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Dresden Nuclear Power Station
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February 16, 1993

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Licensee Event Report #93-002, Docket #050249 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.73(a)(2)(ii).

for 2-16-93

Charles W. Schroeder
Station Manager
Dresden Station

CWS/slb

Enclosure

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

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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 3	0 5 0 0 0 2 4 9	1 of 0 6

Title (4) Control Valve Fast Closure Half-Scram Pressure Switches Out-of Calibration Due to Setpoint Drift

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)
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0 1	1 7	9 3	9 3	0 0 2	0 0	0 2	0 5	9 3		0 5 0 0 0

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 0 0	20.405(a)(1)(i)	50.36(c)(1)	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)	X 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
	AREA CODE
Jerry Larson, Technical Staff Electrical Engineer Ext. 2816	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	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
X	T G	P S	P 0 7 0	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 Unit 3, while performing Dresden Instrument Surveillance (DIS) 5600-3, Generator Load Rejection Control Valve Fast Acting Solenoid Valve Pressure Switch Calibration, three out of four Main Turbine Control Valve (TCV) Fast Acting Solenoid Valve (FASV) Pressure Switches (PS) were found to actuate below the minimum setpoint limit per Technical Specification Table 3.1.1., Reactor Protection System Instrumentation Requirements. These pressure switches provide a Load Rejection Scram signal to the RPS circuitry upon initiation of fast closure of the TCV. This scram signal is provided in anticipation of the rapid increase in pressure and neutron flux resulting from fast closure of the TCV due to a load rejection. Previous testing has concluded that instrument drift over pressure switch settings in the range of 120 - 590 psig. has negligible significance relative to instrument response time to actuate a Reactor Protection System (RPS) trip. All three of the switches were replaced, all were calibrated, and left to trip within the required setpoint limits.

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:

Control Valve Fast Closure Half-Scram Pressure Switches Out of Calibration Due to Setpoint Drift

A. CONDITIONS PRIOR TO EVENT:

Unit: 3 Event Date: January 17, 1993 Event Time: 1815 Hours

Reactor Mode: N Mode Name: Shutdown Power Level: 0%

Reactor Coolant System (RCS) Pressure: 0 psig

B. DESCRIPTION OF EVENT:

On January 17, 1993, at 1815 hours, with Unit 3 in the Shutdown mode at 0% rated core thermal power, the Instrument Maintenance Department (IMD) was performing Dresden Instrument Surveillance (DIS) 5600-03, Generator [TB] Load Rejection Control Valve [TA] Fast Acting Solenoid Valve (FASV) [TG] Pressure Switch (PS) [JE] Calibration, when three out of four turbine control valve (TCV) pressure switches were found to actuate below the minimum setpoint limit per Technical Specification Table 3.1.1, Reactor Protection System Instrumentation Requirements. The as-found and as-left trip setpoints for the four CV pressure switches are shown below. The previous as-found and as-left settings are also given (from a calibration performed on October 18, 1992).

Switch	TCV#	Previous As-found (10/18/92)	Previous As-left (10/18/92)	As-Found (01/17/93)	As-left (01/17/93)
PS3-5641-66	1	564 psig	586 psig	64 psig	590 psig*
PS3-5641-67	3	576 psig	576 psig	555 psig	588 psig
PS3-5641-68	2	565 psig	596 psig	452 psig	591 psig*
PS3-5641-69	4	494 psig	589 psig	310 psig	588 psig*

*As-found pressure switches 3-5641-66 and 3-5641-69 were not able to be calibrated to the desired setpoint of 590 +/- 20 psig and they were replaced under Work Requests (WR) 15564 and 15565, respectively. PS3-5641-68 was able to be calibrated to within the desired tolerance, however, based upon the as-found trip setpoint of 565 psig on October 18, 1992, and the as-found setpoint of 452 psig on January 17, 1993, it was decided to replace PS3-5641-68 under WR 15572 due to the possibility that the noted decreasing as-found setpoint trend was indicative of a degraded condition. All four pressure switches were calibrated to the desired tolerance and repeatability was verified.

The original FASV design on the TCV utilized a limit switch to initiate a Reactor Protection System (RPS) [JE] trip signal upon fast closure of the TCV. The present FASVs and pressure switches were installed on Unit 2 in December, 1984, and on Unit 3 in February, 1984 (reference modifications M12-2(3)-81-25) in response to a recommendation in General Electric Co. (GE) Technical Information Letter (TIL) 848. This design replaced the limit switches with the existing pressure switches. The FASV initiates a TCV rapid closure on a turbine-generator load reject signal. The pressure switch senses Electro-Hydraulic Control (EHC) [TG] fluid pressure at each valve and initiates the trip signal to RPS on a decreasing nominal pressure of 590 psig (normal EHC pressure is 1600 psig).

