10CFR50.73

BOSTON EDISON
Pilgrim Nuclear Power Station
Rocky Hill Road
Plymouth, Massachusetts 02360

Ralph G. Bird
Senior Vice President — Nuclear

November 9, 1989
BECo Ltr. 89-165

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

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

Dear Sir:

The enclosed supplemental Licensee Event Report (LER) 88-002-01 "Full Scram Trip Signal During Surveillance and Resulting Incomplete Actuations" is submitted in accordance with 10CFR Part 50.73.

Please do not hesitate to contact me if you have any questions regarding this report.

R.G. Bird

RLC/bl

Enclosure: LER 88-002-01

cc: Mr. William Russell
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Rd.
King of Prussia, PA 19406

Sr. Resident Inspector - Pilgrim Station

Standard BECo LER Distribution

IE22
1/1

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)
Pilgrim Nuclear Power Station	0 5 0 0 0 2 9 3	1 OF 0 7

TITLE (4)

Full Scram Trip Signal During Surveillance and Resulting Incomplete Actuations

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)
									N/A	0 5 0 0 0
0 1	1 7	8 8	8 8	— 0 0 2 —	0 1	1 1	0 9	8 9	N/A	0 5 0 0 0

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

OPERATING MODE (9)	N								
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)	X	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)
Robert L. Cannon, Sr. Compliance Engineer	5 0 8 7 4 7 - 8 3 2 1

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	J M	R L Y	G 0 8 0	Y					
X	A A	X C V	B 3 5 0	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 fifteen single-space typewritten lines) (16)

On January 17, 1988 at 0113 hours, a full Reactor Protection System (RPS) scram trip signal occurred during a surveillance test. The automatic actuations resulting from the trip signal were incomplete in that portions of the "B" trains of the Primary Containment System (PCS) and Secondary Containment System (SCS) did not actuate as designed. A Control Rod Drive (CRD) System vent valve did not close automatically. Following immediate investigation, the RPS trip signal and isolations were reset at 0135 hours.

The cause for the trip signal was inadequacy of the procedure being used for the surveillance. The cause for the incomplete automatic actuations was high contact resistance of two contacts of a logic relay. The cause for the CRD System vent valve not closing automatically was mechanical binding of the valve due to excessive corrosion buildup between the valve bonnet and valve stem.

Corrective actions consisted of revising the surveillance procedure and replacing the logic relay. Corrective actions for the CRD System vent valve included removal of the excessive corrosion buildup between the valve bonnet and valve stem that caused the valve to bind.

This event occurred during an extended outage with negligible core decay heat and with the mode selector switch in the SHUTDOWN position. There were no control rods in the withdrawn position at the time of the trip signal. The Reactor Vessel (RV) pressure was zero psig and the RV temperature was 92 degrees Farenheit. This event posed no threat to the health and safety of the public.

REASON FOR SUPPLEMENT

This supplemental report is being submitted to provide the results of our root cause investigation regarding the high contact resistance on logic relay RPWBO, and the cause for the mechanical binding of vent and drain valve CV-302-23B.

EVENT DESCRIPTION

On January 17, 1988 at 0113 hours, a full Reactor Protection System (RPS) trip signal occurred. The signal occurred during a surveillance test performed in accordance with Procedure number 8.M.2-2.1.2 "Reactor Level and Pressure Instrument Calibration". The signal occurred when a non-licensed utility Instrumentation and Control (I&C) technician was returning a reactor water level instrument to service following a satisfactory calibration check.

The trip signal resulted in several actuations that are summarized below.

