## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9112310094      DOC.DATE: 91/12/16   NOTARIZED: NO        DOCKET #
  FACIL:50-275 Diablo Canyon Nuclear Power Plant, Unit 1, Pacific Ga  05000275
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  RUEGER,G.M.        Pacific Gas & Electric Co.
   RECIP.NAME         RECIPIENT AFFILIATION

SUBJECT: LER 91-017-00:on 911114,conditional surveillances of control
         rod positions required Tech Specs 4.1.3.1.1 & 4.1.3.2,
         including allowed extension of TS 4.0.2 missed.Caused by
         inadequate computer program.Software revised.W/911216 ltr.

DISTRIBUTION CODE: IE22T  COPIES RECEIVED:LTR _1_ ENCL _1_ SIZE: _6_
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December 16, 1991

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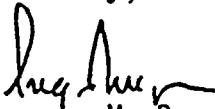Washington, D.C. 20555

Re:  Docket No. 50-275, OL-DPR-80
     Diablo Canyon Unit 1
     Licensee Event Report 1-91-017-00
     Missed Surveillances of Rod Position Indications Because of an
     Inadequate Plant Process Computer Program

Gentlemen:

Pursuant to 10 CFR 50.73(a)(2)(i)(B), PG&E is submitting the enclosed
Licensee Event Report (LER) concerning missed conditional surveillances
of Unit 1 control rod position indications. These surveillances are
required by Technical Specifications 4.1.3.1.1 and 4.1.3.2.

This event has in no way affected the health and safety of the public.

Sincerely,

Gregory M. Rueger

cc:  Ann P. Hodgdon
     John B. Martin
     Philip J. Morrill
     Howard J. Wong
     Harry Rood
     CPUC
     Diablo Distribution
     INPO

DC1-91-CE-N100

Enclosure

1006S/85K/JHA/2246

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# LICENSEE EVENT REPORT (LER)

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**TITLE (4)** MISSED SURVEILLANCES OF ROD POSITION INDICATIONS BECAUSE OF AN INADEQUATE PLANT PROCESS COMPUTER PROGRAM

| EVENT DATE (5) | | | LER NUMBER (6) | | | REPORT DATE (7) | | | OTHER FACILITIES INVOLVED (8) | |
|---|---|---|---|---|---|---|---|---|---|---|
| MON | DAY | YR | YR | SEQUENTIAL NUMBER | REVISION NUMBER | MON | DAY | YR | FACILITY NAMES | DOCKET NUMBER (S) |
| 11 | 14 | 91 | 91 | – 0 1 7 – | 0 0 | 12 | 16 | 91 | | 0 5 0 0 0 |
| | | | | | | | | | | 0 5 0 0 0 |

| OPERATING MODE (9) | 1 | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11) |
|---|---|---|
| POWER LEVEL (10) | 1 0 0 | X 10 CFR ____ 50.73(a)(2)(i)(B) _____ <br> ____ OTHER - _____ <br> (Specify in Abstract below and in text, NRC Form 366A) |

| LICENSEE CONTACT FOR THIS LER (12) | | | |
|---|---|---|---|
| MARTIN T. HUG, SENIOR REGULATORY COMPLIANCE ENGINEER | TELEPHONE NUMBER | AREA-CODE 805 | 545-4005 |

| COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORTABLE TO NPRDS | | CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORTABLE TO NPRDS |
| | | | | | | | | | | |
| | | | | | | | | | | |

| SUPPLEMENTAL REPORT EXPECTED (14) | | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
|---|---|---|---|---|---|
| \| \| YES (if yes, complete EXPECTED SUBMISSION DATE) | \| X \| NO | | | | |

**ABSTRACT (16)**

From approximately 1615 PST on November 14, 1991, to 2305 PST on November 16, 1991, conditional surveillances of the control rod positions required by Technical Specifications (TS) 4.1.3.1.1 and 4.1.3.2, including the allowed extension of TS 4.0.2, were missed. Control room operators were unaware that the rod position deviation monitor (RPDM) of the plant process computer (PPC) was inoperable.

On November 17, 1991, licensed operators completed Surveillance Test Procedure (STP) I-42, "Rod Position Deviation Monitor Functional Test," and discovered that the RPDM failed to initiate an alarm on the main annunciator panel, the PPC typewriter, and the PPC alarm video screen at the appropriate procedural step. Operations declared the RPDM inoperable and initiated four-hour conditional surveillances in accordance with TS 4.1.3.1.1 and 4.1.3.2. The four-hour surveillances were missed from approximately 1615 PST on November 14, 1991, to 2305 PST on November 16, 1991. During that time, rod positions were checked every 12 hours as required by TS when the RPDM is operable.

