

**LICENSEE EVENT REPORT (LER)**

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

**FACILITY NAME (1)**  
Dresden Nuclear Power Station, Unit 2 and 3

**DOCKET NUMBER (2)**  
05000237

**PAGE (3)**  
1 OF 6

**TITLE (4)**  
HPCI Room Cooler Fan Minimum Starting Voltage Above Second Level Undervoltage Relay Setpoint

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
04	12	94	94	-- 010 --	01	08	14	95	Dresden Unit 3	05000249
									FACILITY NAME	DOCKET NUMBER

<b>OPERATING MODE (9)</b>	N	<b>THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)</b>								
<b>POWER LEVEL (10)</b>	099	20.2201(b)	20.2203(a)(3)(i)	50.73(a)(2)(iii)	73.71(b)					
		20.2203(a)(1)	20.2203(a)(3)(ii)	50.73(a)(2)(iv)	73.71(c)					
		20.2203(a)(2)(i)	20.2203(a)(4)	X 50.73(a)(2)(v)	OTHER					
		20.2203(a)(2)(ii)	50.36(c)(1)	50.73(a)(2)(vii)	(Specify in Abstract below and in Text, NRC Form 366A)					
		20.2203(a)(2)(iii)	50.36(c)(2)	50.73(a)(2)(viii)(A)						
		20.2203(a)(2)(iv)	50.73(a)(2)(i)	50.73(a)(2)(viii)(B)						
		20.2203(a)(2)(v)	50.73(a)(2)(ii)	50.73(a)(2)(x)						

**LICENSEE CONTACT FOR THIS LER (12)**

<b>NAME</b>	John J. Smentek, Mod Design Engineer	<b>TELEPHONE NUMBER (Include Area Code)</b>	Ext. 2872 (815) 942-2920
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**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

**SUPPLEMENTAL REPORT EXPECTED (14)**

<b>YES</b> (If yes, complete EXPECTED SUBMISSION DATE).	X	<b>NO</b>	<b>EXPECTED SUBMISSION DATE (15)</b>	MONTH	DAY	YEAR
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**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On April 12, 1994, a review of calculation 8982-19-19-2 was performed in response to an NRC unresolved item in Engineering and Technical Support Inspection 237(249) 94-003. The review revealed that the control circuit contactor (motor starter) minimum starting voltage for the High Pressure Coolant Injection (HPCI) Room Cooler Fans was above the set point for the second level degraded voltage relay settings. The cause was an inadequate design calculation and review. The existing Size 2 full voltage non-reversing contactors have been replaced with new General Electric Series 300 Size 1 contactors. By reducing the contactor size and improving the pickup of the coil, the burden on the control circuit is reduced and the contactor voltage is improved to the extent that the existing set points for the second level degraded voltage relays do not affect the operation of the HPCI Room Cooler Fans.

**LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION**

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FACILITY NAME (1)		DOCKET NUMBER	LER NUMBER (6)			PAGE (3)
Dresden Nuclear Power Station, Unit 2 & 3		05000237	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 6
			94	-- 010 --	01	

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

**EVENT IDENTIFICATION:**

**HPCI Room Cooler Fan Minimum Starting Voltage Above Second Level Undervoltage Relay Setpoint**

**A. PLANT CONDITIONS PRIOR TO EVENT:**

Unit: 2(3)                      Event Date: 04/12/94                      Event Time: 17:15  
 Reactor Mode: N(N)              Mode Name: Run(Refuel)                      Power Level: 99%(0%)  
 Reactor Coolant System Pressure: 1000 psig (0 psig)

**B. DESCRIPTION OF EVENT:**

On April 12, 1994, Unit 2 was operating at 99% rated power and Unit 3 was in a Refuel Outage.

In response to an NRC unresolved item in Engineering and Technical Support Inspection 237(249) 94-003, the August 1989 High Pressure Coolant Injection (HPCI) [BG] Room Cooler Fans second level degraded voltage relay settings calculations were being reviewed. It was discovered in Sargent and Lundy calculation 8982-19-19-2 that the control circuit contactor (motor starter) pick up voltages were above the set point. Specifically, the review identified that under degraded voltage conditions for Unit 2, only 86.8 Volts (V) AC is postulated to be available at the control circuit contactor. 97.72 VAC is required to assure its operation. For Unit 3, only 87.7 VAC is postulated to be available at the motor starter with 97.70 VAC required to assure its operation. Therefore, it could not be assured that the Unit 2 & 3 HPCI Room Cooler Fans would start.

