10 CFR 50.73

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

Ralph G. Bird
Senior Vice President — Nuclear

September 18, 1990
BECo Ltr 90-110

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) 89-037-01, "Primary Containment/Traversing In-Core Probe (TIP) Ball Valve not Closed Contrary to Technical Specification", 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.

R. G. Bird

GJB/bal

Enclosure: LER 89-037-01

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

Sr. NRC Resident Inspector - Pilgrim Station

Standard BECo LER Distribution

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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 5

TITLE (4) Primary Containment/Traversing In-Core Probe (TIP) Ball Valve Not Closed Contrary to Technical Specification

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
1 1	3 0	8 9	8 9	0 3 7	0 1	0 9	1 8	9 0	N/A	0 5 0 0 0

OPERATING MODE (9): N

POWER LEVEL (10): 0 9 4

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

20.402(b)	20.405(c)	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)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iii)	X 50.73(a)(2)(i) B	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)
Gary J. Basilesco, Senior Plant Engineer	5 0 8 7 4 7 - 8 5 3 4

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	I G	I S V	C 5 6 0	Y					
X	I G	S O L	G 0 8 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)

While trouble-shooting the Traversing In-Core Probe (TIP) ball valve No. 45-300A on November 30, 1989 at approximately 1200 hours, it was discovered that the ball valve was almost full open when it was thought to be in the closed position. The valve was being manually operated as part of trouble-shooting in accordance with station procedures.

The cause of the ball valve being open was damage to the valve stem. It is believed that stem damage occurred during previous manual manipulation of the valve (to allow TIP removal following solenoid failure and valve partial closure on the TIP cable). The ball valve and actuator were replaced. Other corrective action included incorporating the details of this event into the Instrumentation and Control technician training program. The ball valve (plate number 73110-2) was manufactured by Consolidated Controls, Inc. The solenoid actuator (plate number 112C2391P001-2) was manufactured by General Electric Co.

The condition was discovered during power operation with the reactor mode selector switch in the RUN position. The Reactor Vessel (RV) temperature was approximately 540 degrees Fahrenheit and the RV pressure was 1025 psig. The RV power level was approximately 94 percent. This report is submitted in accordance with 10CFR50.73 (a)(2)(i)(B) and the event posed no threat to the health and safety of the public.

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REASON FOR SUPPLEMENT

This supplemental report is being submitted to augment the safety consequences section of the original Licensee Event Report. Detail is provided regarding the impact of a design basis accident on primary containment integrity and the resulting dose consequences. Results confirm that the safety significance of the open ball valve was minimal. The report also provides additional detail in the cause and corrective action sections.

EVENT DESCRIPTION

During the performance of Temporary Procedure (TP) No. 89-112, "Manual Insertion of a Tip When Primary Containment Integrity is Required" on November 30, 1989 at approximately 1200 hours, the Traversing In-Core Probe (TIP) system ball valve No. 45-300A was inspected and manually operated. During this time, it was discovered that the valve was almost full open when it was thought to be in the closed position. A significant rotation of the ball valve's roll pin (approximately 80 degrees) from the expected position was discovered (i.e., the valve would have been full open at 10 degrees from the indicated closed position). This condition was documented on Failure and Malfunction Report 89-463.

On November 30, 1989 at approximately 1530 hours, the valve was shut, verified closed and deactivated by tagging with the valve actuator removed. The closing and deactivation of the valve is in accordance with Technical Specification 3.7.A.2.b for an inoperable automatic primary containment isolation valve.

Leading to this event was a previous condition identified on November 15, 1989. During that time, the TIP became stuck in the indexer while performing Procedure 9.5, "LPRM Calibration", Attachment 6. This condition was documented on F&MR 89-443. TP 89-112 was written to explore and trouble-shoot this condition.

The condition was discovered during power operation with the Reactor Mode Selector Switch in the RUN position. The Reactor Vessel (RV) temperature was 540 degrees Fahrenheit and the RV pressure was 1025 psig. The reactor power level was approximately 94 percent.