The immediate cause of this event was that after the PPC was shut down and restarted on November 14, the RPDM logic inhibited the alarm function because the PPC incorrectly statused the reactor trip breakers as open. The root cause of this event was that the vendor software was not designed for all transient situations which might be encountered.

To prevent recurrence, the PPC software is being revised to allow the PPC to obtain the correct sequence of event (SOE) status after computer startup transients. Training will be provided to enable operators to identify RPDM inoperability. Procedure AP C-27, "Computer Software Quality Assurance," will be revised to ensure that significant computer functions will be verified in accordance with an appropriate schedule.

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## I. Plant Conditions

Unit 1 was in Mode 1 (Power Operation) at 100% power.

## II. Description of Event

### A. Summary:

On November 14, 1991, at approximately 1615 PST, the time interval requirements specified by Technical Specification (TS) 4.1.3.1.1 and TS 4.1.3.2, including the allowed extension of TS 4.0.2, were exceeded when the rod position deviation monitor (RPDM)(MON) was rendered incapable of generating control rod position alarms following shutdown and restart of the plant process computer (PPC)(ID)(CPU).

### B. Background:

TS 4.1.3.1.1 and 4.1.3.2 require that individual rod positions be verified to be within the group demand limit and that the demand position indications agree within 12 steps of the digital rod position indications every 12 hours. Surveillance Test Procedure (STP) I-1A, "Routine Shift Checks Required By Licenses," implements these requirements. However, if the RPDM is inoperable, TS 4.1.3.1.1 and 4.1.3.2 require that these indications be verified every 4 hours on conditional surveillance forms.

The RPDM, which is a part of the PPC, automatically monitors individual control rod positions and demand positions within 12 steps and checks for agreement.

STP I-42, "Rod Position Deviation Monitor Functional Test," is performed weekly to verify that the RPDM is operating properly. The 12-step deviation limit is temporarily altered to cause out-of-tolerance conditions, which in turn causes the RPDM to actuate an alarm on the control room annunciator panel (IB)(ALM), print out an alarm message and deviation value on the PPC alarm typewriter (ID)(TPW), and indicate these messages on the alarm monitor video screen (ID)(MON). If the alarm does not function, the RPDM is declared inoperable and the conditional surveillances are initiated in accordance with TS.

### C. Event Description:

On November 10, 1991, STP I-42 was performed and the RPDM was operable. On November 14, 1991, at approximately 1115 PST, the Unit 1 PPC was shut down and restarted to make some minor vendor-supplied updates. At 1615 on the same date, the time interval requirements of TS 4.1.3.1.1 and TS 4.1.3.2, including the allowed extension of TS 4.0.2, were exceeded.

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On November 16, 1991, Operations was performing Surveillance Test Procedure (STP) I-42, "Rod Position Deviation Monitor Functional Test." At the appropriate step in the procedure, the RPDM failed to initiate an alarm on the main annunciator panel, the PPC log typewriter, or the PPC alarm video screen. Operations declared the RPDM inoperable at 2310 PST and initiated a four-hour conditional surveillance in accordance with TS 4.1.3.1.1 and TS 4.1.3.2.

On November 18, 1991, PG&E Computer Engineering (CE) discovered that when the PPC had been restarted on November 14, the PPC incorrectly statused the reactor trip breakers (JC)(BKR) and reactor trip bypass breakers (JC)(BKR) as being open and the reactor as tripped. The RPDM alarm function was then automatically inhibited as required by this status. CE entered a command for the PPC to update the reactor-trip breaker positions and the RPDM alarm function was restored at 1100 PST. The conditional surveillance was terminated.