- Primary Containment System (PCS) Group 1 reactor water (Recirculation System Loop "B") sample valves closed automatically as designed.
- PCS Group 3 Residual Heat Removal System (RHRS) shutdown cooling isolation valves closed automatically as designed.
- PCS Group 6 Reactor Water Cleanup (RWCU) System isolation valves closed automatically as designed.
- PCS/Containment Atmosphere Control System (CACS) Group 2 Drywell air purge inlet and exhaust isolation valves (AO-5035B and 5044B respectively) failed to close automatically as designed. The redundant in-series air purge inlet and exhaust isolation valves closed automatically.
- The "B" Train Secondary Containment System (SCS) supply and exhaust ventilation dampers failed to close automatically as designed. The redundant in-series Train "A" SCS supply and exhaust ventilation dampers closed automatically.
- The "B" Train PCS personnel access lock supply and exhaust ventilation dampers failed to close automatically as designed. The redundant in-series Train "A" access lock supply and exhaust ventilation dampers closed automatically.
- The "B" Train of the SCS/Standby Gas Treatment System (SGTS) failed to start automatically as designed. The redundant "A" Train of the SCS/SGTS started automatically.
- The vent valves of the Control Rod Drive (CRD) System scram discharge instrument volume (SDV) tanks (west and east) closed automatically as designed except for CV-302-23B (redundant vent valve for west SDV tank). The drain valves of the CRD System SDV tanks all closed automatically as designed.

Following immediate investigation, the RPS trip signal and isolations were reset on January 17, 1988 at 0135 hours. The "A" loop of the RHRS was returned to the shutdown cooling mode of operation at 0215 hours. The "B" train of the SGTS was returned to standby service at 0810 hours. The RWCU system was returned to service following the reset of the isolation.

Failure and Malfunction Report (F&MR) 88-12 was written to document the reactor scram trip signal. F&MR 88-13 was written to document the incomplete actuation of the SCS/ventilation dampers, SCS/SGTS, and PCS/CACS isolation valves; a priority Maintenance Request (MR 88-30) was issued to further investigate. F&MR 88-14 was written to document the failure of the SDV tank vent valve to close automatically; MR 88-31 was issued to further investigate. Notification of the trip signal and incomplete actuations was made to the NRC Operations Center on January 17, 1988 at 0500 hours.

This event occurred during an extended outage with plant conditions that were as follows. The mode selector switch was in the SHUTDOWN position. There was negligible core decay heat with the reactor water temperature at approximately 92 degrees Fahrenheit. The "A" loop of the RHRS was in the shutdown cooling mode of operation with the "A" pump in service. The RWCU System was in service. The process computer was out of service (from 0020 to 0900 hours).

CAUSE

The cause for the RPS trip signal was procedural inadequacy. The procedure did not contain sufficient instructions or cautions to alert the technician that air introduced into the sensing lines of local level indicator (LI-263-59A) during calibration could affect other instruments mounted on the same RPS Instrumentation Rack (C-2205). The (trapped) air introduced a fluctuation in the sensing lines when LI-263-59A was being returned to service. The fluctuation was sensed by level indicating switches LIS-263-57A -57B ,-72A and -72C as an abnormal reactor water level that was sufficient to generate the RPS trip signal. These level indicating switches share a sensing line that is common to the local level indicator.

The cause for the failure of the "B" trains of the PCS and SCS to actuate automatically was the failure of logic relay RPWBO contacts 3 (three) and 4 (four) to establish electrical continuity when the relay became de-energized. The relay is normally energized with the contacts in the open position. The designed response of the relay is to become de-energized as a result of an RPS signal. The relay functioned properly except for contacts 3 and 4 that did not close sufficiently for electrical continuity. The contact resistance of the contacts was measured in the meg-ohms region when the relay was tested in the de-energized state. To further determine root cause and identify corrective action to preclude recurrence, a representative sample of 21 type HFA relays that had been set-up or installed during the outage was selected to check if the contact wipe fell within the General Electric (G.E.) specification. The inspection and testing was performed utilizing the appropriate sections of maintenance procedure 3.M.3-30, "HFA Relays/Preinstallation Testing and Adjustment, Removal/Installation and Testing Coil Replacement, Preventive Maintenance".

Of the 21 relays tested, 3 were found to have contact wipe adjustment out of tolerance. One additional relay was added to the sample group because the relay was noted to have contact arms bent opposite to that which would be expected for proper wipe adjustment. When tested this relay also failed to fall within the specified tolerance.