The review confirmed that the concern was isolated to the 120 VAC motor starters, and that the voltages at the 480 VAC HPCI Room Cooler Fan motors were calculated to be acceptable.

According to Commonwealth Edison's (ComED) Nuclear Engineering Department Mechanical Structural Group (NED M&S) letter concerning the Emergency Core Cooling System (ECCS) Room Cooler Operability Requirements, dated February 3, 1993, CHRON #198404, the HPCI room cooler fans are required to function in the event of a Designed Basis Accident (DBA) Loss Of Coolant Accident (LOCA). These room cooler fans are fed from Unit 2 480 VAC Bus 29 (MCC 29-4) and Unit 3 480 VAC Bus 39 (MCC 39-1); both of these busses are affected by their respective second level degraded voltage relay settings. (See attached sketch, Unit 3 is similar).

**C. CAUSE OF EVENT:**

This LER is submitted pursuant to 10CFR50.73(a)(2)(V)(D), any event or condition that alone could have prevented fulfillment of the safety function of systems needed to mitigate the consequences of an accident.

**LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION**

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FACILITY NAME (1)		DOCKET NUMBER	LER NUMBER (6)			PAGE (3)
Dresden Nuclear Power Station, Unit 2 & 3		05000237	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 6
			94	-- 010 --	01	

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

The root cause of the event was a deficiency in the review process for the 120 VAC motor starter for the HPCI Room Cooler Fans. In 1989, the effects of degraded voltage were not readily understood throughout the industry. NRC Inspection Reports, numbers 50-237/91038 (DRS) and 50-249/91042 (DRS), identified unresolved degraded voltage concerns with Units 2 & 3. These reports documented a follow up inspection to previously identified Electrical Distribution Safety Functional Inspection (EDSFI) concerns. As a result of those NRC unresolved degraded voltage concerns, ComEd committed to review the degraded voltage calculations. This review was completed in January, 1992, and the Unit 2 & 3 HPCI Room Cooler Fan control circuit contactors were identified as circuits that failed during that review and were determined to need a more detailed calculation.

This calculation was placed on a list, with other circuits that also failed the initial review, for recalculation but given a low priority since it was incorrectly assumed at that time that the HPCI System was primarily a DC system and that no AC electrical components affected its capability to perform its required safety function. Subsequent to the setting of the priorities for recalculation of the degraded voltage calculations which failed the review, the NED M&S issued a letter to Dresden Station describing the ECCS Room Cooler Operability Requirements; this letter was based on the ComEd Nuclear Fuel Services (NFS) Room Cooler Study, issued on February 3, 1993 (CHRON # 198404).

The NFS Room Cooler Study captured the results of a meeting held September 15, 1992 between NFS, Nuclear Licensing Department (NLD) and the NRC (NRR Projects and Technical Staff). It was during that meeting that ComEd and the NRC discussed the natural circulation within the HPCI room and corner rooms. Both parties agreed that the HPCI Room Cooler Fans were necessary to ensure adequate circulation within the HPCI room. It was concluded at that time that the HPCI Room Cooler Fans would be required to be safety-related. As a result of this conclusion, the NED M&S letter identified that the HPCI Room Cooler Fans would be required to function in the event of a DBA LOCA. The significance of the NFS Room Cooler Study, relative to the importance of the HPCI Room Cooler Fans, was not recognized due to inadequate communications between the separate ComEd Engineering organizations. Each of the Engineering organizations were working on different aspects of the subject equipment, however, the connection was never made and as a result the priority for the recalculation of calculation 8982-19-19-2 was not elevated.

**D. SAFETY ANALYSIS:**

The likelihood of a degraded voltage event which would result in a degraded voltage that resides in the narrow region of vulnerability concurrent with DBA LOCA is remote.

Abnormal Operating Procedures give guidance to Operating Personnel to take actions in the event of a degraded voltage condition. The Abnormal Operating Procedures are entered when the computer alarm which measures emergency bus voltage annunciates. The alarm value is above the bus critical voltage value, and provides margin for the Nuclear Station Operator (NSO) to attempt to restore emergency bus voltage. Voltage restoration is accomplished by raising the switchyard voltage through raising main generator reactive power output and

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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FACILITY NAME (1)	DOCKET NUMBER	LER NUMBER (6)			PAGE (3)
Dresden Nuclear Power Station, Unit 2 & 3	05000237	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 6
		94	-- 010 --	01	

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

through switchyard configuration changes. If required, specific plant loads are started or stopped as necessitated by plant conditions.