The reactor trip breaker positions are sequence-of-event (SOE) points which were programmed to update only upon changes of state. Because the breaker positions did not change state, the incorrect status was not noted by Operations or CE until November 18, 1991, when CE reviewed the failure of STP I-42. Conditional surveillances were missed between November 14, 1991, at 1615 PST (when the RPDM alarm function became inhibited) and November 16, 1991, at 2310 (when conditional surveillances commenced).
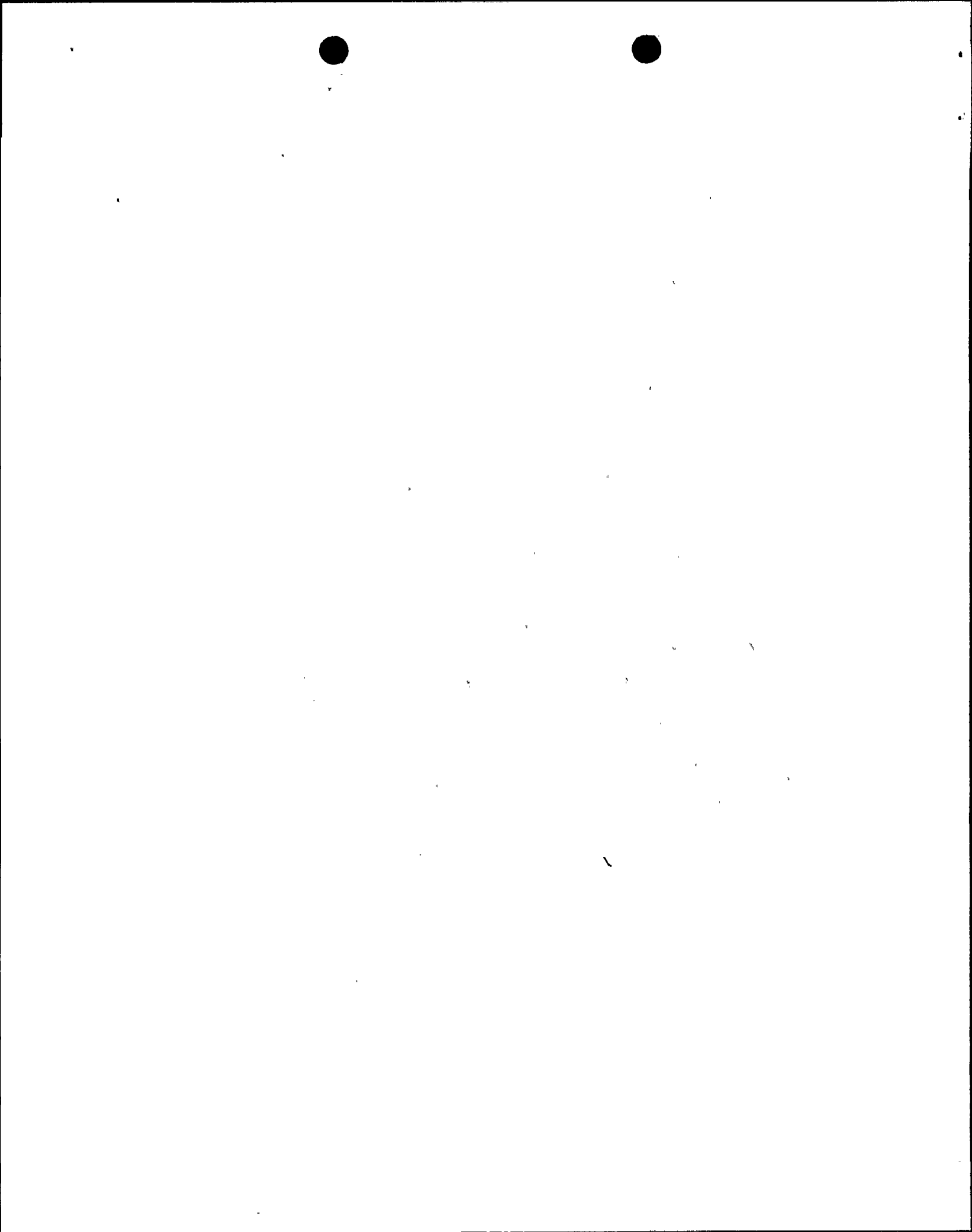
CE could not duplicate this problem when initially troubleshooting the RPDM. On November 20, 1991, however, CE shut down and restarted the PPC and a data communication bus switchover occurred. The input to the PPC once again indicated the reactor trip breaker positions incorrectly. CE determined that the problem occurs during PPC startup concurrent with data-communication bus switching. If data communication problems are encountered during startup, the PPC is designed to switch from one bus to another redundant bus. On these occasions, the reactor trip breaker position may not be statused correctly.

D.  Inoperable Structures, Components, or Systems that Contributed to the Event:

None.

