LICENSEE EVENT REPORT (LER)

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 4

Title (4) Reactor Scram on High Flux Resulting From Turbine Control Valve Closure Due to Personnel Error

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)
									Dresden Unit 2	0 5 0 0 0 2 3 7
0 9	1 9	8 5	8 5	0 1 8	0 2	0 6	2 0	8 8	N/A	0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)			
POWER LEVEL (10) 0 8 3		___ 20.402(b)	___ 20.405(c)	X 50.73(a)(2)(iv)	___ 73.71(b)
		___ 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)	___ 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
Robert J. Whalen, Mechanical Systems Group Leader (X-462)	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
B	A A	X X X X	X X X X	N					
X	J A	X I S	G 0 8 0	N					

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)

While operating at 83% power, Unit 3 tripped from an Average Power Range Monitor (APRM) high-high level scram. The trip resulted from a pressure/flux transient which was caused by closure of the turbine control valves. The cause of this reactor scram was personnel error. An Instrument Maintenance Mechanic accidentally moved a circuit card in the electro hydraulic control system circuitry while removing a test lead. This disrupted the maximum combined flow portion of the circuitry resulting in closure of the turbine control valves.

During the scram recovery, difficulty was encountered in resetting Reactor Protection System (RPS) Channel B. During the scram recovery, the Scram Discharge Volume (SDV) vent and drain valves opened while the Control Rod Drive (CRD) scram inlet and outlet valves on every CRD were open. This resulted in the release of reactor vessel water inventory past the CRD seals into the reactor building.

To prevent recurrence of an event of this type, several changes will be made to the Unit 2/3 scram procedure, DGP 2-3, to ensure that the SDV vent and drain valves remain closed until all scram inlet and outlet valves are closed. Following further investigation into the root cause of this event, larger air regulators will also be installed on the Unit 2 and 3 SDV air header systems in order to provide improved air supply. This is the first reportable occurrence of its type at Dresden Station.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT

While operating at 83% power, Unit 3 tripped from an Average Power Range Monitor (APRM) high-high level scram. The trip resulted from a pressure/flux transient which was caused by closure of the turbine control valves. During the scram recovery, difficulty was encountered in resetting Reactor Protection System (RPS) Channel B. Also during the recovery, the Scram Discharge Volume (SDV) vent and drain valves opened while the Control Rod Drive (CRD) scram inlet and outlet valves on every CRD were open. This resulted in the release of reactor vessel water inventory past the CRD seals into the Reactor Building.

The cause of the reactor scram was personnel error. Several days before the Unit 3 scram had occurred, the Instrument Maintenance (IM) Department had installed a multi-point recorder to various points in the Electro-Hydraulic Control (EHC) system circuitry for test purposes. Following the tests, while removing the recorder leads from the EHC control circuit, an IM Mechanic accidentally moved a circuit card, momentarily disrupting the maximum combined flow portion of the EHC circuit. This caused a zero maximum combined flow output voltage signal resulting in closure of all turbine control valves and bypass valves. The closure of the control valves caused a reactor pressure spike, resulting in a high neutron flux and subsequent APRM high-high level scram.

The difficulty in resetting the RPS Channel B has been attributed to stuck contacts on the reactor mode switch. When the Operator moved the mode switch to the "refuel" position per the scram procedure DGP 2-3, it is suspected that mode switch contacts were left between the "shutdown" and "refuel" positions. This generated a reactor mode switch scram signal on the B RPS channel which could not be reset. Approximately one hour and sixteen minutes after the scram, the Unit 3 Operating Engineer suspected mode switch contacts were not made up and exercized the mode switch to the "refuel" position. When the mode switch was fully placed in the "refuel" position, the Reactor Operator was able to fully reset the reactor scram signal.

The steam release to the Reactor Building resulted from a low SDV air header pressure. During the event, only partial SDV air header pressure was restored after the Reactor Operator reset the A RPS channel. While the degraded condition on the air header existed, the maximum header air pressure was only 38 psig. This pressure was sufficient to automatically open the SDV vent and drain valves as they open at approximately 8 to 15 psig air pressure. The scram inlet and outlet valves did not close as they are designed to close at approximately 42 psig air pressure. This valve alignment (SDV vent and drain valves open in conjunction with the scram inlet and outlet valves) provided a leakage path in which primary reactor coolant passed through the CRD drive seals into the SDV header and into the Reactor Building through the SDV vents and drains. The SDV vent lines are routed to open Reactor Building atmosphere in the Reactor Water Cleanup (RWCU) pump room and the Shutdown Cooling (SDC) heat exchanger room. The SDV drain valves are routed to the Reactor Building Equipment Drain Tank (RBEDT).

An investigation of the degraded SDV air header pressure was conducted and the following items were performed:

1. The RPS buses were observed to be providing proper system voltage and current to the scram pilot valves. The Electrical Maintenance Department tested scram pilot valves locally by wiring up an ammeter and voltmeter across the valves and measured current and voltage. This test verified that the current and voltage provided to the scram pilot valves was adequate to maintain proper system operation. No abnormalities were observed during the measurement of voltage and current to the scram pilot valves.

2. The Technical Staff performed an extensive "walkdown" of all the air header piping. This physical examination of the piping has identified no significant leaks. Furthermore, the Operating Department also conducted a walkdown of a majority of this piping and again found no significant leakage. Therefore, leakage from the air header piping was eliminated as the cause of the air header system failure.