BACKGROUND

The TIP System provides signals proportional to neutron flux in the reactor. The system enables the calibration of the Local Power Range Monitor (LPRM) signals by correlating TIP signals to the LPRM signals as the TIP is positioned in selected radial and axial locations in the core. The TIP System consists of a fission chamber attached to a flexible drive cable, which is driven by a gear box assembly. The flexible cable is contained by guide tubes that extend into the reactor core. The cable drive mechanism inserts and withdraws the TIP and its cable from the reactor and provides detector position indication signals.

A valve system is provided on each guide tube entering the primary containment. A ball valve and a cable shearing valve are mounted in the guide tubing just outside of the primary containment (Drywell). The valves are to provide primary containment isolation in the event of a guide tube rupture inside the drywell. The ball valve is normally closed and opens when the related probe is being inserted. The in-series shear valve is normally open and is used only if a leak occurs when the TIP is beyond the ball valve and a loss of power to the related TIP system drive mechanism occurs. The shear valve, controlled by a remote manual key-locked switch, can cut the cable and close off the guide tube. The shear valve is actuated by a detonation squib. The continuity of the squib circuit is monitored by indicator lights in the control room.

CAUSE

The cause of the rotation of the roll pin from the expected position has been determined to be a damaged valve stem. The cause of the damaged stem is believed to be manual manipulation of the stem by Instrumentation & Controls (I&C) personnel to allow the removal of the TIP cable and probe from the inserted position.

The TIP System mechanism 'A' (C-730A) was in service on November 15, 1989 for determining the neutron flux distribution within the reactor core. This action was being conducted in accordance with Procedure 9.5 (Rev. 19) "LPRM Calibration", Attachment 6 (six). When the drive cable and detector for C-730A were being withdrawn, the ball valve unexpectedly attempted to close automatically even though the cable and detector had not fully retracted. The ball valve is electrically opened by a solenoid and closes by a spring. Subsequent investigation revealed that the solenoid of the ball valve's actuator had become de-energized. The cause of the solenoid deenergizing (failing) is unknown. Because of primary containment and ALARA considerations, the ball valve stem was manually rotated in accordance with a Maintenance Request to allow retraction of the drive cable/detector. After the retraction, the ball valve was allowed to self close (spring action) to what was believed to be the closed position. However, on November 30, 1989 during subsequent troubleshooting of the ball valve and actuator, the ball valve stem was discovered to be permanently distorted. The distortion resulted in an offset for the ball valve position such that the valve was unknowingly not fully closed by the operation of the actuator's spring.

Engineering analysis (by test on a similar valve stem) has confirmed that the solenoid spring alone does not have sufficient force to distort the valve stem. Therefore, it is reasonable to believe that manual manipulation caused the damage.

The ball valve (plate number 73110-2) was manufactured by Consolidated Controls, Inc. The solenoid actuator (plate number 112C2391P001-21) was manufactured by General Electric Company.

CORRECTIVE ACTION

The ball valve and solenoid actuator were replaced while shutdown on December 11, 1989 in accordance with Procedure No. 3.M.2-5.6.3 (Rev. 5), "T.I.P. Ball Valve Replacement". The valve was tested with satisfactory results in accordance with Procedure No. 8.7.1.5, "Local Leak Rate Testing of Primary Containment Penetrations and Isolation Valves".

Additional corrective action has included training the Instrumentation and Control (I&C) technicians as part of the I&C Plant Status Update Training Program. The training included a comprehensive presentation of the TIP system highlighting any past operational problems including the event described in this report. The training was given to the technicians and outlined in detail, the contents of the LER and stressed the importance of using extreme caution when operating the TIP system, especially when manual operation of the system (i.e. manual retraction of TIP cable and probe) was required. The process used to perform this manual retraction of the TIP cable was examined thoroughly, and it was stressed to each class that the use of undue forces may damage equipment including the ball valve and stem. The training is given each quarter to I&C personnel that may work on the TIP system and associated equipment.

