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Dresden Nuclear Power Station
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June 4, 1991

EDE LTR #91-324

U.S. Nuclear Regulatory Commission
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Licensee Event Report #90-008-1, Docket #050237 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.73(a)(2)(v)(D). This revised report provides an update concerning corrective actions.

E.D. Eenigenburg
Station Manager
Dresden Nuclear Power Station

EDE/ade

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
File/NRC
File/Numerical

(ZDVR/226)



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LICENSEE EVENT REPORT (LER)

Form Rev 2.0

| Facility Name (1) | Docket Number (2) | Page (3) |
|---|---|---|
| Dresden Nuclear Power Station, Unit 2 | 0 5 0 0 0 2 3 7 | 1 of 0 5 |

Title (4)

Failure of HPCI Steam Line High Flow Isolation Differential Pressure Transmitter Due to Unknown Cause

| 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) |
| 0 8 | 2 0 | 9 0 | 9 0 | 0 0 8 | 0 1 | 0 9 | 1 1 | 9 0 | NONE | 0 5 0 0 0 |
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| OPERATING MODE (9) | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11) | | | | |
|---|---|---|---|---|---|
| N | ___ 20.402(b) | ___ 20.405(c) | ___ 50.73(a)(2)(iv) | ___ 73.71(b) | |
| POWER LEVEL (10) 0 8 2 | ___ 20.405(a)(1)(i) | ___ 50.36(c)(1) | X 50.73(a)(2)(v) | ___ 73.71(c) | |
| | ___ 20.405(a)(1)(ii) | ___ 50.36(c)(2) | ___ 50.73(a)(2)(vii) | ___ Other (Specify | |
| | ___ 20.405(a)(1)(iii) | ___ 50.73(a)(2)(i) | ___ 50.73(a)(2)(viii)(A) | in Abstract | |
| | ___ 20.405(a)(1)(iv) | ___ 50.73(a)(2)(ii) | ___ 50.73(a)(2)(viii)(B) | below and in | |
| | ___ 20.405(a)(1)(v) | ___ 50.73(a)(2)(iii) | ___ 50.73(a)(2)(x) | Text) | |

LICENSEE CONTACT FOR THIS LER (12)

| Name | TELEPHONE NUMBER |
|---|---|
| | AREA CODE |
| Paul Hajovy, Technical Staff System Engineer Ext. 2788 | 8 1 5 9 4 2 -2 9 2 0 |

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 |
|---|---|---|---|---|---|---|---|---|---|
| X | B J | P D T | R 3 6 9 | 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 August 20, 1990 at 0645 hours, with Unit 2 at 82% rated core thermal power, during performance of routine surveillance testing, differential pressure transmitter (dPT) 2352, which monitors High Pressure Coolant Injection (HPCI) steam supply line flow, was found to be outside of the established tolerance limits. With only one operable instrument channel, when two are required by the Technical Specifications, the HPCI system was declared inoperable, and a seven-day Limiting Condition for Operation (LCO) was entered. The failed transmitter was replaced and the LCO terminated on August 22, 1990. The safety significance of this event was minimal, as the redundant transmitter was determined to be operable, and would have provided the required primary containment isolation signal. Further testing of the removed transmitter by the vendor was inconclusive. A similar event occurred when the same transmitter failed in 1988, due to a loss of transmitter fill oil. That event was documented in LER 88-15, docket 050237.

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2527 MWt rated core thermal power

Nuclear Tracking System (NTS) tracking code numbers are identified in the text as (XXX-XXX-XX-XXXXX)

EVENT IDENTIFICATION:

Failure of HPCI Steam Line High Flow Isolation Differential Pressure Transmitter Due to Unknown Cause.