As part of the review of the root cause, a G.E. factory representative was contracted to consult on the problem. The G.E. representative reviewed the station procedure for setting up HFA relays and observed workers testing and adjusting relays in the field. The G.E. representative found the procedure adequate but he indicated that the practice of setting the wipe adjustment near the minimum tolerance probably contributed to the reason why the three relays were found out of specification. G.E. also concurred with a BECo proposal to narrow the tolerance envelope in the procedure to decrease the likelihood of drifting outside of the qualified published tolerance envelope.

The practice of isolating contacts by "booting" the contact was also observed to determine if contact arm bending was occurring during the "booting" process. Both the G.E. representative and the Systems Engineer who observed the process agreed that the "booting" would not likely cause contact arm bending. The cause of the contact arm bending could not be established with certainty.

In order to preclude any additional in-service relay failures, the remaining HFA relays replaced during the extended outage were visually inspected by the Systems Engineer for contact wipe misadjustment. The inspection included checking for indication that the contact arm had been bent in the wrong direction and comparing adjacent contacts for alignment and contact arm spring compression. This inspection identified 4 relays which were suspect. The G.E. factory representative performed an independent inspection on the same group of relays. The representative's inspection identified one additional suspect relay with a possible bent stationary contact arm. Maintenance Requests were written for the (five) 5 suspect relays to test them per Maintenance Procedure 3.M.3-30. No incidence of contact wipe misadjustment was found for any of the five suspect relays.

The cause for the west SDV tank vent valve (CV-302-23B) failing to close automatically was confirmed to be mechanical binding of the valve. The valve is controlled by air from a solenoid operated valve that also controls the west SDV tank drain valve CV-302-22B. Drain valve CV-302-22B closed automatically as designed. The air to the vent valve was disconnected in order to investigate the possibility that the vent valve did not close because of a pneumatic problem. The vent valve did not close as a functional valve would when the air was removed. The vent valve did not close when a manual attempt was made using the valve's handwheel. The vent valve is a one inch Y-pattern globe valve, model 105DAB6-001, manufactured by the Borg-Warner Corporation.

Subsequent disassembly and inspection of valve CV-302-23B determined the valve binding was the result of excessive corrosion buildup between the valve bonnet and the valve stem during the extended outage.

Prior to the performance of surveillance testing associated with fuel loading (Fall 1987), the SDV vent and drain valves had not been cycled since January 1987. The Technical Specifications require the vent and drain valves to be cycled quarterly when the CRD System is required to be operable. Because the CRD System was not required to be operable during this time period, the vent and drain valves were not cycled. Cycling of the valves on a regular (quarterly) basis would have precluded the excessive corrosion buildup that occurred.

CORRECTIVE ACTION

The surveillance procedure (8.M.2-2.1.2) was revised following review, and approved on January 30, 1988. The additional instructions provided to maintenance personnel for isolating, connecting and disconnecting test equipment, and returning local level indicators LI-263-59A and -59B to service are expected to preclude the likelihood of a recurrence in the future.

The relay (RPWBO) was replaced with a new relay. The new relay was tested prior to installation and post work tested with satisfactory results following installation. The removed relay was controlled and delivered to General Electric's Relay Test Laboratory to determine the cause for the high contact resistance.

Maintenance Procedure 3.M.3-30, Rev. 5 was approved on February 3, 1989 which narrowed the HFA relay contact wiping tolerances. The narrowing of these tolerances will increase the reliability for contacts closing on HFA relays.

The corrosion was removed from the valve stem and bonnet of valve CV302-23B (MR 88-31) using an approved solvent. Following cleaning of the valve stem and valve bonnet, a tolerance check was performed on the clearance between the stem and bonnet. The clearance was found to be out of specification. The required clearance specification is based on preventing the stem packing from being pulled into the clearance space between the bonnet and stem. ESR 88-472 was written to request NED to evaluate the use of an alternative type packing based on the vendor's recommendation. The recommended alternative packing is a type that would not be extruded (pulled) into the stem/bonnet space. Based on the engineering evaluation (ERM 88-557) and vendor recommendation, valve CV302-23B was re-assembled using a anti-extrusion packing arrangement as an interim repair. The valve bonnet will be replaced as a long term action.

