



PECO NUCLEAR

A UNIT OF PECO ENERGY

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January 28, 1998

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Docket No. 50-277

SUBJECT: Licensee Event Report, Peach Bottom Atomic Power Station Unit 2

This LER reports the failure of the 2A reactor feedpump turbine (RFPT) to trip and is being submitted pursuant to the requirements of 10 CFR 50.73 (a)(2)(i)(E).

Reference: Docket No. 50-277
Report Number: 2-97-010
Revision Number: 00
Event Date: 12/29/97
Discovery Date: 12/29/97
Report Date: 01/28/98
Facility: Peach Bottom Atomic Power Station
1848 Lay Road, Delta, PA 17314

Sincerely,

Robert L. Chamberlain for G.D. Edwards

DBB:dbb

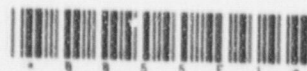
enclosure

cc: N. J. Sproul, Public Service Electric & Gas
R. R. Janati, Commonwealth of Pennsylvania
INPO Records Center
H. J. Miller, US NRC, Administrator, Region I
R. I. McLean, State of Maryland
A. C. McMurtry, US NRC, Senior Resident Inspector
A. F. Kirby III, DelMarVa Power
T. M. Messick, Atlantic Electric

CCN 98-14004

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS
INFORMATION COLLECTION REQUEST 500 HRS. FORWARD
COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS
AND REPORTS MANAGEMENT BRANCH (F530), U.S. NUCLEAR
REGULATORY COMMISSION WASHINGTON DC 20555 AND TO
THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE
OF MANAGEMENT AND BUDGET WASHINGTON DC 20503

PAGE 73

1 OF 04

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)																			
1	2	9	9	7	9	7	-	0	1	0	-	0	0	0	1	2	8	9	8					0	5	0	0	0					
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OPERATING MODE (B)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 8 (Check one or more of the following) (11)									
1		20.402(b)		20.406(c)		50.73(a)(2)(iv)		73.71(b)			
POWER LEVEL (10)		20.406(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)			
1319		20.406(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vi)		OTHER (Specify in Abstract below and in Text: NRC Form 366A)			
		20.406(a)(1)(iii)	X	50.73(a)(2)(ii)		50.73(a)(2)(viii)(A)					
		20.406(a)(1)(iv)		50.73(a)(2)(iii)		50.73(a)(2)(viii)(B)					
		20.406(a)(1)(v)		50.73(a)(2)(iv)		50.73(a)(2)(ix)					

LICENSEE CONTACT FOR THIS LER (12)

TELEPHONE NUMBER

AREA CODE

George Lengvel

7	1	7	4	5	6	-	7	0	1	4
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS
1	SIX	SOIL	GIEI	

SUPPLEMENTAL REPORT EXPECTED (14)

EXPECTED
SUBMISSION
DATE (15)

MONTH	DAY	YEAR
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YES (If yes, complete EXPECTED SUBMISSION DATE)

NO

ABSTRACT (Limit to 1400 spaces - i.e. approximately fifteen single space typewritten lines) (16)

On December 29, 1997, the 2A RFPT was being removed from service during reactor power reduction to support a planned maintenance outage. At this time, the 2A Reactor Feedpump Turbine (RFPT) failed to trip when the Reactor Operator (RO) pushed the control room 2A RFPT trip push-button. During the time frame of developing the troubleshooting plan, the 2A RFPT did trip when it received a valid reactor high level signal. During the subsequent troubleshooting, it was determined the trip solenoid had an intermittent electrical failure and was the cause of the failure to trip. Further investigation proved that the failure to trip was not associated with the mechanical portion of the trip mechanism as had been the case in previous events. The condition that prevented the 2A RFPT to trip is believed to be an intermittent failure mechanism that existed during power operations prior to the scheduled outage and is therefore a condition prohibited by Technical Specifications (TS) 3.3.2.2, "Feedwater and Main Turbine High Water Level Trip Instrumentation". Corrective actions for the 2A RFPT included repair, reinstallation, and testing of the electrical trip solenoid and associated mechanical devices. Additionally, inspection of the 2B, and 2C RFPTs and the unit 3 RFPTs found that no similar problems existed in the trip solenoid mechanisms.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555 AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