In mid-December, 1990, the Nuclear Licensing Department contacted Dresden Station concerning a modification at Quad-Cities Nuclear Station that was changing the design of the TCV FASV. The Licensing Department communicated to Dresden Station that Quad-Cities Station had determined that a Technical Specification change would be required to specify the existance of the new pressure switches instead of limit switches, and to appropriately specify setpoint and surveillance (calibration) requirements. At this time, it was determined that periodic calibration of the pressure switches was not being performed.

Subsequent to this notification, Technical Specification amendments for Units 2 and 3 were prepared, submitted, and have now been incorporated. The descriptions of the existing FASV pressure switches in UFSAR Sections 7.7.1 and 11.2.3 have been enhanced and submitted as part of the annual UFSAR update. In addition, the IMD developed DIS 5600-03 to calibrate these switches during each refueling outage.

C. APPARENT CAUSE OF EVENT:

The cause of this event is attributed to setpoint drift. Calibration records show that these pressure switches were calibrated three months prior to this event. PS operability is demonstrated each month when each TCV is cycled closed and the FASV PS de-energizes the appropriate RPS channel.

The current design pressure switches have two microswitches enclosed in the main switch housing, with only one of the microswitches being used to initiate the scram signal through an auxiliary relay. A plunger is seated inside the housing of the PS for actuating the microswitch. When a turbine-generator power/load unbalance (load reject) occurs, the TCVs are closed by energizing the FASV. Energization of the FASV allows the EHC oil to drain through the disk dump valve, which causes the TCV to fast-close. The PS detects the drop in EHC oil pressure and gives a half-scram signal to RPS. At normal operating pressure, the plunger is raised, thus engaging and actuating the microswitch. Upon decreasing oil pressure, the plunger is not able to maintain contact with the microswitch and the switch opens and initiates a trip signal to RPS. Inspection of the removed switches revealed a wear pattern on the face of the plunger where contact is made with the microswitch that is indicative of vibration. It is believed that vibration of the TCV and PS may contribute to drift of the pressure setpoint.

D. SAFETY ANALYSIS OF EVENT:

A loss of generator load will cause the turbine-generator to speed up. The turbine speed governor will react by closing the turbine control valves. The reduction of steam flow will cause the reactor vessel pressure to rise, and the pressure regulator will open the turbine bypass valves in an attempt to maintain constant reactor pressure (analysis of the load reject scram considers failure of the bypass valves to open). If the load reduction is sudden and of a greater magnitude than bypass valve capacity, the reactor pressure will rise, resulting in compression of the steam voids and a resulting positive reactivity effect, thereby increasing heat generation and resulting in further pressure increases. The purpose of the Generator Load Reject Scram is to anticipate this rapid increase in pressure, neutron flux, and fuel cladding surface heat flux resulting from the fast closure of the TCVs.

The FASV and the associated PS are located on the body of the TCV near the main hydraulic cylinder. The PS detects TCV closing through a drop in EHC oil pressure and gives a half-scram to the RPS. Logic for this scram is designed such that if TCV #1 (PS3-5641-66) or #2 (PS3-5641-68) were to fast-close, a half-scram will occur on RPS Channel "A". If TCV #3 (PS3-5641-67) or #4 (PS3-5641-69) were to fast-close, a half-scram will occur on Channel "B". A half-scram signal on both channels will result in a full reactor scram.

The as-found FASV PS setpoints were below the 590 psig desired setpoint; however, a pressure switch in each RPS channel had an as-found setting which exceeded 400 psig. General Electric has defined the 400 psig limit (reference GE calculation EDE-40-1190 dated November 16, 1990) as the setpoint which ensures that the pressure switch will generate an RPS trip signal within a 30 millisecond response time after start of TCV fast closure. This response time is consistent with the pressure switch response time assumed in the current turbine generator load rejection without bypass event analysis used in the current fuel cycle reload analyses. In December, 1989, this response time was verified on Unit 2 by timing the period from initiation of TCV closure to the time that a trip signal was generated by the pressure switch (reference Special Procedure (SP) 89-12-129).