E.  Dates and Approximate Times for Major Occurrences:

1.  November 14, 1991; 1615 PST:    Event date.

2.  November 16, 1991; 2310 PST:    Discovery date. The RPDM was discovered to be inoperable.

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3. November 18, 1991; 1100 PST: Operability of the RPDM alarm function was restored.

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

PG&E licensed operators performing STP I-42 identified that the RPDM did not initiate alarms on the PPC log typewriter, alarm video monitor, nor main annunciator panel when required.

H. Operators Actions:

Operations declared the RPDM inoperable and initiated four-hour conditional surveillances of control rod position indications in accordance with TS 4.1.3.1.1 and TS 4.1.3.2.

I. Safety System Responses:

None.

III. Cause of the Event

A. Immediate Cause:

After a startup, the PPC erroneously statused the reactor as tripped and the RPDM alarm function was inhibited. Operators were unaware that the RPDM alarm function was inhibited.

B. Root Cause:

The root cause of the missed surveillances was that the vendor provided a computer program that was not adequate for all data-communication bus-switching transients that might be encountered. A time delay was provided that appears to be insufficient for the various data-communication bus-switching transients that might be encountered. This resulted in reactor trip breakers positions being statused before a data-communication bus-switching transient was over. Diablo Canyon Power Plant (DCPP) has the only PPC from this computer vendor that utilizes redundant busses and the resultant possibility of data transmission bus switching transients.

C. Contributory Causes:

1. The functional specification for the PPC required that the SOE points be updated periodically. This periodic update is a contingency feature to account for any SOE point changes of state

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that might be missed. Periodic updating was not provided by the vendor as specified and not discussed during computer acceptance testing. DCPP has the first PPC from this vendor to utilize the periodic update feature of the SOE points.

2.  Software verification and validation (V&V) for this important computer function was not performed adequately by the vendor. The software program had been identified by PG&E as part of the V&V program, but not in time to prevent the event.

## IV. Analysis of the Event

The 12-hour surveillance requirements of TS 4.1.3.1.1 and 4.1.3.2 were met during the period that the RPDM was inoperable by verifying individual rod positions and verifying that the demand position indication system and the digital rod position indication system agreed within 12 steps. PG&E reviewed the PPC archive information for the period the RPDM was inoperable. Based on this review, at no time did any of the rod positions violate the TS limits. Consequently, this event did not adversely affect the health and safety of the public.

## V. Corrective Actions

A.  Immediate Corrective Actions:

1.  Operations declared the RPDM inoperable and initiated four-hour conditional surveillances in accordance with TS 4.1.3.1.1 and TS 4.1.3.2.

2.  CE conducted troubleshooting and entered a command for the PPC to manually update the reactor trip breaker positions. When the breaker positions were corrected, the RPDM automatically restored its alarm function for the annunciator, PPC typewriter, and PPC alarm video screen. The RPDM then was declared operable.

3.  The information relevant to this event, which instructed operators from both units as to the problem and interim actions to prevent recurrence, was provided in a shift foreman turnover immediately after the cause was known.

