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June 23, 1995

U.S. Nuclear Regulatory Commission  
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant  
Unit No. 1 or 2; Docket No. 50-317 or 50-318; License No. DPR 53 or DPR 69  
Licensee Event Report 95-005, Revision 0  
Manual Reactor Shutdown Due to Ground Fault In Motor Control Center

The attached report is being sent to you as required under 10 CFR 50.73 guidelines. Should you have questions regarding this report, we will be pleased to discuss them with you.

Very truly yours,

CHC/RCG/bjd

Attachment

cc: D. A. Brune, Esquire  
J. E. Silberg, Esquire  
L. B. Marsh, NRC  
D. G. McDonald, Jr., NRC  
T. T. Martin, NRC  
P. R. Wilson, NRC  
R. I. McLean, DNR  
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## 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 (MNBB 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.

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

FACILITY NAME (1) Calvert Cliffs, Unit 2	DOCKET NUMBER (2) 05000 318	PAGE (3) 1 OF 7
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TITLE (4)  
Manual Reactor Shutdown Due to Ground Fault in Motor Control Center

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 NUMBERS(S)
05	24	95	95	-- 005 --	00	06	23	95		05000
										05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (Check one or more) (11)							
		20.402(b)	20.405(c)	X	50.73(a)(2)(iv)	73.71(b)			
POWER LEVEL (10)	100	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)				
		20.405(a)(1)(iii)	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)	OTHER			
		20.405(a)(1)(iv)	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)	(Specify in Abstract below and in Text, NRC Form 366A)			
		20.405(a)(1)(v)	50.73(a)(2)(iii)		50.73(a)(2)(x)				

## LICENSEE CONTACT FOR THIS LER (12)

NAME R. C. Gradle, Compliance Engineer	TELEPHONE NUMBER (include Area Code) (410) 260-3738
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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)

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

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

On May 24, 1995, at 12:49 p.m., Calvert Cliffs Unit 2 was manually tripped from 100 percent power due to the loss of five out of six circulating water pumps (CWP) that resulted from a ground fault inside a non-safety-related motor control center (MCC).

The root causes of this event were: (1) plant equipment improperly restored to service; and (2) the assessment of the potential risk to plant personnel and equipment safety was less than adequate. This event did not result in any significant nuclear or personnel safety consequences.

Corrective Actions include repair and restoration of the affected MCC, inspection of similar MCCs, strengthened expectations and work practices to increase personnel safety, reduce equipment hazards, and trip potentials.

NRC FORM 366A (5-92)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95	
<p align="center"><b>LICENSEE EVENT REPORT (LER)</b></p> <p align="center"><b>TEXT CONTINUATION</b></p>				<small>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 (MNBB 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.</small>	
FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)	
Calvert Cliffs, Unit 2		05000 3 1 8		95 - 005 - 00	
				PAGE (3)	
				02 OF 07	

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# I. DESCRIPTION OF EVENT

On May 24, 1995, at 12:49 p.m., Calvert Cliffs Unit 2 was manually tripped from 100 percent power in accordance with established plant procedure due to the loss of five out of six circulating water pumps' flow to the main condenser. The loss of the CWP's resulted from a ground fault inside 480 volt AC non-safety-related motor control center 208. The ground fault occurred when an internal cover plate fell, contacted the electrical bus, and caused a phase-to-ground short circuit. Post-Trip Immediate Actions were performed in accordance with Emergency Operating Procedure (EOP)-0 and completed satisfactorily at 12:59 p.m. with all safety functions within acceptance criteria. Neither the Engineered Safety Features nor the Auxiliary Feedwater Actuation System actuated since their setpoints were not reached. There were no structures, components, or systems that were inoperable at the start of the event that contributed to the event.

Calvert Cliffs Unit 2 has one three-shell, single pass, deaerating-type main condenser designed to condense the exhaust steam from the three low pressure turbines and steam generator feed pump (SGFP) turbines, under full plant load. During normal plant operation all six CWP's provide circulating water, to the main condenser. Each of the three condenser shells has a divided water box that consists of two half-shells. Each half-shell is supplied cooling water through its condenser tubes by an independent CWP. This design allows one-half of each shell to be opened and cleaned during plant operation. Established plant procedure requires the reactor to be tripped when both CWP's associated with a shell are lost.