Furthermore, SP 91-1-4 was performed in January 16, 1991. This test repeated SP 89-12-129, with the only exception being that the pressure switch setpoints were deliberately set down to 120 psig. The test concluded that instrument drift has negligible significance relative to instrument response time to operate an RPS trip over pressure switch settings in the range of 120-590 psig. The GE Turbine Department reviewed the test and concluded that the response time results obtained during the test procedure would bound the response times expected during actual normal plant operation.

In summary, the as-found PS trip settings of at least one switch in each RPS channel greater than 400 psig provides reasonable assurance that the FASV pressure switches would have performed their intended function and resulted in a full RPS Scram signal in the event of an actual Generator Load-Reject situation. In addition, PS operability is demonstrated monthly when each TCV is cycled closed and the FASV PS de-energizes the appropriate RPS channel. For these reasons, the safety-significance of this event is minimal.

E. CORRECTIVE ACTIONS:

Pressure switches 3-5641-66, 3-5641-68 and 3-5641-69 were replaced under WR 15564, 15572 and 15565, respectively. All four pressure switches were calibrated and verified for trip setpoint repeatability.

Due to previous problems with these pressure switches, the Nuclear Engineering Department (NED) evaluated the switch application under Action Item Record (AIR) 91-13 for possible modification or replacement. A similar switch has been ordered to replace the existing switches during the current refueling outage on Unit 2, D2R13, under WR 10091. This new switch is a like-for-like replacement for the present switch, with the exception that each main switch housing contains only one microswitch instead of two (only one microswitch is used, the other is spare in the present switch). This switch was unavailable at the time of the original installation. No other suitable replacement has been found. The intent of the substitution of the newer switch design is to change the mass of the switch and thus the vibration response in an attempt to reduce the susceptibility to setpoint drift.

The susceptibility to instrument setpoint drift of these pressure switches in this application has been identified as a recurring equipment problem and is also currently being investigated under the Dresden Equipment Reliability Issues Database (ERID). Due to the lack of calibration data prior to 1990, a replacement or preventive maintenance (PM) program schedule has not been determined for these switches. The performance of the new single microswitch pressure switches will be tracked under the ERID program and a PM or replacement schedule will be determined when the results are evaluated. As a preventive measure, the Instrument Maintenance Department will calibrate these switches per DIS 5600-03 during each cold shutdown >72 hours in duration after any cummulative 90 days of operation.

F. PREVIOUS OCCURRENCES:

LER/Docket Numbers	Title
12-3-92-047	Control Valve Fast Closure Half Scram Pressure Switch Out of Calibration Due to Setpoint Drift While performing DIS 5600-03, it was discovered that PS 3-5641-67 failed to actuate at the required setpoint. The cause of the event was attributed to instrument setpoint drift. The switch was calibrated and subsequently found to trip within the desired setpoint limits.
12-2-92-052	Failure to Receive a Half Scram During a Load Reject Test Due to Pressure Switch Failure While performing Dreden Operating Surveillance (DOS) 0500-09, Turbine Control Valve Fast Closure Scram Circuit Functional Test, TCV #2 initiated a Channel "B" Scram; however, computer point alarm T068, Turbine Generator Load Reject was not received. The root cause of the failure is attributed to mechanical malfunctioning of the internal microswitch of PS2-5641-67 due to aging. The top portion (cover with microswitches) of the pressure switch housing was replaced and surveillance testing was satisfactorily completed.
12-2-91-095	Control Valve Fast Acting Solenoid Pressure Switches Out of Calibration Due to Setpoint Drift While the IMD was performing Turbine Control Valve FASV Pressure Switch calibrations, pressure switches 2-5641-67 and 2-5641-68 failed to actuate at their decreasing setpoint. The cause of this event was attributed to setpoint drift. These pressure switches were calibrated and verified to trip within the required setpoint limits.
12-2-90-159	Control Valve Fast Closure Half Scram Pressure Switches Out of Calibration Due to Setpoint Drift While performing Control Valve Fast Closure Half Scram Pressure Switch Calibration per WR 97114, IMD determined that the pressure switches on the TCVs were out of calibration. The pressure switches were calibrated and verified to trip within the required setpoint limits.

G. COMPONENT FAILURE DATA:

Manufacturer	Nomenclature	Model Number	Mfg. Part Number
Barksdale	Pressure Switch	TC9622-3	********

An industry-wide NPRDS search revealed a total of 16 failures involving this type of pressure switch. Of these failures, 5 were due to instrument setpoint drift, while the remaining 11 were attributed to wear or aging of the switch.