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Dresden Nuclear Power Station
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February 4, 1992

CWS LTR #92-057

U.S. Nuclear Regulatory Commission
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Washington, D.C. 20555

Attached please find Licensee Event Report #87-012-1, Docket #050237. This revised report is being submitted to provide an update of corrective actions implemented as stated in the original Report and to provide further clarifying information.

L. F. Gerner for 2/5/92
Charles W. Schroeder
Station Manager
Dresden Nuclear Power Station

CWS/cfq

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
NRC Resident Inspector's Office
File/NRC
File/Numerical

(ZDVR/465)

IE22

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 7

Title (4) High Pressure Coolant Injection System Turbine Trips Due to Hydraulic Control System Problems

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 4	2 2	8 7	8 7	0 1 2	0 1	0 5	2 1	8 7	Dresden Unit 3	0 5 0 0 0 2 4 9

OPERATING MODE (9): N

POWER LEVEL (10): 0 0 1

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (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)	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 in Abstract below and in Text)
__ 20.405(a)(1)(iii)	__ 50.73(a)(2)(i)	__ 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
Mark Churilla, Technical Staff System Engineer Ext. 2788	AREA CODE 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 G	X X P S	S 3 4 5	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

__ Yes (If yes, complete EXPECTED SUBMISSION DATE) X NO

Expected Submission Date (15) Month | Day | Year

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

On April 22, 1987, while conducting Dresden Unit 2 startup operations at 1% rated thermal power, the Reactor Operator observed that the High Pressure Coolant Injection (HPCI) turbine reset light was not lit. A Unit shutdown to hot standby had been initiated due to a problem with the main turbine seal steam system. Investigation found the root cause of the turbine trip reset indication to be a loose hydraulic control system pressure switch contactor arm. Subsequently, while performing HPCI testing following repairs, the HPCI turbine was observed to trip while being brought up to speed. The turbine trip, which occurred while the HPCI emergency oil pump was on to support turning gear operation, was found to be caused by premature tripping of the HPCI auxiliary oil pump. Corrective actions included inspection, testing, and adjustment of the HPCI turbine hydraulic control system components. Safety significance was minimal because these problems were observed at low reactor power during startup from a refuel outage and reactor pressure did not exceed the capability of the low pressure emergency core cooling systems. A related event is recorded by LER 87-2/050249.

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:

High Pressure Coolant Injection (HPCI) [BG] System Turbine Trips Due to Hydraulic Control System Problems

A. CONDITIONS PRIOR TO EVENT:

Unit: 2 Event Date: April 22, 1987 Event Time: 2200 Hours

Reactor Mode: N Mode Name: Startup Power Level: 1%

Reactor Coolant System (RCS) Pressure: 0 psig

B. DESCRIPTION OF EVENT:

On November 29, 1986, while undergoing a scheduled shutdown for refueling, a special test of the HPCI system was performed. This test involved fast-starting the HPCI system utilizing the emergency start pushbutton. Although this testing was satisfactorily completed, further testing was planned for completion during startup from the refueling outage in order to verify proper operation of the HPCI system. It was planned to monitor eight test points by a chart recorder during this testing. These points are listed below.

1.	High Pressure Oil Header Pressure	PG-1
2.	Low Pressure Oil Header Pressure	PG-5
3.	Tripping Oil Header Pressure	PS-1
4.	Trip Solenoid Valve	SV-12
5.	Turbine Speed	Tachometer
6.	Control Valve Position	LS-7
7.	Stop Valve Position	LS-1
8.	Motor Speed Changer Position	LS-4

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

The objectives of this test program (which was scheduled to be performed at 300 PSIG reactor pressure) were to demonstrate proper HPCI operation under normal surveillance and fast starting conditions with the HPCI auxiliary oil pump (AOP) running alone or concurrent with the HPCI emergency bearing oil pump (EOP) operating to support turning gear operation. Automatic tripping of the AOP as the HPCI main shaft oil pump (MSOP) developed sufficient pressure and flow to support the HPCI turbine hydraulic control system was also to be verified. In preparation for this activity, the major components of the HPCI hydraulic control system were checked and calibrated in accordance with the vendor initial hydraulic control system lineup instructions.