B.  Corrective Actions to Prevent Recurrence:

1.  The PPC software is being revised to add a read function for SOE points, including the reactor trip breakers and reactor trip bypass breakers every 10 seconds at all times. This will allow the PPC to obtain the correct SOE status after computer startup transients. This change has been made in Unit 1 and will be made in Unit 2 as soon as the PPC is available.
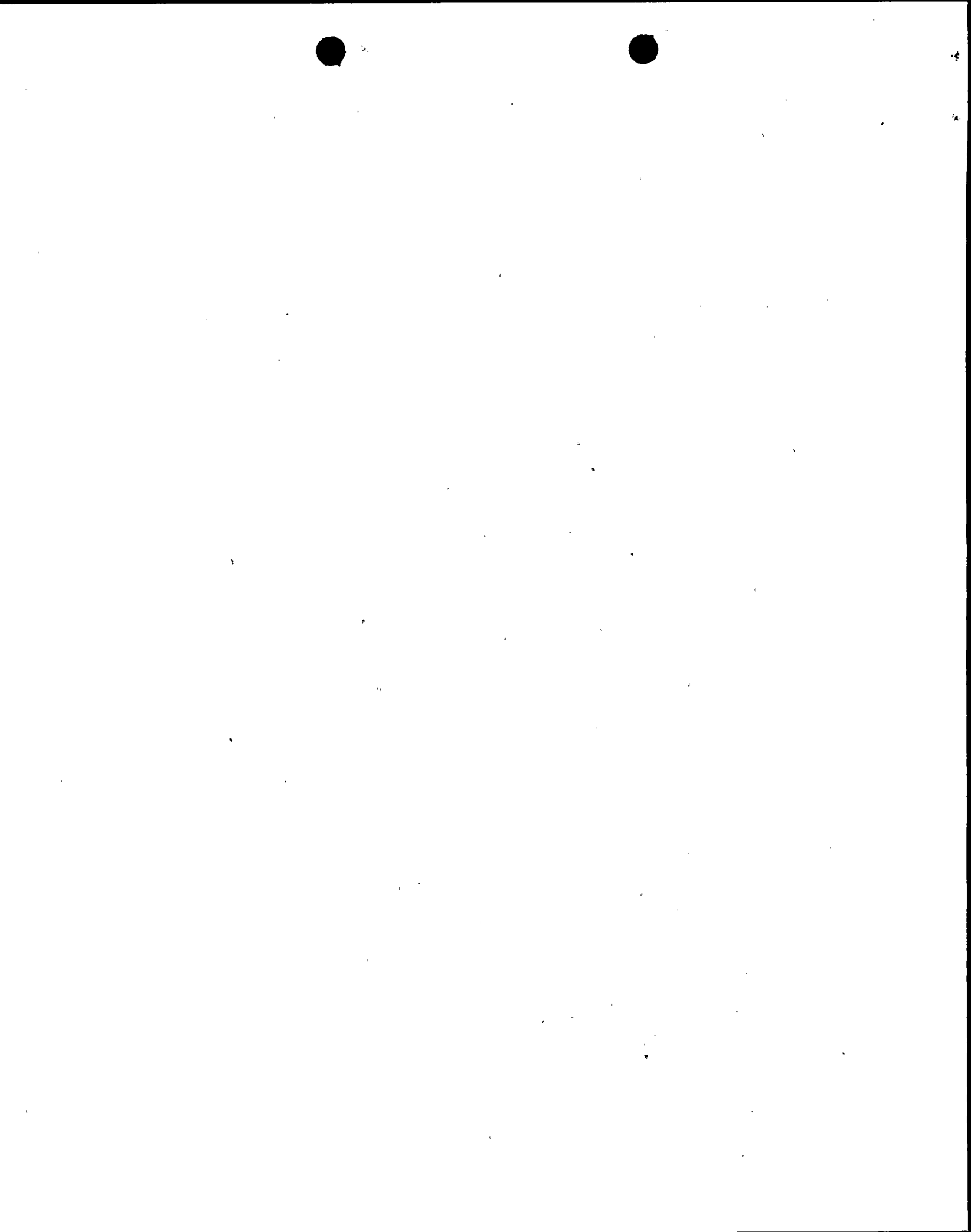
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2.  Required operator training and requalification requirements will be identified and implemented to enable operators to identify RPDM inoperability sooner than the weekly STP would allow.

3.  Procedure AP C-27, "Computer Software Quality Assurance," will be revised to ensure that significant computer functions will be verified in accordance with an appropriate schedule.

4.  This event was reviewed with the vendor to improve understanding of the program and prevent future problems.

5.  The vendor software and V&V program for important computer functions are being reviewed to determine if any other critical functions were not adequately tested.

VI.  Additional Information

A.  Failed Components:

None.

B.  Previous LERs on Similar Problems:

LER 1-90-012, "Mixed Axial Flux Difference Surveillance Due to a Computer Problems From an Unknown Cause."  The axial flux difference (AFD) monitor alarm became inoperable when the plant process computer was reinitialized by a licensed operator.  When the AFD monitor alarm is inoperable, TS 4.2.1.1.a.2 requires monitoring of the indicated AFD for each operable excore channel at least once per hour.  The inoperability was not discovered for almost four days, during which time the hourly surveillances were missed.  The root cause of the computer problem could not be determined.  The computer return-to-service procedure was revised to verify that the AFD program was operating satisfactorily after reinitialization of the computer.  The computer was replaced with the existing computer at the next refueling outage as scheduled.

The circumstances of this LER are similar.  However, the new PPC and associated software are much different than the P-250 and has different reboot requirements and automatic checking features.  Plant operators did not reboot the PPC during the recent event.

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