RV water temperature was 253 degrees F and the RV pressure was approximately 10 psig. The signal resulted in a reactor protection system (RPS) scram signal, and PCIS and reactor building isolation control system (RBIS) isolations. The cause of the event was utility licensed operator error in that the operator did not refer to all reactor vessel water level indications while maintaining RV water level in the desired band. A contributing factor was the feedwater level instruments did not accurately reflect reactor water level. The nonsafety-related feedwater level instruments associated with condensing chambers 13A/13B were indicating higher than the safety-related reactor water level instruments associated with condensing chambers 12A/12B. The feedwater level indications were inaccurate due to the presence of non-condensable gases in the feedwater level instrumentation lines associated with condensing chambers 13A/13B. The noncondensable gases were present because there was/is no continuous backfill system for the nonsafety-related instrumentation connected to condensing chambers 13A/13B, and there was no procedural requirement to backfill the instrumentation lines connected to condensing chambers 13A/13B prior to plant startup. Corrective action taken included backfilling the instrumentation lines connected to condensing chambers 12A/13A and 12B/13B in accordance with procedure 3.M.2-12.3 and 3.M.2-12.4, and revising procedure 2.1.1, "Startup from Shut Down," to require backfilling the instrument lines associated with condensing chambers 13A/13B. The event was included in the routine operator requalification program. The installation of a continuous backfill system to the instrument lines associated with condensing chamber 13A/13B was evaluated as part of actions related to LER 93-026-00. Essentially, the evaluations concluded that a continuous backfill system for the instrument lines associated with condensing chambers 13A and 13B was not necessary based, in part, on the training conducted and the procedure 2.1.1 step for backfilling prior to startup.

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

For LER 94-003-00, a false low reactor vessel water level signal occurred while shut down on April 27, 1994, at 1410 hours. The plant had been shut down on April 22, 1994, for the replacement of scram solenoid pilot valves' diaphragms. For the replacements, the control rod drive (CRD) system had been removed from service and vented. The event occurred after the replacement of scram solenoid pilot valves' diaphragms and during plant startup activities that included the venting of the CRD system discharge piping at the reactor vessel water level reference leg backfill rack C2208. The trip signal resulted in designed automatic responses that included a RPS scram signal and actuations of the PCIS and RBIS. The signals resulted in the closing of applicable PCS valves that were open including the RHR system SDC valves MO-1001-47, -50, and -29B, closing of the secondary containment system ventilation dampers and start of the standby gas treatment system. After initial investigation, the RPS, PCIS, and RBIS were reset. The RHR system was returned to service in the SDC mode at 1421 hours. The reactor vessel water temperature increased approximately 2 degrees F as a result of the event. The cause of the false low water level signal was a deficiency in procedure 2.2.87 (rev. 48), "Control Rod Drive System." The procedure did not contain sufficient steps or instructions to alert the licensed operator that when the CRD system is to be shut down, the reactor water level reference leg backfill system shall be removed from service at reference leg backfill rack C2208 and returned to service after the CRD system had been restored to normal. Long term corrective action taken included revising procedure 2.2.87. The revision identified actions to be taken when the CRD system is to be removed from service or returned to service.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

COMPONENTS	CODES
Valve, isolation (MO-1001 -29A, -47 and -50)	ISV
Transmitter, pressure (PT-263-50A)	PT

SYSTEMS	CODES
Containment Isolation Control System (PCIS)	JM
Engineered Safety Features Actuation System (PCIS)	JE
Feedwater level control system	JB
Incore monitoring system (reactor water level instrumentation)	IG
Residual Heat Removal System (SDC mode)	BO