

**LICENSEE EVENT REPORT (LER)**

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-8 F33), 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)  
Clinton Power Station

DOCKET NUMBER (2)  
05000461

PAGE (3)  
1 OF 4

TITLE (4)  
Excessive Voltage Drop in the Control Circuit for the Division 3 Diesel Output Circuit Breaker Results in the Plant Being Outside Design Basis

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
09	29	86	1998	032	00	10	01	98	None	05000
									None	05000

OPERATING MODE (9) 5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)										
	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)				
POWER LEVEL (10) 000	20.2203(a)(1)		20.2203(a)(3)(ii)		X 50.73(a)(2)(ii)		50.73(a)(2)(x)				
	20.2203(a)(2)(ii)		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)		X 50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A				
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)						

LICENSEE CONTACT FOR THIS LER (12)  
NAME: M. G. McMenamin, Nuclear Station Engineering  
TELEPHONE NUMBER (include Area Code): (217) 935-8881, Extension 3469

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)					EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES	X NO							
(If yes, complete EXPECTED SUBMISSION DATE).								

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

A review of battery calculations identified that the voltage drop in the Division 3, Diesel-Generator, output-circuit-breaker, control circuit, caused by the length of the circuit, could result in less than the vendor recommended voltage being applied to the circuit breaker's closing coil. This could prevent the circuit breaker from operating when required, in turn preventing the actuation of the High Pressure Core Spray system. This condition has existed since prior to the receipt of the Operating License on September 29, 1986. The cause of this event has been attributed to the failure of the Architect Engineer to recognize the effect of circuit length on the applied voltage at the closing coil and an inappropriate application of a generic calculation as a design input. Corrective actions include the preparation of a design change to reduce the overall resistance of the control circuit and removal of inappropriate generic calculation design input.

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LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Clinton Power Station	05000461	1998	032	00	2 OF 4

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

DESCRIPTION OF EVENT

On September 1, 1998, with the plant in Mode 4 (Cold Shutdown), it was determined that the voltage drop in the Division 3, Diesel-Generator [DG] [EK], output-circuit-breaker [BKR] control circuit [CBL3] resulted in less than the minimum 90 Volts Direct Current (VDC) recommended by the vendor being applied at the breaker's closing coil. This is a condition outside the design basis of the facility and affects the High Pressure Core Spray (HPCS) [BG] system which is used for accident mitigation. This condition has existed since before the receipt of the Operating License on September 29, 1986. At the time the Operating License was received the plant was in Mode 5 (Refueling) with reactor coolant temperature [RCT] at ambient and reactor pressure at atmospheric.

While reviewing battery [BTRY] [EJ] calculations as part of the corrective actions for Condition Report 1-98-01-452, which was generated in early 1998, it was identified that the control circuit for the Division 3, Diesel-Generator, output-circuit-breaker contained more than 3000 feet of number 12 AWG wire. (Condition Report 1-98-01-452 addressed the failure of the Architect Engineer to include certain cables in voltage drop calculations. The condition was reported as Licensee Event Report 1998-006-00.) The voltage losses caused by this size and length of wire result in less than the vendor recommended 90 VDC being applied the circuit breaker's closing coil.

The Division 3 Diesel Generator is a dedicated emergency power supply to the High Pressure Core Spray pump [P]. The design of the control circuit for the output circuit breaker was developed by the High Pressure Core Spray system vendor. The implementation of the wiring for the circuit was the responsibility of the Architect Engineer. At the time of the wiring installation, the impact of the physical circuit length between the various panel locations (737 ft. level of the Diesel Generator Building [NB] and the 781 ft./800 ft. levels of the Control Building [NA]) on the voltage applied to the closing coil was not recognized. This resulted in the use of the standard 19/25 (nominal #12 AWG wire) conductors in the control circuit rather than larger conductors that could have reduced the circuit impedance to an acceptable level.