A. CONDITIONS PRIOR TO EVENT:

Unit: 2 Event Date: August 20, 1990 Event Time: 0645 Hours

Reactor Mode: N Mode Name: Run Power Level: 82%

Reactor Coolant System (RCS) Pressure: 1002 psig

B. DESCRIPTION OF EVENT:

On August 20, 1990 at 0645 hours, with Unit 2 at 82% rated core thermal power, during performance of routine surveillance testing, High Pressure Coolant Injection (HPCI) [BJ] steam line high flow differential pressure transmitter (dPT) 2-2352 was found to be outside of the established tolerance limits. The testing was being performed in accordance with Dresden Instrument Surveillance (DIS) 2300-10, HPCI Steam Line High Flow Isolation Differential Pressure Transmitters 2352 and 2353 Calibration and Maintenance Inspection. Attempts by the Instrument Maintenance Department (IMD) to recalibrate the dPT were unsuccessful. Unit 2 Technical Specification (TS) Table 3.2.1 requires that the minimum number of operable instrument channels of this type per trip system shall be two. Completion of DIS 2300-10 demonstrated that the redundant transmitter, dPT 2-2353, was functioning properly within the accepted tolerance ranges. With only one operable instrument channel, the required action per TS Table 3.2.1 action "D", which states, "Close isolation valves in HPCI subsystem", was implemented. The Nuclear Station Operators (NSOs) proceeded to close the HPCI system motor operated valves (MOVs) 2-2301-4 and 2-2301-5. The control switch for the MOV 2-2301-4 was placed in the pull-to-lock position, thereby providing the required system isolation. The Unit 2 HPCI system was declared inoperable, placed in the Unit 2 Degraded Equipment Log, and a seven-day Limiting Condition for Operation (LCO) was entered per TS 3.5.C.2.a. The TS requires that, from and after the date that the HPCI system is made or found to be inoperable for any reason, reactor operation is permissible only during the succeeding seven days unless such system is sooner made operable, provided that during such seven days all active components of the Automatic Depressurization system (ADS) [SB], the Core Spray [BM] system, the Low Pressure Coolant Injection (LPCI) [BO] system, and the Isolation Condenser [BL] system are operable. Review of the Control Room [NA] Unit 2 Degraded Equipment Log for the affected time period showed that all these required systems were operable during this period. The required Title 10 Code of Federal Regulations Part 50.72 (b)(2)(iii)(D) notification was made at 0748 hours reporting the inoperable status of the HPCI system. Review of IMD surveillance records indicates that dPT 2-2352 was last calibrated on August 25, 1988, when the transmitter was previously replaced via Work Request (WR) 77919. This date bounds the maximum time period during which the dPT could have been out of tolerance. WR 94624 was initiated to facilitate replacement of the failed dPT. The work was performed on the transmitter in accordance with all Safety Related and Environmental Qualification (EQ) requirements. The work request was classified as an A priority to minimize the duration of the LCO.

The new dPT was successfully installed, calibrated and tested utilizing DIS 2300-10, and Dresden Instrument Procedure (DIP) 010-6, Rosemount Transmitter Model 1153 and 1154 Full Operating Range Calibration Check. Upon verification that the equipment was in satisfactory condition, the HPCI system was declared operable at 1640 hours on August 22, 1990. The seven-day LCO was terminated at that time.

No systems or components were inoperable at the time of the event which could have contributed to the event. Also, no manual or automatic safety system actuation occurred as a result of this event.

C. APPARENT CAUSE OF EVENT:

Because this event required isolation of the HPCI system, this event is reported in accordance with 10CFR50.73(a)(2)(v)(D), which requires the reporting of any event or condition that prevented the fulfillment of the safety function of a system used to mitigate the consequences of an accident.

To determine the root cause of this event the IMD prepared WR 94703 to investigate the failure mode of the transmitter. To facilitate the investigation, the IMD prepared a series of work instructions designed to provide a systematic approach for determining the root cause. These steps included:

1. As found calibration.

2. Attempt to calibrate dPT and record as left data.

3. Sensing module check.

4. If sensing module is operable, replace amplifier circuit board, attempt another calibration, recording results.

During performance of this diagnostic testing of the failed component, the transmitter was recalibrated successfully. However, after reviewing the circumstances of the failure, including original as found data and corrective actions, IMD personnel contacted Rosemount for consultation because no specific cause of the failure could be determined. Based on recommendations from the vendor, the transmitter was returned to the manufacturer for performance of a failure analysis. Prior to shipping the dPT to Rosemount for a failure analysis, it was discovered that the dPT was internally contaminated. Due to the internal contamination, the dPT could not be shipped to Rosemount for failure analysis. However, the dPT printed circuit boards were not contaminated and were shipped. Rosemount installed the printed circuit boards in a test dPT and noted satisfactory operation. Further testing revealed no deficiencies in the printed circuit boards. Since the dPT printed circuit boards were satisfactorily tested by Rosemount, it appears that the dPT failure is attributable to a failed transmitter cell. Because internal contamination precluded shipment of the transmitter cell to Rosemount for failure analysis, the exact cause of the transmitter failure cannot be determined.

A maintenance history review was performed to determine if any adverse trends are developing for the HPCI high steam flow dPTs. The Total Job Management (TJM) system revealed that no maintenance, other than routine surveillances, has been required for the Unit 2 2353 and Unit 3 2352 and 2353 transmitters. It was observed that a failure of the Unit 2 2352 transmitter occurred in 1988. The transmitter which failed during this event was installed on August 25, 1988 via WR 77919. Review of the previous 1988 test data for the previously failed dPT showed the failed transmitter was out of tolerance, and workman's notes on the test report indicated that the dPT was experiencing a slow response time. The root cause of that previous failure was determined by the manufacturer to be loss of fill oil in the transmitter. This failure mode has been previously identified as a 10 CFR Part 21 notification and is also the subject of NRC Bulletin 90-01, Loss of Fill Oil in Transmitters Manufactured by Rosemount. A loss of fill oil in the transmitter has been ruled out as a failure mode in this more recent instance since the transmitter was able to be calibrated successfully and did not exhibit slow response time during diagnostic testing.

Generic corrective actions have been previously implemented concerning Rosemount transmitters of this type at Dresden Station, including phased-in replacement with an upgraded sensing module less susceptible to fill oil leakage and specific checks during routine IMD surveillances for symptoms of this problem.