DOCKET NUMBER (2)

LER NUMBER (6)

PAGE (3)

Peach Bottom Unit #2

0 | 5 | 0 | 0 | 0 | 2 | 7 | 7 | 9 | 7 | - | 0 | 1 | 0 | - | 0 | 0 | 0 | 2 | OF | 0 | 4

TEXT (If more space is required, use additional NRC Form 355A's) (17)

Requirements of the Report

This LER is being submitted pursuant to 10 CFR 50.73 (a)(2)(i)(B) due to a condition prohibited by Technical Specifications.

Unit Conditions at Time of Discovery

Unit 2 was in the "RUN" mode at 39.5 percent of thermal reactor (EIS:RCT) power and in power reduction to support a scheduled maintenance outage. Unit 3 was in the "RUN" mode at 94.6 percent power. There were no systems, structures or components that were inoperable that contributed to the event.

Description of the Event

On December 29, 1997, at 5:12 A.M., the 2A reactor feedpump turbine (RFPT) (EIS:SK) was being secured in accordance with SO 6D.2.A-2, Reactor Feedwater Pump Shutdown, to facilitate continued power reduction for a planned maintenance outage. The reactor operator (RO) (licensed) attempted to trip the 2A RFPT from the main control room (MCR) but was unsuccessful. The tripping of the RFPTs remotely from the control room was being observed in response to two previous events of the 2A RFPT failing to trip remotely that had occurred in April and November of 1997. Upon manual push-button trip initiation from the MCR, the 2A RFPT did not trip as expected and the appropriate TSA was entered for failure of the 2A RFPT trip logic (EIS:JK) to operate in accordance with TS 3.3.2.2. Since this failure to trip appeared similar to the previous failures in April and November, the 2A RFPT was left in the un-tripped condition and an extensive troubleshooting plan was developed. While troubleshooting plans were being developed, the reactor experienced a high water level condition due to bypass valve position changes and the 2A RFPT tripped on a valid high reactor water level of +45". This new information was factored into the plan being developed to determine why the 2A RFPT originally failed to trip from the main control room.

Cause of the Event

Extensive troubleshooting was performed and focused around repeating the failure to trip from the main control room push-button. This investigation showed that the push-button and the associated wiring to the trip solenoid (EIS:SOL) were electrically secure. Electrical testing of the trip solenoid coil indicated significant variations in coil resistance when the coil was mechanically agitated. The trip coil was sent to Valley Forge Corporate Laboratory for further analysis to determine the integrity of the coil under simulated operating conditions of vibration and elevated temperatures. Testing at Valley Forge indicated that an intermittent short could be generated when the coil was

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Peach Bottom Unit #2	0 5 0 0 0 2 7 7	9 7	— 0 1 0	— 0 0 0	0 3	OF 0 4

TEXT (If more space is required, use additional NRC Form 285A's) (17)

mechanically agitated at all temperature levels. This indicated that normal vibration with the unit in operation could be a contributing factor to the intermittent shorting of the coil. Also, internal inspections indicated evidence of wear due to long-term exposure to vibration. There is a high probability that this intermittent short was present during the event and prevented the solenoid trip coil from energizing on a short duration signal as received during push-button operation. Further analysis indicated that with a long duration signal such as the sealed-in high level trip signal, the coil could build up enough magnetic field to operate the solenoid plunger.