However, on April 22, 1987, at 1% rated thermal power, while conducting the Unit 2 startup in accordance with Dresden General Procedure (DGP) 1-1, Normal Unit Startup, the Reactor Operator (RO) observed that the HPCI turbine trip light was not lit. This was discovered at a reactor pressure of 207 PSIG, prior to beginning the scheduled testing program. Checking the bulb and depressing the turbine trip reset button had no effect on the indication problem. A 10CFR50.72 phone notification was not made at that time regarding the HPCI system since it was not immediately recognized that this problem would affect HPCI operability. A Unit 2 shutdown to hot standby had been initiated due to a problem with the main turbine [TA] seal steam system [TC] . Work Request (WR) 64354 was initiated for troubleshooting and repair of the turbine trip reset light. While investigating the trip reset indication problem, it was discovered that a nut holding the contactor arm of pressure switch PS-1, located on the turbine hydraulic control system, had become loose. With this nut loose, the switch contact was being broken intermittently. The PS-1 switch is a HPCI turbine trip reset permissive. It was determined that when these switch contacts were not properly engaging, the HPCI turbine could not be reset. This had the potential of rendering the system inoperative. However, reactor pressure was below 90 PSIG (where HPCI operability is not required by Technical Specification 3.5.C.1) when this was discovered. A 10CFR50.72 notification was not made regarding this information due to a misinterpretation of the reporting requirements. After repairs were completed, reactor pressure was increased to 300 PSIG in order to perform the previously scheduled HPCI testing program.

On April 25, 1987 at 0515 hours, at 6% rated thermal power, with reactor pressure at 330 PSIG, while testing the HPCI system in the normal surveillance mode, the AOP tripped off while the HPCI turbine speed was increasing from 600 to 800 RPM. The AOP trip caused the HPCI turbine stop valve to drift closed because the turbine had not attained sufficient speed for the MSOP to support the turbine hydraulic control system. As a result, the HPCI turbine tripped. At this time, increasing main condenser [SG] conductivity was observed. Investigation indicated that the probable cause was a leaking condenser tube, and it was necessary to initiate an orderly shutdown in order to troubleshoot and repair the source of the condenser inleakage. Reactor pressure was again decreased to below 90 PSIG by 0813 hours. WR 64433 was initiated for troubleshooting and repairs, and a 10CFR50.72 phone notification was made. Upon investigation the Instrument Mechanics (IMs) discovered that pressure switch PS-4 (also located on the HPCI turbine hydraulic control system) was actuating at 43 PSIG and increasing rather than the normal setpoint of 52.5 PSIG. This was discovered to be the result of the technique used for calibrating the switch during preparation for the testing program. As a result of PS-4 being set improperly, the AOP had tripped prematurely. Using more accurate calibration methods, PS-4 was reset in accordance with the vendor guidelines.

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

On April 27, 1987 at 0335 hours, while continuing with the HPCI testing program at 1% rated thermal power, the AOP tripped once again with HPCI turbine speed at approximately 700 RPM. Again, the AOP trip caused the turbine stop valve to drift closed, tripping the HPCI turbine. A 10CFR50.72 phone notification was again made, and testing continued.

As a precautionary measure, hydraulic control system components MRV2, PRV2, and PRV3 were removed from the oil system for closer inspection and possible repairs. Identification of these components and their deficiencies are listed below.

MRV2- Low pressure header pressure relief valve with a vendor required setting of 55 PSIG. This relief valve also regulates the MSOP low pressure oil discharge pressure. This relief valve was found to have an increased setting of 58 PSIG but was not fully opening until a header pressure of 60 PSIG was obtained. This valve was reset to 55 PSIG and reinstalled.

PRV2- Pressure regulating valve for supply oil to the HPCI pump bearings. The vendor recommended setting is 20 PSIG. Pressure could not be properly regulated through PRV2; it was discovered to have a deteriorated diaphragm. The valve was repaired and reinstalled. After re-installation, it was determined that a minimum pressure regulating value of 30 PSIG could be obtained. Upon review, it was concluded that the increased oil pressure would have no adverse effects on the system but would only better lubricate the bearings.

PRV3- Pressure regulating valve for the discharge of the AOP. The vendor recommended setting is 50 PSIG. It was discovered that the PRV3 setting was lower than recommended due to a deteriorated diaphragm. The valve was repaired and reinstalled. The recommended setpoint of 50 PSIG was then obtained.

These conditions were not found to be contributing factors to the root cause of premature AOP tripping.

Following these repairs, HPCI was cold fast started. HPCI was started and reached 4000 RPM within 2 seconds. After evaluation of test data, PS-4 was set at 56.5 PSIG and two individual tests were performed; one with both the AOP and EOP operating and one with only the AOP operating. During both of these tests the AOP tripped off as designed at a turbine speed of 2000 RPM. It was then concluded that hydraulic system pressure spikes during the fast start testing had been the cause of the premature AOP tripping. After further review of the testing data, it was decided to increase the PS-4 setpoint to 60 PSIG in order to prevent spurious AOP tripping. Following this setpoint change, the normal HPCI monthly surveillance was performed on April 29, 1987. This surveillance was performed once with both the AOP and EOP operating, and once with only the AOP operating. On May 1, 1987, at 0100 hours, Dresden Operating Surveillance (DOS) 2300-7, HPCI Pump Test and Fast Initiation Test, was performed. This test required the HPCI system to be started once with both the AOP and EOP operating, and once with only the AOP operating. All these tests were satisfactory, and the HPCI system was declared operable.

TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

C. APPARENT CAUSE OF EVENT:

This report is submitted in accordance with 10CFR50.73(a)(2)(v)(d), which requires the reporting of any condition which could have prevented the fulfillment of a system designed to mitigate the consequences of an accident.

In the design of the HPCI hydraulic control system, pressure switch PS-4 is utilized to trip the AOP when the turbine reaches 2000 RPM, at which speed the MSOP can support the hydraulic control system. It was determined during testing that in the extremely rare condition where the EOP and the AOP are both operating during system initiation, oil pressure buildup in the low pressure oil header could, depending on the sepoint of PS-4 and the turbine acceleration rate, cause spurious tripping of the AOP prior to the MSOP being able to develop sufficient pressure to maintain the HPCI turbine stop and control valves open. As shown on Figure 1, this was due to differing dynamic conditions in the low pressure depending on wether or not the AOP is operating concurrently with the EOP. With both the AOP and EOP operating, there was essentially no flow in the low pressure oil header because the check valve between the low pressure and bearing oil headers is fully seated. Any pressure disturbance, such as that produced as the MSOP is developing output pressure as the turbine is accelerated, had a tendency to trip the AOP prematurely. However, with the only the AOP operating, the AOP delivers substantial flow to the bearing oil header, and additional flow from the MSOP is merely dumped to the bearing oil header with no significant pressure disturbance resulting in the low pressure header. This initial testing program was unable to develop a PS-4 setpoint which would provide for automatic AOP trip at 2000 RPM under all combinations of pumps. However, satisfactory HPCI operation was demonstrated without the automatic AOP trip feature, and interim procedural actions were implemented concerning securing the AOP manually to prevent undue load on the 250 V battery [EJ] (which supplies the AOP) pending further investigation and testing. Further investigation concluded in September, 1991, when an improved PS-4 setpoint was demonstrated to provide the automatic AOP trip feature. However, as described in Section E of this report, the PS-4 setpoints will be readjusted to prevent the automatic trip feature pending further modifications to provide more margin to the latest revision of the 250 V battery load profiles.

D. SAFETY ANALYSIS OF EVENT:

These problems were observed during startup of the plant from an extended refuel outage. When the RO noted that the HPCI turbine reset lamp was not illuminated, the plant was promptly returned to less than 90 PSIG reactor pressure, where HPCI system operability was not required. Reactor pressure was above the operability requirement for a relatively short period of 7 hours and 8 minutes. During this period, reactor pressure achieved a maximum of 207 PSIG, which is within the capability of the low pressure emergency core cooling systems (Low Pressure Coolant Injection [BO] and Core Spray [BM]). The Isolation Condenser [BO] and Automatic Depressurization [SB] were also available during this period.

The difficulties observed with premature tripping of the AOP were of minimal safety significance, since these events would have had no affect on HPCI system operability under automatic initiation or emergency start scenarios unless the EOP was operating. The EOP is normally operated only to support turning gear operation while performing operability surveillances, or to prevent HPCI turbine bearing damage during coastdown if the AOP fails. It is not required for automatic or emergency HPCI initiation. Interim procedural actions concerning Operator action to secure the AOP to prevent undue load on the 250 V battery system were also implemented.

E. CORRECTIVE ACTIONS:

As described above, initial testing resulted in a PS-4 setpoint which insured satisfactory operation under all pump combinations, but required Operator action to subsequently secure the AOP when its operation was no longer required. The HPCI system was then tested a total of six times during the two month period following this event in order to insure continued satisfactory performance. The PS-4 setpoint adjustment was also implemented on Dresden Unit 2, and a routine preventative maintenance program for the HPCI oil system components was established. Proper interpretation of the 10CFR50.72 requirements concerning this event were also reviewed with the personnel involved.

Subsequently, various tests have been performed to adjust the AOP setpoint in order to provide for automatic AOP trip as the HPCI turbine accelerates. General Electric (GE) recommended a revised setpoint for the AOP, which was implemented for Unit 3 on September 4, 1991. Following implementation of this setpoint change on Unit 3, the HPCI System was tested using Dresden Operating Surveillance (DOS) 2300-3, HPCI System Operability Verification, on September 6, 1991. The test proved to be successful in that the AOP tripped at approximately 2500 RPM during both the fast and controlled start up. However, during the current Unit 3 D3R12 refuel outage, a concern developed regarding the 250V battery load profiles (refer to LER 91-13/050249). Therefore, the Unit 3 AOP trip setpoint will be readjusted to prevent the automatic AOP tripping function prior to startup from the refuel outage. Additional modifications have been proposed to install separate 250 VDC batteries for the Unit 2 and Unit 3 main turbine emergency bearing oil pumps in order to provide more margin to the battery profile requirements. The current schedule for installation of these additional modifications is the fourth quarter of 1993 (249-200-91-08404). Upon completion of these modifications, automatic tripping of the HPCI turbine AOPs will be implemented (249-200-87-03901).