On May 24, 1995, at 12:48 p.m., Unit 2 Control Room personnel recognized and verified by Control Room indications and plant computer alarms that five Unit 2 CWP's had tripped. The licensed reactor operator reported main condenser vacuum decreasing. At 12:49 p.m., the Control Room Supervisor directed manually tripping the Unit 2 reactor and the implementation of EOP-0.

At the time of the event, a plant Control Electrician was performing an independent pre-job walkdown evaluation (i.e., non-intrusive visual inspection) of a previously identified deficiency concerning missing mounting screws from a bus cover inside the back of MCC 208. The inner bus cover is secured in place with two bottom screws. He opened the main door on the back of Cubicle 14 (the rear of the cubicle has three entrances: a hinged door in the center, and outer cover plates at the top and bottom), looked up into the upper section and observed the inside bus cover plate out of its normal position, angled away from the bus bar. In order to get a clearer look at the inner cover plate, the Control Electrician retrieved a four-foot step-ladder, removed the upper cover plate and set it on the floor. He climbed up the ladder (keeping his flashlight outside the cubicle) and looked into the upper section for about 10 seconds. He saw the inner cover plate start to shift, heard a loud explosion, and found himself standing on the floor. He was not injured. He was wearing a hard hat and safety glasses. The safety glasses aided in preventing a potential eye injury, which involved metal splatter from

NRC FORM 365A (5-92)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95	
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 (MNBB 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.	
TEXT CONTINUATION					
FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)	
Calvert Cliffs, Unit 2		05000 3 1 8		95 - 005 - 00	
				PAGE (3)	
				03 OF 07	

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the resultant electrical arc. The Control Electrician contacted his Assistant General Supervisor (AGS) reporting his near miss incident and the electrical explosion at MCC 208. The AGS dispatched supervisory personnel to MCC 208 and informed the Control Room of the incident.

At 12:59 p.m., EOP-1, "Reactor Trip," recovery actions were implemented by Control Room personnel. At approximately 13:15 p.m., the Unit 2 Control Room Operator (CRO) noted that steam generator feed rate was excessive and had resulted in lowering Reactor Coolant System (RCS) temperature. The Unit 2 CRO tripped No. 21 SGFP and shut the main feedwater regulating valve bypass valves. This terminated the RCS temperature transient at approximately 519 degrees Fahrenheit. The Unit 2 CRO took manual control of these bypass valves and restored RCS temperature within the safety function acceptance criteria of EOP-1.

At 1:30 p.m., No. 24 and No. 26 CWPs were started and cooling flow was restored to all three condenser shells. EOP-1 was exited at 1:57 p.m. with the plant in MODE 3, "HOT STANDBY."

## II. CAUSE OF EVENT

The Significant Incident Finding Team (SIFT) conducted an extensive investigation of the event which included, in part: (1) several inspections of the affected MCC, (2) personnel interviews, and (3) review of logs, maintenance orders, plant historical documents, technical references, drawings, and various procedures.

It was determined that the immediate loss of the five CWPs resulted from the ground fault inside MCC 208 Cubicle 14 when the inner cover plate (missing its two mounting screws) slipped and contacted the C phase bus bar, completing a phase-to-ground fault. Typical characteristics of a fault are high current and reduced voltage. The fault dropped voltage on non-safety-related MCC 207 (also fed from 480 volt AC Bus No. 25) which supplies the six CWP exciter field circuits and associated control relays to the CWP control circuit. CWP No. 22 continued to run as its 4 kV supply breaker did not trip. The SIFT believes this breaker did not open due to a slight delay in its relay drop out time. The relay was tested after the event. Due to the subsequent fast fault-clearing action of the 480 volt AC Bus No. 25 feeder breaker to MCC 208 (52-2510), the MCC sustained minimal damage.