Failure of the HPCI Room Cooler Fans to start would lead to excessive temperatures in the HPCI room and degradation of the Safety Related equipment in the HPCI room. The HPCI room temperature isolation setpoint is nominally set at 180 degrees Fahrenheit, with an uncertainty of approximately 5 degrees Fahrenheit. A maximum temperature of 175 degrees Fahrenheit is assumed to be the lowest temperature that would result in isolation of the HPCI steam lines.

However, the "Small Break Analysis" in General Electric documents NEDO-21082-02-1A & NEDO-24146A (for Dresden Units 2 & 3 and Quad Cities Units 1 & 2) identified that although the most severe equipment failure is loss of HPCI for small breaks, the reactor vessel depressurizes relatively slowly (or not at all) and the Peak Cladding Temperature (PCT) of the fuel is between 1500 - 1600 degrees Fahrenheit. This is still bounded by the Large Break LOCA with single failure of the LPCI injection valve which results in a PCT for the fuel of 2045 degrees Fahrenheit. These PCTs are well below the 10 CFR 50.46 limit of a PCT for the fuel of 2200 degrees Fahrenheit.

Therefore, the safety significance of this event is considered to be minimal.

**E. CORRECTIVE ACTIONS:**

The corrective actions taken with regard to this event are the following:

At approximately 1500 on April 12, 1994, the Unit 2 HPCI Room Cooler Fans were manually started and Caution Cards were placed to keep the fans running until such time that ComEd is assured that the HPCI Room Cooler Fans would start under degraded voltage conditions. This action was completed prior to the completion of the Operability Evaluation.

An Operability Evaluation was performed in accordance with ComEd Engineering and Construction Procedure ENC-QE-40.1. This evaluation identified that the only Compensatory Action was to start the Unit 2 HPCI Room Cooler Fan and keep it running until the degraded voltage concern was addressed. The Unit 3 HPCI Room Cooler Fan was not required since it was shut down for a refuel outage.

The HPCI Room Cooler Fan's control circuit contactors were replaced under Nuclear Work Request (NWR) numbers D25259 and D25260 for Unit 2 and Unit 3, respectively. The existing Size 2 full voltage non-reversing contactors were replaced by new General Electric (GE) Series 300 Size 1 contactors. The HPCI Room Cooler Fans are rated at 3 horsepower (hp); GE vendor data indicates that a Size 1 contactor may be utilized for all motor sizes up to 10 hp. These motor starters are equipped with 75 percent pickup coils. By reducing the contactor size and improving the pickup of the coil, the burden on the control circuit is reduced and the contactor voltage is improved to the extent that the existing set points for the second level degraded voltage relays do not affect the operation of the HPCI Room Cooler Fans.

The deficiency in the review process has been addressed through organizational changes within ComEd Nuclear Engineering departments. The ComEd Nuclear Fuel Services Department has been merged into the ComEd Nuclear Engineering

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FACILITY NAME (1)		DOCKET NUMBER	LER NUMBER (6)		PAGE (3)
Dresden Nuclear Power Station, Unit 2 & 3		05000237	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER
			94	-- 010 --	01
					5 OF 6

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

Department and now report to the same Engineering Manager. In addition, ComEd Engineering has decentralized and has relocated the majority of its design engineers to the Nuclear Stations. At Dresden Station both the System Engineers and the Design Engineers report to the same Engineering Manager. These changes have resulted in improved communications throughout the ComEd Engineering Departments and it is believed that in aggregate these changes acceptably address action to prevent recurrence of the noted deficiency.

Based on a commitment in the LER 94-010, Docket 50-237, an engineering evaluation was performed to confirm the effects of HPCI Room Cooler Fans not starting. The results did confirm that the failure of the HPCI Room Cooler Fans to start would lead to excessive temperatures in the HPCI room and degradation of the safety-related equipment in the room.

**F. PREVIOUS OCCURRENCES:**

<u>LER/Docket Numbers</u>	<u>Title</u>
91-021/050-237	Improper Setpoint of Second Level Undervoltage Relays Due to Management Deficiency
91-037/050-237	Unit Emergency Bus Undervoltage Relays Susceptible to Setpoint Drift Due to Design Deficiency
92-004/050-249	Improper Setpoint of Second Level Undervoltage Relays Due to Management Deficiency

The corrective actions associated with these events would not have prevented this event.

**G. COMPONENT FAILURE DATA:**

N/A

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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FACILITY NAME (1)	DOCKET NUMBER	LER NUMBER (6)			PAGE (3)
Dresden Nuclear Power Station, Unit 2 & 3	05000237	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	6 OF 6
		94	-- 010 --	01	

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

UNIT 2