Additionally, Procedure 8.3.3, "Scram Discharge Instrument Volume Vent and Drain Valve Quarterly Operability," was revised to require the vent and drain valves to be full-stroke exercised each quarter as part of the In-Service Testing (IST) Program.

SAFETY CONSEQUENCES

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

The event occurred during an extended outage while in the cold shutdown condition with negligible core decay heat and with no control rods in the withdrawn position.

Had this event occurred during operation with any or all control rods in the withdrawn position, the control rods would have been inserted automatically into the core thereby placing the reactor in a shutdown condition.

The portions of the PCS and SCS that failed to actuate automatically were compensated for by the redundant portions that actuated automatically as designed.

The failure of a SDV tank vent or drain valve to close automatically is compensated for by the automatic closing of the redundant vent or drain valve installed for each SDV tank. Each vent or drain valve may also be operated through the use of a handwheel. In the unlikely event that both vent valves or both drain valves of a SDV tank did not close automatically or could not subsequently be closed manually, the water from the tank(s) would be directed to the Reactor Building equipment sump. The function of the CRD System to insert the control rods into the core would not be affected by the open position of both vent valves or both drain valves of either or both SDV tanks.

Control Room operator corrective actions for response to alarms or malfunctions are addressed in procedures that include: 2.1.6, "Reactor Scram"; 2.2.50, "Standby Gas Treatment"; 2.2.70,"Primary Containment Atmosphere Control System; 2.4.25, "Loss of Shutdown Cooling"; and 2.4.27, "Reactor Water Cleanup System Malfunctions".

The RPS trip signal was determined to be reportable pursuant to 10CFR50.73 (a)(2)(iv) because the signal was not an expected part of the surveillance. The interruption in the operation of the RHRS/shutdown cooling and RWCU System was determined to be reportable pursuant to 10CFR50.73(a)(iv) because the automatic closing of the isolation valves of those systems, although an expected part of the RPS trip signal, was an unnecessary challenge to the valves. The failure of the "B" trains of the SCS and PCS to actuate was determined to be reportable pursuant to 10CFR50.73(a)(2)(vii) because a single cause (relay RWPBO) resulted in the failure (incomplete actuation) of one train in more than one system designed to mitigate the consequences of an accident.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
Pilgrim Nuclear Power Station	0 5 0 0 0 2 9 3	8 8	— 0 0 2	— 0 1	0 7 OF 0 7

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

SIMILARITY TO PREVIOUS EVENTS

A review of Pilgrim Station Licensee Event Reports (LERs) written since January 1984 was conducted. The review focused on LERs submitted pursuant to 10CFR50.73(a)(2)(iv) involving actuation of the RPS that were caused by procedural inadequacy.

The review identified a similar event reported in LER 50-293/84-014-00. For that event, a full RPS scram signal occurred during a refueling outage. The signal occurred during maintenance for the SDV (half signal generated) concurrent with a loss of power to the "B" RPS motor generator set. The cause for the loss of power was procedural inadequacy.

The review also included a review of Pilgrim Station LERs written since January 1984 for which the cause was identified as the failure of a 125 VDC HFA relay. No previous failures were identified.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this event are as follows:

COMPONENTS	CODES
Relay (RPWBO)	RLY
Valve (CV-302-23B)	XCV

SYSTEMS	
Containment Combustible Gas Control System (CACS)	BB
Containment Isolation Control System (PCIS/RBIS)	JM
Control Rod Drive System (CRD)	AA
Engineered Safety Features Actuation System (PCIS/RBIS/RPS)	JE
Primary Containment System (PCS)	JM
Reactor Building (SCS)	NG
Reactor Water Cleanup System (RWCU)	CE
Residual Heat Removal System (RHRS/shutdown cooling)	BO
Standby Gas Treatment System (SGTS)	BH