The SIFT concluded the following root causes for this event:

- A. Plant equipment was improperly restored to service. The inner cover plate for the upper section of Cubicle 14 in MCC 208 was installed without the retaining screws following preventive maintenance cleaning on March 29, 1987. The SIFT found no record of any work in Cubicle 14 of MCC 208 since 1987 that would have required removing the inner cover plate screws. Causal factors include poor work practices and a less than adequate closeout inspection of this MCC. Our present 480 volt MCC

NRC FORM 366A (5-92)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95	
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 (MNBB 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.	
TEXT CONTINUATION					
FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)	
Calvert Cliffs, Unit 2		05000 3 1 8		95 - 005 - 00	
				PAGE (3)	
				04 OF 07	

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

inspection "Functional Test Procedure," FTE-58, requires a two person signature verification that all bus panels and covers are replaced.

- B. The assessment of the potential risk to plant personnel and equipment safety was less than adequate. Until the Unit 2 trip occurred due to ground fault, the loss of non-safety-related MCC 208 was not viewed as a potential trip initiating event. This contributed to our failure to correct the fastener deficiency sooner.

On March 13, 1995, four days prior to the commencement of the 1995 Unit 2 refueling outage, Plant Modification Electricians were installing an authorized power cable to MCC 208 when they noticed the inner cover plate slightly canted in the upper section of Cubicle 14. The cover plate was missing its mounting screws. They incorrectly determined that the inner cover plate was firmly wedged in place. They knew there was a bus bar behind the cover plate but they did not know how close the bar was to the cover plate. They thought it was safe to have the plate in this condition because one of them had physically attempted to move the plate with his hands and the plate seemed to be secure. This action was itself a potentially fatal maneuver. After their supervisor had seen the plate condition, an Issue Report was written and a Deficiency Tag was hung on the center hinged rear door of MCC 208 to document and identify the problem. The potential risk to personnel and equipment safety was not adequately assessed as both the initiator of this Issue Report and his reviewing supervisor noted on the report form that they had no immediate safety concern. The Issue Report identified that the cover plate that shields the live bus in the back of MCC 208 Cubicle 14 was missing the mounting screws that hold it in place.

The Operations Maintenance Coordinator evaluated the Issue Report on March 20, 1995, and determined it could be worked safely with Unit 2 at power and with MCC 208 de-energized. Nothing in the wording of the Issue Report conveyed to him any immediate risk to MCC 208 or to plant personnel. When the Electrical Maintenance AGS received the Issue Report, he also did not have an immediate safety concern for the plant or personnel. He therefore assigned the Issue Report a P3 code, meaning it was classified as a task that did not require advance planning. Since the Unit 2 refueling outage had already started, this item was not considered for work until after the outage was completed on May 19, 1995.

On May 24, 1995, the Unit 2 Electrical Shop supervisor was reviewing a backlog report that described the Maintenance Order (MO) for the MCC 208 Cubicle 14 inner cover as simply "cover that shields the line bus from being exposed." The supervisor asked the Control Electrician "to check into" the MO meaning that he wanted to determine the scope of the work involved (a paperwork review). This supervisor was not the Control Electrician's normal supervisor. The supervisor was not aware of the electrician's custom of performing his own walkdown prior to starting

NRC FORM 366A (5-82)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95	
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 (MNBB 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.	
TEXT CONTINUATION					
FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)	
Calvert Cliffs, Unit 2		05000 3 1 8		95 - 005 - 00	
				PAGE (3)	
				05 OF 07	

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

work. The Control Electrician went down to the MCC 208 by himself. He is experienced, having been a Lead Electrical Technician for about five years. He conducted a visual non-intrusive inspection by opening the center hinged door, well within the expectations of his supervision. However, when he made the decision to continue his investigation by physically removing the outer upper cubicle cover he should first have notified the Control Room before entering any energized panel or bus, even for a visual inspection. In addition, by not employing the two-man rule for field activities involving entry into energized equipment, he removed a final safety barrier as a second person might have questioned his decision to open the outer upper cover. The Control Electrician made an insufficient safety assessment regarding the potential risk should the inner cover plate come loose. Although the worker was not injured, it was a potentially fatal near miss.