D. SAFETY ANALYSIS OF EVENT:

The dPT 2-2352 senses flow in the steam supply line to the HPCI turbine, line 2-2305-10"-B. The pressure differential is measured across taps on the 10" Schedule 80 elbow located near the reactor vessel nozzle upstream of MOV 2-2301-4. The common 3/4" instrument line from the elbow supplies process flow to both dPTs 2-2352 and 2-2353. The purpose of the dPTs is to sense steam flow, so a trip signal can be provided if flow reaches the trip setpoint. This function provides for the detection of a HPCI steam supply line break. The trip setpoint corresponds to a 300% maximum rated steam flow. Upon reaching the trip setpoint, the result is a closure signal to valves MOV 2-2301-3, 4, 5, 35, and 36.

The safety significance of the failure of the 2-2352 dPT is minimal, due to the fact that both instrument channels are not required to actuate primary containment isolation capabilities. As shown by the completion of DIS 2300-10, dPT 2-2353 was still operable and within calibration tolerances at the time of the failure of dPT 2-2352. Based on dPT 2-2353 being operable, had a HPCI steam line break occurred during the time dPT 2-2352 was inoperable, the HPCI system isolation valves would have isolated, and primary containment integrity would have been maintained.

In addition, while the HPCI system was isolated and considered inoperable, the ADS system, LPCI subsystem, Core Spray subsystem and Isolation Condenser system were all operable. Therefore, the safety significance of HPCI being inoperable is considered to be minimal.

E. CORRECTIVE ACTIONS:

Immediate corrective action was to initiate WR 94624 to facilitate replacement of the failed transmitter. The replacement transmitter utilized was of the same type, because an improved model replacement transmitter was unavailable. Subsequent testing by the IMD utilizing DIS 2300-10 and DIP 010-6 provided verifiable data supporting the operability of the dPT (237-200-90-08201).

Subsequent corrective action was to issue WR 94703 to test the failed transmitter. The failure mode of the dPT could not be determined by this on-site diagnostic testing (237-200-90-08202). Consultation with the manufacturer, Rosemount, resulted in the return of the printed circuit boards to the manufacturer for performance of a failure analysis, as described in Section C of the report (237-200-90-08203). The dPT printed circuit boards were found to operate satisfactorily and further testing revealed no deficiencies. It appears that the dPT failure is attributable to a failed transmitter cell. Because internal contamination precluded shipment of the transmitter cell to Rosemount for failure analysis, the exact cause of the transmitter cell failure cannot be determined. DIS 2300-10, Unit 2/3 HPCI Steam Line High Flow Isolation Pressure Transmitters Calibration and Maintenance Inspection, surveillance interval has been upgraded to once per operating cycle (Technical Specification requirement priority) to coincide with a pending Technical Specification Change Request which specifies a "once per operating cycle" interval (237-200-90-08204). DIS 2300-10 was previously performed on an eighteen month routine interval.

The replacement dPT (which was installed via WR 94624) is included on a Rosemount Inc. listing summarizing transmitters which are more susceptible to the loss of fill oil phenomenon, as detailed in NRC Bulletin 90-01. Therefore, the IMD replaced the newly installed transmitter again during the Unit 2 D2R12 refuel outage. The work for dPT 2-2352 was accomplished via WR 94889 (237-200-90-08205). In addition, the 2-2353 dPT was also replaced via WR 94887 during the Unit 2 D2R12 refuel outage (237-200-90-08206). The IMD also plans to replace dPT 3-2353 by the end of the Unit 3 D3R12 refueling outage. Work request 98073 was written by the IMD to facilitate this replacement (237-200-08207). Unit 3 HPCI dPT 3-2352 is not included on the Rosemount transmitter listing, and as such does not need inclusion into the replacement program. All Rosemount transmitters of this type will also be monitored for symptoms of fill oil leakage through continued regular surveillance testing, in accordance with the corrective action program outlined in NRC Bulletin 90-01; replacement of all transmitters susceptible to this failure mode is scheduled for completion by the Unit 2 D2R13 and Unit 3 D3R13 refuel outages, respectively.

F. PREVIOUS EVENTS:

A review of system records showed that a similar event has occurred previously. This event is detailed below.

| LER Number | Title |
|---|---|
| 88-15/050237 | HPCI System Isolated Upon Discovery of a Failed High Steam Flow Transmitter Due to Unknown Causes |

This event involved the previous failure of dPT 2-2352, as described in Section C of this report. The root cause of the failure was determined by the manufacturer to be loss of fill oil. A leakage path was discovered at the glass to metal seal. Reference NTS item 237-200-88-100-01.

G. COMPONENT FAILURE DATA:

| Manufacturer | Nomenclature | Model Number | Mfg. Part Number |
|---|---|---|---|
| Rosemount, Inc. | Differential Pressure Transmitter | 1153DB5PA | N/A |

An industry wide NPRDS data base search will be conducted to determine if similar events of this type have occurred at other stations in the country when the failure analysis is received from Rosemount.