SAFETY CONSEQUENCES

The event posed no threat to the health and safety of the public

With the ball valve inoperable, the in-series shear valve was capable of providing the primary containment isolation function if necessary.

In addition, Secondary Containment and Standby Gas Treatment (SBGT) system were operable and available if a release of radioactive material from the Drywell into the Reactor Building (via the guide tube containing the open ball valve) would have occurred. The SBGT system consists of two parallel air filtration assemblies capable of reducing and holding the Reactor Building at a sub-atmospheric pressure, thus minimizing the release of fission products. The filtration assemblies consist of charcoal filter beds as well as high efficiency particulate absorber (HEPA) filters capable of removing 95% of the influent iodine.

The leak rate past the ball valve following a Loss of Coolant Accident (LOCA), assuming the valve was full open and the TIP probe in the chamber shield, was calculated. The flow area considered was the open area between the guide tube and the TIP probe. The leakage would be out of the open end of the guide tube into the drive mechanism. Using the Design Basis Accident (DBA) LOCA Primary Containment Pressure Response contained in FSAR Section 14.5 (Postulated Design Basis Accidents), the flow rate was calculated in liters per minute. The pressure response assumes a containment pressure of 45 psig up to 10 seconds after the event, 27 psig from 10 seconds to 16 minutes and 8 psig from between 16 minutes to 24 hours after the event. The calculation conservatively assumed the TIP system probe to be a smooth opening when in fact the actual geometry is not smooth and would result in less leakage.

The values calculated indicate that the total predicted containment leakage which included the calculated leakage past the ball valve plus other known primary containment leakage at the time of the event was within the one percent/day limit established in PNPS Technical Specifications.

The flow path outside the primary containment would be the result of a ruptured guide tube inside the Drywell or from the indexer mechanism due to containment pressurization following a LOCA. Flow from inside the pressure vessel to outside primary containment is not expected because the TIP dry tubes are small bore class I piping which performs a passive safety function and is not assumed to fail.

Assuming leakage past the ball valve into secondary containment did occur, the shear valve was available to isolate the guide tube. PNPS Emergency Operating Procedure EOP-03, "Primary Containment Control" directs Control Room operators to initiate drywell sprays at or below 11 psig. This would lower containment pressure and reduce the flow rate out of the guide tube. Following EOP-04, "Secondary Containment Control", operators would be aware of the potential for a breach of primary containment via the Reactor Core Isolation Cooling (RCIC) piping area (23' elevation) high temperature alarm. Operators were aware of existing problems with TIP ball valve 45-300A. Based on the operator awareness of existing ball valve concerns, the high temperature alarm in the subject area and the instruction in EOP-04 to isolate all systems discharging into the area, it is reasonable to conclude that the shear valve would be fired within 24 hours.

In addition, analysis was performed by the BWR owners group and General Electric to assess the radiological dose consequences of TIP containment isolation failure. The analysis assumed the failure of all TIP ball valves to isolate. The analysis also used NRC Regulatory Guide 1.3 entitled "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for BWR's" source term assumptions and conservative Pilgrim-unique parameters, including a 95% filter efficiency for the Standby Gas Treatment System. The results of the analysis indicate that, failure of the four TIP ball valves to isolate concurrent with a design basis accident (LOCA), would result in offsite doses within 10 CFR 100 limits.

This report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B) because the ball valve was not in the closed position and Technical Specification Section Limiting Condition for Operation 3.7.A.2.b for an inoperable automatic isolation valve was not met.

SIMILARITY TO PREVIOUS EVENTS

A review conducted of Pilgrim Station Licensee Event Reports (LERs) submitted since January 1984 involving a TIP System ball valve(s), revealed no similar events.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

COMPONENTS	CODES
Valve, Isolation	ISV
Solenoid	SOL

SYSTEMS	
In-core Monitoring System (TIP System)	IG
Primary Containment System (PCS)	JM