### III. ANALYSIS OF EVENT

This event resulted in no significant consequences to the public health and safety. The manual trip of the plant was conducted as prescribed in approved plant procedures. Operations personnel actions were prompt and correct. All safety systems functioned as required with all safety function status checks completed satisfactorily.

The most limiting loss of load event is described in Chapter 14 of our Updated Final Safety Analysis Report as a turbine trip from 100 percent power without a concurrent reactor trip, with both the atmospheric dump valves and the turbine bypass valves inoperable. A turbine trip can result from the loss of condenser vacuum resulting in the quick closure of the turbine throttle valves. Because of the immediate manual reactor trip, subsequent automatic turbine trip, and the acceptable operation of the atmospheric dump valves and turbine bypass valves, the transient was fully bounded within the assumptions of the safety analysis. Therefore, there was no nuclear safety significance associated with this event. However, the event did pose an avoidable, serious threat to personnel safety and unnecessary challenge to our operators and plant safety systems.

This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv), "Any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protective System (RPS)."

### IV. CORRECTIVE ACTIONS

#### Short-Term:

- A. Operations personnel promptly and appropriately tripped the Unit 2 reactor in accordance with established plant procedures.
- B. The Electrical Control Technician was evaluated on the scene by Safety and Fire Protection Unit personnel. He was transported to the local

NRC FORM 366A (5-82)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95	
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 (MNBB 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.	
TEXT CONTINUATION					
FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)	
Calvert Cliffs, Unit 2		05000 3 1 8		95 - 005 - 00	
				PAGE (3)	
				06 OF 07	

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

community hospital as a precaution. He was released shortly thereafter with no problems identified.

- C. The area surrounding MCC 208 was quarantined under the Shift Supervisors' direction.
- D. A SIFT was activated to investigate the event, determine the root cause(s) of the event, and recommend corrective actions.

Long-Term:

- A. The Electrical and Controls Maintenance General Supervisor took immediate action to strengthen expectations and work practices that will increase personnel safety and reduce equipment hazards and trip potentials.
- B. Maintenance orders were issued to inspect, repair, clean and test MCC 208. MCC 208 was restored to service on May 26, 1995. All other Unit 2 and Unit 1 non-safety-related MCCs have since been inspected. All noted discrepancies were documented via our corrective action process. The safety-related MCCs were not inspected at this time, crediting recent preventive maintenance performed with upgraded procedures.
- C. Plant Engineering Section personnel conducted a review of Issue Reports covering all switchgear and electrical distribution panels for reports of loose electrical components; none were found that warranted immediate actions based on this event.
- D. A discussion of this event was highlighted during recent site-wide training by our Trip Prevention Task Force.
- E. Recommended actions by the SIFT concerning risk assessment and quality of work issues are being evaluated for implementation by plant management.
- F. We are evaluating a modification to the CWP control circuit to prevent the loss of CWPs due to a similar momentary undervoltage condition.
- G. In order to lower the threshold for considering personnel and equipment safety, we will revise the Issue Report form to eliminate the word "immediate" for the questions assessing safety.

NRC FORM 366A (5-92)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95	
LICENSEE EVENT REPORT (LER)				ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST, 500 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	
TEXT CONTINUATION					
FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (5)	
Calvert Cliffs, Unit 2		05000 3 1 8		95 - 005 - 00	
				PAGE (3)	
				07 OF 07	

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V. ADDITIONAL INFORMATION

A. Identification of components and systems described in this report:

Component or System	IEEE 803 EIIIS Funct	IEEE 805 System ID
Circulating Water System	NA	KG
Circulating Water Pumps	P	KG
Motor Control Center	MCC	EC
Condenser	NA	SG
Breaker	BKR	NA
Bus	BU	EC
Relay	RLY	NA
Turbine	TRB	TA

B. Previous Similar Events

There has been one previous event reported via Licensee Event Report involving a loss of load reactor trip due to the improper installation of equipment. A main generator output transition link was reinstalled incorrectly on May 31, 1993. The root cause and corrective actions from that event would not have been expected to prevent this event from occurring. Details may be found in LER 50-318/94-006.