F. PREVIOUS OCCURENCES:

LER/Docket Numbers	Title
87-2/050249	Unit 3 HPCI System Inoperative Due to Oil Pressure Regulation Valve Failure
	A PRV3 lower piston connection was repaired and adjustments to PS-4 were performed.

G. COMPONENT FAILURE DATA:

Manufacturer	Nomenclature	Model Number	Mfg. Part Number
Square D	PS-1	9013	ASG11-F

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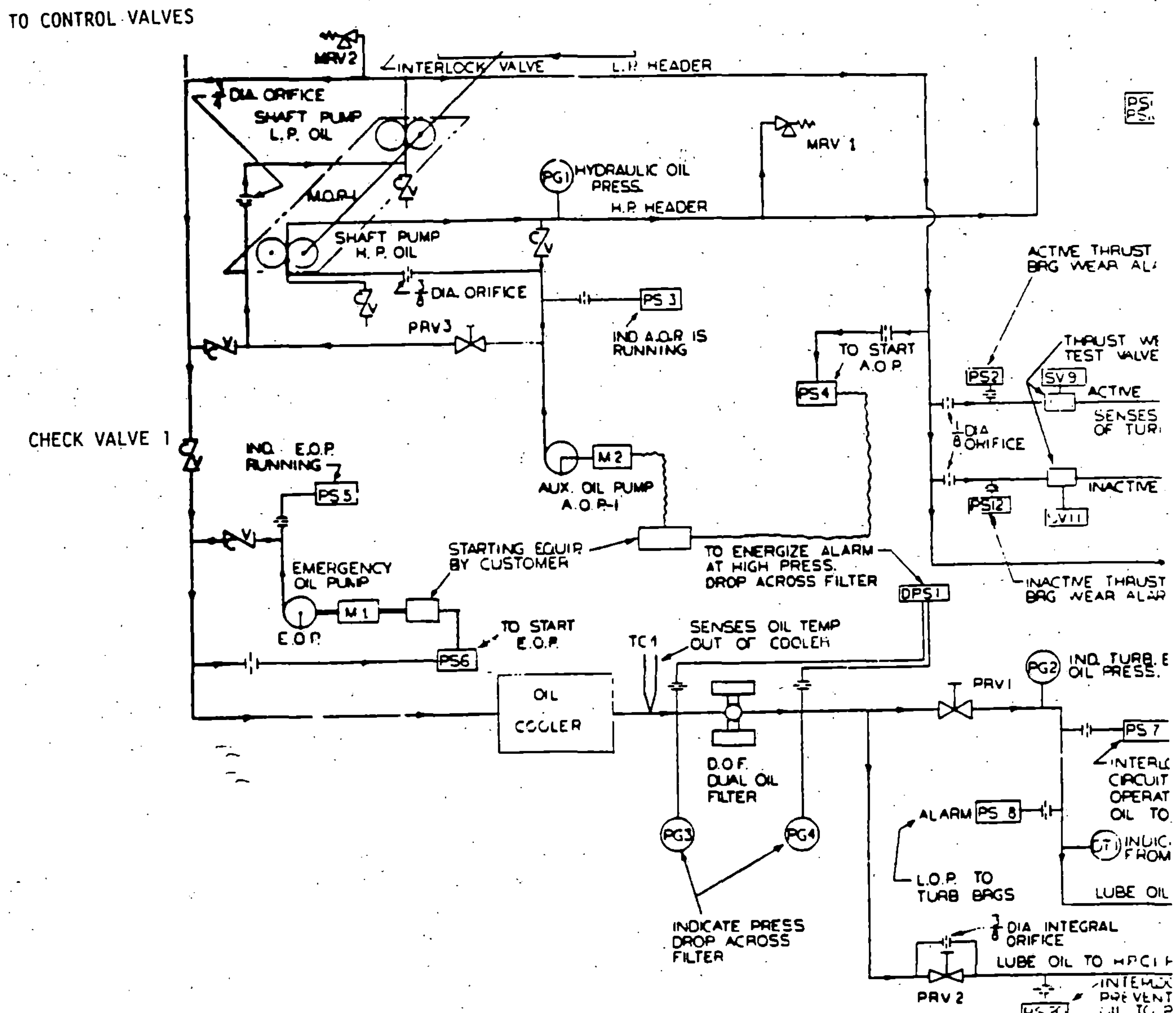

FIGURE 1