

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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## FACILITY NAME (1)

Cooper Nuclear Station

## DOCKET NUMBER (2)

05000298

## PAGE (3)

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## TITLE (4)

Failure to Recognize Set Point Shift Causes Common Mode Failure of High Pressure Coolant Injection Pressure Switches

| 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 NAME                 | DOCKET NUMBER |
| 02   | 22  | 1999               | 1999              | -- 001 --          | 00  | 03              | 22  | 1999 | FACILITY NAME                 | DOCKET NUMBER |
| <b>THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)</b> |     |                    |                   |                    |   |                 |     |      |                               |               |
| OPERATING MODE (9)   | 1   | 20.2201(b)         | 20.2203(a)(2)(v)  | 50.73(a)(2)(i)     | 50.73(a)(2)(viii)                             |                 |     |      |                               |               |
| POWER LEVEL (10)   | 100 | 20.2203(a)(1)      | 20.2203(a)(3)(ii) | 50.73(a)(2)(ii)    | 50.73(a)(2)(x)                                |                 |     |      |                               |               |
|  |     | 20.2203(a)(2)(i)   | 20.2203(a)(3)(ii) | 50.73(a)(2)(iii)   | 73.71   |                 |     |      |                               |               |
|  |     | 20.2203(a)(2)(ii)  | 20.2203(a)(4)     | 50.73(a)(2)(iv)    | OTHER   |                 |     |      |                               |               |
|  |     | 20.2203(a)(2)(iii) | 50.36(c)(1)       | 50.73(a)(2)(v)     | Specify in Abstract below or in NRC Form 366A |                 |     |      |                               |               |
|  |     | 20.2203(a)(2)(iv)  | 50.36(c)(2)       | X 50.73(a)(2)(vii) |   |                 |     |      |                               |               |

## LICENSEE CONTACT FOR THIS LER (12)

| NAME                               | TELEPHONE NUMBER (Include Area Code) |
|------------------------------------|--------------------------------------|
| Roy A. Radloff, Licensing Engineer | (402) 825-3811                       |

## COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX |  | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX |
|-------|--------|-----------|--------------|--------------------|--|-------|--------|-----------|--------------|--------------------|
| D     | BJ     | PS        | S382         | N                  |  |       |        |           |              |                    |
|       |        |           |              |                    |  |       |        |           |              |                    |

## SUPPLEMENTAL REPORT EXPECTED (14)

|   |   |    |
|---|---|----|
| YES<br>(If yes, complete EXPECTED SUBMISSION DATE). | X | NO |
|---|---|----|

|                               |       |     |      |
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| EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
|-------------------------------|-------|-----|------|

## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On February 11, 1999, during the performance of the Division II functional surveillance test for High Pressure Coolant Injection (HPCI) (EIIS:BJ) Steam Line Low Pressure switches (EIIS:PS), HPCI-PS-68B and -68D were found out of allowable calibration range and below the Technical Specification (TS) allowable value. The instruments were recalibrated and returned to service. During the subsequent performance of the Division I functional/calibration test, HPCI-PS-68C was also found to be out of allowable calibration range and below the TS allowable value.

Action was taken to increase the frequency of the functional/calibration testing to ensure set point accuracy is maintained.

On February 22, 1999, during an evaluation of the performance of the pressure switches with the increased surveillance frequency, it was recognized that these failures were due to a single condition. This common mode failure is reportable under the requirements of 10CFR50.73(a)(2)(vii) as an event where a single cause or condition caused two independent trains or channels in a single system designed to control the release of radioactive material to become inoperable.

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**TEXT** (If more space is required, use additional copies of NRC Form 366A) (17)

## PLANT STATUS

Cooper Nuclear Station (CNS) was in Mode 1 at approximately 100 percent power at the time this condition was identified.

## BACKGROUND

The High Pressure Coolant Injection (HPCI) (EIIS:BJ) pressure switches (EIIS:PS) HPCI-PS-68A and C, and -68B and D provide divisionally separate two out of two logic to initiate the steam line low pressure containment isolation function.

HPCI turbine steam line low pressure is used to automatically close the two isolation valves in the HPCI turbine steam line so that steam and radioactive gases will not escape from the HPCI turbine shaft seals into the reactor building after steam pressure has decreased to such a low value that the turbine cannot be operated. The isolation set point is chosen at a pressure below that where the HPCI turbine can operate efficiently.

## EVENT DESCRIPTION

On February 11, 1999, during the performance of the Division II functional surveillance test for HPCI Steam Line Low Pressure switches, HPCI-PS-68B and -68D were found out of allowable calibration range and below the Technical Specification (TS) allowable value. The instruments were recalibrated and returned to service. During the subsequent performance of the Division I functional/calibration test, HPCI-PS-68C was also found to be out of allowable calibration range and below the TS allowable value.

On February 22, 1999, during an evaluation of the performance of the pressure switches with the increased surveillance frequency, it was recognized that these failures were due to a single condition. This common mode failure is reportable under the requirements of 10CFR50.73(a)(2)(vii) as an event where a single cause or condition caused two independent trains or channels in a single system designed to control the release of radioactive material to become inoperable.