3. The system pressure failure can always be repeated when the header is depressurized and a half scram condition exists only on RPS Channel B. If the test is repeated with the A RPS channel tripped, the air header pressure will return to normal. The test was repeated numerous times in which a full scram was initiated and only Channel A was reset. When this scenario exists, air header pressure remains below the normal level. Yet, when Channel B is reset, air header pressure promptly returns to normal. No deviation from this scenario was observed throughout the testing period.

4. During a half scram condition on the B RPS channel, a total leakage of 25 scfm was measured from all of the scram exhaust ports combined. This test was performed by installing a flowmeter on the exhaust port of each HCU and measuring leakage from every port. Every scram exhaust port was tested and 118 of the 177 leaked measurably. The combined leakage was calculated to be approximately 25 scfm.

5. Investigation of the backup scram valves (0302-19A and 19B) and scram dump valves (0302-20A and 20B) have shown that they appear to operate properly and that they do not restrict air flow to the header. This was verified by installing a mechanical jumper bypassing the backup scram valves and scram dump valves. The scram scenario was repeated. The unit was fully scrammed and the A channel was reset with the jumper valved in. Again, the header pressure stabilized well below its normal level. The test was repeated and again it was determined that the dump valves and backup scram valves had an insignificant effect on the low header pressure. The B channel was reset and pressure stabilized at its normal level.

According to the manufacturer of the scram pilot solenoid valves, Asco, a minimum pressure of 10 psi across the valve is required to seat the valve's exhaust diaphragm once the solenoid is energized. If this minimum supply pressure is not met, the valve will not isolate the air header supply and leakage will occur. General Electric has also suggested that under low SDV supply air header pressure conditions, it is possible that a small leakage path can exist through the exhaust diaphragms of both scram pilot solenoid valves when the scram pilot closest to the scram inlet and outlet valves is energized (A RPS channel reset) and the scram pilot is de-energized (B RPS). Based on this information, 20 sets of scram pilot solenoid valves (117 and 118) exhibiting the worst exhaust leakage were rebuilt by the Electrical Maintenance Department. All valves were bench tested before and after they were rebuilt. All required significantly high pressure to close before they were rebuilt than after. In some cases, dried out O-rings were found on the coil seal allowing leakage past the exhaust port. In other cases, worn diaphragms were found to cause leakage. After all 20 sets had been replaced, the half scram condition (A RPS channel energized, B RPS channel de-energized) was repeated. The SDV air header pressure still remained low.

TEXT

In reviewing all tests and observations performed on the SDV air header system it is believed that the low air header pressure can possibly be attributed to one or any combination of the following items:

1. Leakage through the pilot valve exhaust ports due to failure of the Asco solenoid valves to reseat and close at low pressure.

2. Leakage through the pilot valve exhaust ports due to wear and hardening of the Asco solenoid coil O-ring.

3. Leakage through the pilot valve exhaust ports due to aging and wear of the solenoid exhaust diaphragm.

To prevent the recurrence of an event of this type, several changes were made to the Unit 2/3 scram procedure DGP 2-3. First, the Reactor Operator is directed to place the mode switch to the "shutdown" position after any scram occurs. This will help prevent any future mispositions of the mode switch. Also, the Reactor Operator is directed to close the SDV vent and drain valves before resetting any scram. This will prevent any possible steam releases in the future if the scram air header pressure were to be degraded. Finally, if the SDV vent and drain valves will not close during any half scram condition, following a full reactor scram reset, the Reactor Operator is instructed to manually scram the reset RPS channel. In addition to these changes made to DGP 2-3, the reactor mode switch contacts were inspected by the Electrical Maintenance Department. No problems were discovered. The Unit 2 reactor mode switch was subsequently replaced under Work Request No. 51383 on May 23, 1986; the Unit 3 reactor mode switch was replaced on June 23, 1986 under Work Request No. 51393. The new reactor mode switches are General Electric type SB-9.

Dresden Station believes that its extensive testing and changes made to the scram procedure DGP 2-3 will ensure safe and effective plant operations. Therefore, no further actions are deemed necessary. Investigation of plant records has shown that a similar event occurred on Unit 2 on April 29, 1972. The unit was in cold shutdown at the time of the event and no primary containment inventory had been lost. The event was not reportable. The cause of the Unit 2 event was attributed to the same items as this Licensee Event Report.

Further investigation into this event was performed with the assistance of the Station Nuclear Engineering Department (SNED). As a result, the following additional long term corrective actions are being implemented.

1. In order to upgrade the SDV air header system, larger air regulators will be installed on the Unit 2 and 3 SDV air headers. These larger regulators will provide greater flow capacity to the scram pilot solenoid valves. This work was planned for the upcoming 1988 refueling outages. However, due to difficulties in completion of engineering work and parts procurement, this work will not be completed during the Unit 3 1988 refueling outage currently in progress. The Unit 3 SDV Air Header Regulator Replacement will be completed during the next Unit 3 refueling outage. Completion of this work on Dresden Unit 2 remains scheduled for completion during the upcoming fall 1988 refueling outage.

2. Following installation of the new SDV air header regulators, a special test will be performed with the reactor in cold shutdown in order to confirm satisfactory operation.

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June 20, 1988

EDE LTR #88-463

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Licensee Event Report #85-018-2, Docket #050249 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.73(a)(2)(iv). This revised report is being submitted to provide a revised scheduled completion date for Unit 3 scram discharge volume air header regulator replacement work.

E.D. Eenigenburg
Station Manager
Dresden Nuclear Power Station

EDE/ade

Enclosure

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

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