Additional investigation of the trip solenoid found two conditions that may have contributed to the solenoid failure. First, the trip coil mounting assembly/bracket was missing two hold-down bolts, as compared to the 2B and 2C RFPT trip coils. These missing bolts could have magnified the vibration of the coil and lead to the misalignment and internal degradation. Second, the solenoid valve inspection revealed misalignment between the trip coil and the hydraulic valve plug. This misalignment was approximately 0.25" and was not significant enough to cause any interference with solenoid action but may have contributed to solenoid failure.

In addition to the electrical troubleshooting, a detailed review and disassembly of the mechanical portion of the 2A RFPT trip mechanism was performed. The inspection performed for this event found no evidence that mechanical binding contributed to the 2A RFPT failure-to-trip. The cause of the 2A RFPT failure-to-trip was determined to be directly related to the intermittent shorts observed in the trip valve solenoid valve coil.

Analysis of Event

No actual safety consequences occurred as a result of this event. During power operations, the 2A RFPT high reactor water level trip feature is required to prevent fuel cladding damage due to the injection of cold feedwater into the reactor. The 2A RFPT was being secured as part of a normal shutdown sequence for the planned maintenance outage and follow-up testing to the November event was being performed when it failed to trip. The failure of the 2A RFPT to trip on demand from the MCR is the same trip solenoid that is used to trip the 2A RFPT for the reactor high water level trip. This trip function is required to be operable whenever reactor power level is greater than 25 percent and failure of this trip is a condition prohibited by TS. Had the 2A RFPT failed to trip on demand from the Reactor High Water Level trip circuit or the MCR at plant operation greater than 25 percent power, operator action would have been taken to trip the 2A RFPT locally.

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		0	5	0	0	0	2	7	7	9	7	—	0	1	0	—	0	0	0	4	OF

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

Corrective Actions

The 2A RFPT trip device was repaired, reinstalled and tested to prove operability. This included replacement of the solenoid coil, as well as realignment of the solenoid mechanism and replacement of all four hold-down bolts. In addition, a complete disassembly of the mechanical portion of the trip mechanism was performed. This inspection did reveal some worn parts that were within design specifications. These parts were replaced to gain more margin on the design specifications of the trip mechanism. A test plan was developed to test the trip mechanism from both the MCR and locally before returning the 2A RFPT to service. These tests were performed satisfactorily on January 1, 1998. In order to ensure all operational conditions of the 2A RFPT trip solenoid were tested, additional trip testing was performed at various power levels. These included a satisfactory trip test after operating the 2A RFPT in standby for six hours on January 3, 1998, a satisfactory test just prior to putting the 2A RFPT in service on January 4, 1998 and a satisfactory test on January 6, 1998 during a load drop from 89 percent power. Additionally, increased functional testing of the 2A RFPT trip circuit is currently being performed to maintain confidence that the trip circuit performs its required function during operational conditions. This increased functional testing will continue until it is determined that it is no longer required.

To ensure that no other RFPTs had similar problems, an inspection of both remaining Unit 2 RFPTs and the Unit 3 RFPTs was performed. This inspection included verification that the alignment between the trip coil and the valve plug was acceptable and that all of the hold-down bolts were installed and secured. In addition, the coils were tested on the 2B and 2C RFPT to ensure the resistance of the coils was satisfactory. All testing and inspections were found to be acceptable. A review of past equipment performance indicates the other turbine trip devices have been very reliable. This includes successful tripping of the 2B RFPT and 2C RFPT during the April 1997, November 1997, and December 1997 plant shutdowns. Also, the Unit 3 RFPTs were successfully tripped during the scheduled testing performed in 3R11 and the Unit 3 plant shutdown in December 1997.

Previous Similar Events

The 2A RFPT failure-to-trip event is a repeat failure and was identified in LER 2-97-009. Corrective actions in LER-2-97-009 involved repairs to the mechanical portion of the trip mechanism. The equipment was tested and returned to service. The previous failure to trip focused on mechanical binding within the trip mechanism. No other issues with the electrical portion of the trip mechanism were identified to be a concern at that time. This event is being evaluated within the licensee's corrective action program.