HPCI low steam pressure isolation switches HPCI-PS-68A, B, C and D were replaced during Refueling Outage RE18 on or about October 26, 1998 to address an Environmental Qualification issue related to Kapton diaphragms in the switches. The replacement switches contained a Stainless Steel diaphragm, but were considered to be a like-for-like replacement. New set points, TS allowable values, and extended surveillance frequencies had been established for the implementation of Improved Technical Specifications (ITS) on August 15, 1998, and were incorporated into the surveillances. The implementation of ITS raised the TS allowable value and subsequently decreased the margin between the allowable value and leave alone tolerance (LAT) to 0.1 pounds per square inch (psi). In addition, the surveillance frequency in ITS changed from monthly to quarterly, which extended the time between start-up and the first calibration check, allowing more time for the pressure switches to drift.

The set point for HPCI pressure switches HPCI-PS-68B, C and D had drifted downward approximately 6 psi. The set point for HPCI pressure switch HPCI-PS-68A had drifted downward less than 1 psi, and remained within the LAT.

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Data compiled by the vendor, Static O Ring (SOR), between early 1997 and 1998 indicated that the replacement switches with the Stainless Steel diaphragms exhibited more set point drift than originally expected. This set point drift was due to the new switches developing a 'set' attributed to hysteresis. This 'set' is believed to develop as the diaphragm conforms to the face of the piston after the switch is subjected to operating pressures and temperatures. Testing confirmed that the set point drift due to hysteresis occurred within the first several weeks of service, and the majority of the drift occurred within the first month. This greater than expected drift, combined with a decreased surveillance frequency and a reduced margin to TS allowable values, resulted in the pressure switch as-found value being below the TS allowable value but above the analytical limit. The testing results support the belief that the diaphragm is deforming under pressure, and also indicates that calibration checks within approximately one month of operation will assure set point accuracy is maintained within operating limits.

## BASIS OF REPORT

This condition is reportable under the requirements of 10CFR50.73(a)(2)(vii) as an event where a single cause or condition caused two independent trains or channels in a single system designed to control the release of radioactive material to become inoperable.

## CAUSE

The cause of the HPCI pressure switch as-found set point being below TS limits was that CNS failed to recognize the need to address newly installed pressure switches developing a 'set' attributed to hysteresis in installation and calibration procedures.

A contributing cause to this event was the implementation of set point and instrument drift calculations failed to adequately address the margin to Technical Specification Limits.

## SAFETY SIGNIFICANCE

The safety significance associated with this condition is low. Although the as-found set point was below the TS limit, the as-found set point was above the CNS accident analysis analytical limit. The HPCI system was capable of performing its safety function and the steam line low pressure containment isolation function would have occurred within the accident analysis analytical limit.

A Probabilistic Safety Analysis (PSA) Risk Evaluation was performed to determine the impact that a lower than TS Limit isolation of the HPCI steam line on low Reactor Vessel pressure would have on Core Damage Frequency (CDF) and Large Early Release Frequency (LERF). The results of this analysis concluded that the low actuation set point of the HPCI low pressure isolation switch does not impact CDF. The analysis also concluded that there is no impact on LERF from this event, even with the conservative assumption that the isolation function completely failed.

## CORRECTIVE ACTION

## Immediate Actions:

The pressure switches were recalibrated and returned to service.

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An operability evaluation was performed to determine if the pressure switches would remain operable between surveillances performed on an increased frequency.

## Actions Completed:

The frequency of the functional/calibration testing was increased to weekly calibration checks to ensure set point accuracy is maintained. Based on data from the weekly calibration checks which indicated the set point accuracy was being maintained, the weekly calibration checks were discontinued on March 9, 1999.

A review of the Problem Identification Report data base was performed to determine whether set point drift concerns existed for other pressure switches. A specific review of SOR switch performance for switches which were installed during the previous refueling outage was also performed. These SOR switches had been subject to monthly rather than quarterly surveillances immediately following installation, and larger margin to TS Limits exists for these switches. Based on the results of these reviews, it was concluded that the HPCI pressure switch set point drift was an isolated case.

## On-going Actions:

A review of the applicable set point calculation will be performed to determine whether set point adjustments can be made to allow additional margin to TS allowable values. The calculation will be revised to incorporate the vendor information on set point drift. These actions will be complete by July 25, 1999.

Information on the effect of hysteresis on newly installed pressure switches will be evaluated and incorporated into necessary station documents to assure that newly installed pressure switches are calibrated approximately one month after reaching normal operating pressure by July 25, 1999. The replacement of multiple switches in HPCI system was due to a programmatic requirement. It is considered to be highly unlikely that multiple switches in a single channel that provides input to a safety function will be required prior to this action being completed. Therefore, there is a low safety significance associated with the time required to complete this action.

A program change to ensure HPCI-PS-68A, B, C and D pressure switch functional/calibration surveillance will be scheduled approximately one month after a plant outage will be completed by July 25, 1999. This scheduled surveillance will be discontinued after two planned outages, provided trend data supports discontinuing this activity.

Vendor Manual 0769 for Static O Ring pressure switches will be updated to include newly acquired information from the vendor on the behavior of these pressure switches by June 25, 1999.

## PREVIOUS EVENTS

No previous events related to common mode failure were identified.