The Direct Current (DC) portion of the High Pressure Core Spray system was originally reviewed in calculation 19-D-27, "Review of Division III DC System 1C." This calculation did not address all circuits out to the end devices resulting, and this went unrecognized. Later this calculation was expanded to include an evaluation of adequate voltage to end devices. When calculation 19-D-27 was revised, generic calculation 19-AJ-19, "Permissible Cable Length at 125 VDC Control Circuits for 4KV Circuit Breaker Operation During LOCA," which examined the allowable length of DC control circuits for 4KV switchgear [SWGR] circuit breakers, was incorporated. However, calculation 19-AJ-19, applies to Westinghouse DHP 4KV circuit breakers, not to the General Electric AM circuit breakers used in the 4KV Division 3 High Pressure Core Spray switchgear. The Westinghouse circuit breaker operating coils have a lower power/current draw than the General Electric circuit breakers; thus, the conclusions of calculation 19-AJ-19 were not applicable to calculation 19-D-27. This error went undetected until detailed reviews of DC calculations were required by Condition Report 1-98-01-452.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Clinton Power Station	05000461	1998	032	00	3 OF 4

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

This condition is limited to the Division 3, Diesel-Generator, output-circuit-breaker. Other Division 3, switchgear circuit breakers have significantly shorter circuit lengths. Division 1 and Division 2 switchgear circuit breakers utilize control circuits with lower power/current draws and have control circuits with shorter lengths.

No automatic or manually initiated safety system response was necessary to place the plant in a safe and stable condition. Other inoperable equipment or components did not directly affect this event.

CAUSE OF EVENT

The initial cause of this event was a failure of the Architect Engineer to recognize the impact of the control circuit length on the voltage applied to the end device (Division 3, Diesel-Generator, output-circuit-breaker's closing coil). Also, although it cannot be determined with certainty, it appears that when preparing a revision to calculation 19-D-27 in 1991, the preparer assumed that use of calculation 19-AJ-19 was appropriate without verifying its applicability.

CORRECTIVE ACTION

The relevant engineering standard (ESC-291) that was used by the Architect Engineer in the implementation of the control circuit wiring has been revised since the original design was prepared and is currently very explicit regarding the need to limit DC circuit losses.

The reference to calculation 19-AJ-19, will be removed from calculation 19-D-27, at its next revision.

A design change will be prepared to reduce the overall resistance of the control circuit to an acceptable level.

The need for thoroughness and a questioning attitude during design activities was re-emphasized to Nuclear Station Engineering personnel in the lessons learned briefing conducted for Condition Report 1-98-01-452.

ANALYSIS OF EVENT

This event is reportable under the provisions of 10CFR50.73(a)(2)(ii)(B) and 10CFR50.73(a)(2)(v)(D) since the plant was outside of its design basis because the voltage applied to the Division 3, Diesel-Generator, output-circuit-breaker's closing coil could be less than that specified by the vendor and this condition could have resulted in the High Pressure Core Spray system being unable to perform its function to mitigate accident conditions.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Clinton Power Station	05000461	1998	032	00	4 OF 4

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Should the Division 3, Diesel-Generator, output-circuit-breaker not close, High Pressure Core Spray would not initiate as required. However, the likelihood of this occurring is small because surveillance test 9080.23, "DG 1C ECCS Integrated," subjects the Division 3 DC bus to the same conditions it would experience during an actual loss of off-site power event. These conditions result in the applied voltage to the Division 3, Diesel-Generator, output-circuit-breaker's closing coil to be less than the specified 90 VDC when the coil was required to operate. Since this test has been successfully completed numerous times since the issuance of the operating license, it is likely that it would function in an actual event. Furthermore, the same coil is also used in the trip circuit of the affected circuit breakers and in this application the minimum voltage specified is 70 VDC.

ADDITIONAL INFORMATION

Illinois Power has reported one other event relating insufficient DC control circuit voltage. The event involved Division 1 Diesel Generator and was reported as Licensee Event Report 1998-006-00.

For further information regarding this event, contact M. G. McMenamin, Design Engineering at (217) 935-8881, extension 3469.