BALTIMORE GAS AND ELECTRIC

CALVERT CLIFFS NUCLEAR POWER PLANT
1650 CALVERT CLIFFS PARKWAY • LUSBY, MARYLAND 20657-4702

CHARLES H. CRUSE
PLANT GENERAL MANAGER
CALVERT CLIFFS

December 24, 1992

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 1; Docket No. 50-317; License No. DPR 53
Licensee Event Report 92-008
Plant Trip Due to Ground Fault in the Isolated Phase Bus Duct System

Gentlemen:

The attached report is being sent to you as required under 10 CFR 50.73 guidelines. Should you have any 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
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NRC FORM 366 (5-92) U. S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES: 5/31/95

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.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Calvert Cliffs, Unit 1	05000 317	1 OF 07

TITLE (4)
Plant Trip Due to Ground Fault in the Isolated Phase Bus Duct System

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)
										05000
11	24	92	92	-- 008 --	00	12	24	92		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)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		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 (include Area Code)
R. C. Gradle, Associate Engineer	410-260-3738

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	BA	TRB	B580	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 15 single-space typewritten lines) (16)

On November 24, 1992, at 2:18 p.m., Calvert Cliffs Unit 1 automatically tripped from 100 percent power due to a ground overcurrent fault in the isolated phase (isophase) bus duct system. The fault occurred when an upper isophase bus duct inspection window came loose and fell into the duct. Ground protection circuitry tripped the main generator and the main turbine. The reactor protective system tripped the reactor on loss of turbine load. This event did not result in any significant safety consequences. Operations personnel implemented established emergency operating procedures and placed the plant in a safe shutdown condition. The apparent cause of this event is that someone stepped on and loosened the window during a recent maintenance activity in the area. Normal duct vibration probably freed the glass. Immediate actions were taken to quarantine the area, initiate an event investigation, and conduct necessary repairs. Actions to prevent recurrence and inform plant personnel of the potential personal safety consequences of this event are in progress.

I. DESCRIPTION OF EVENT

On November 24, 1992, at 2:18 p.m., Calvert Cliffs Unit 1 automatically tripped from 100 percent power due to a ground overcurrent fault in the isophase bus duct system. The ground fault occurred between the main generator and the main unit transformers when an upper inspection window on the "A" phase bus duct came loose and fell inside. The gasket around the glass window contacted the high voltage bus disconnect link assembly inside the duct causing a phase-to-ground short circuit. The gasket ignited, resulting in a small contained fire which self-extinguished in less than five minutes. The main generator ground protection system detected the fault, correctly tripped the generator, deenergized the bus, and tripped the main turbine. The reactor protective system (RPS) tripped the reactor on loss of turbine load. The plant was brought to a safe shutdown condition. There were no other structures, components, or systems that were inoperable at the start of the event that contributed to the event.

The isophase bus duct system has three separate hollow cylindrical metal ducts (44 inch diameter). Each duct encloses a phase of the electrical buswork from the main generator to the unit transformers. The ducts have pairs of glass inspection windows, one upper and one lower, installed at several locations along their length. For each window a metal box is welded onto the ducts to provide a flange. A metal plate with a cutout approximately 12 by 22 inches is bolted onto the box. The safety glass is held in the opening by a rubber gasket.

At the time of the event, plant maintenance personnel were removing scaffolding from just above the normally inaccessible Isophase Bus Ducts, following completion of maintenance on adjacent equipment. They heard the glass window fall into the duct below them and saw the small fire. They immediately left the scaffolding and called the Control Room.

At 2:20 p.m. the Control Room received their report of the fire and its location. The appropriate Emergency Response Plan implementation procedure was initiated. The Fire Brigade and Fire Protection personnel arrived on the scene shortly thereafter. No fire fighting agents were required. Security quarantined the area under Shift Supervisor direction. A search of the area, including the 12 foot elevation below, produced no stray scaffolding parts or objects which could have caused the glass to fall into the duct. The maintenance personnel who were removing the scaffolding later stated that they had not dropped anything. The buswork was not damaged.

Emergency Operating Procedure (EOP)-0, "Post-Trip' Immediate Actions," was implemented when the Unit tripped. All safety functions were met. The steam generator feed pumps (SGFPs) tripped on high discharge pressure following the turbine trip. Auxiliary feedwater (AFW) flow was manually initiated with the starting of AFW pumps No. 11 (steam driven turbine) and No. 13 (motor driven). EOP-0 was exited at 2:28 p.m.

At 2:53 p.m., the Control Room received a high turbine inboard journal bearing temperature alarm on No. 11 AFW pump. The pump was secured and No. 12 AFW pump was started. An inspection of No. 11 AFW pump found the turbine journal bearing wiped. The bearing was replaced in accordance with established maintenance procedures. Bearing oil samples were drawn for analysis. Post maintenance testing was completed satisfactorily. The bearing failure was determined to be an isolated event limited to No. 11 AFW pump. The pump was restored to OPERABLE status at 6:30 p.m. on November 26, 1992.

A Significant Incident Finding Team (SIFT) was activated by the Plant General Manager following the event. The SIFT was established to: (1) investigate the event, (2) determine the cause of the event, and (3) recommend corrective actions to prevent recurrence due to similar causes.

II. CAUSE OF EVENT

The SIFT conducted an extensive investigation of the event which included, in part: (1) several inspections of the affected area and section of the isophase bus duct system, (2) personnel interviews, and (3) review of logs, maintenance orders, technical references, drawings, and various procedures.

Post-trip inspection by SIFT personnel located the glass window lodged between the staves of the disconnect link assembly inside the duct. Dust had accumulated on the duct work and when the plate was removed a footprint was observed spanning the shattered area of the window. The responsible individual was not identified. Numerous footprints were observed on top of the ductworks below the scaffolding. The other inspection windows were checked for looseness. The glass for the "C" phase was cracked and it was replaced. No other work had been done in this area since June 1990.

The SIFT concluded that during the recent maintenance activity, someone left the scaffolding for an indeterminate reason and stepped on the ductwork, including directly on the "A" phase glass. It appears that the glass was then cracked and loosened in its gasket. Continuous, normal vibration probably freed the glass, and it fell inside.

The primary cause of this event is that the appropriate supervision did not recognize the potential safety hazard that existed in the work area. Since the potential hazard was not recognized, an adequate pre-job briefing was not held. Some of the workers involved with the maintenance activity were not aware they were working over glass windows or that high voltage existed inside the duct work. In addition, work practices gave inadequate attention to the protection of plant equipment. This is evidenced by the numerous footprints on the ducting and inspection windows. All work involved in the maintenance activity was accessible from the scaffolding. No one involved with either erecting or removal of the scaffolding could remember stepping onto the ductwork. The footprint on the glass strongly supports the conclusion that the work activity caused the window's failure.

Additional causal factors that contributed to the event are:

A. The maintenance work package did not indicate to personnel that they would be working over high voltage ductwork.

B. There were no signs in the area to warn personnel that the Isophase Bus Ducts contained high voltage.

C. The planning effort did not specify the procection of plant equipment near the work site.

III. ANALYSIS OF EVENT

This event is considered reportable in accordance with 10 CFR 50.72(a)(2)(iv), "Any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)."

This event resulted in no significant consequences to the public health and safety. The RPS automatically tripped the reactor on loss of turbine load. Following the unit trip, when main feedwater flow was lost, AFW flow was promptly initiated to the steam generators by Control Room personnel. All safety systems functioned as required.

The most limiting loss of load event is described in the Calvert Cliffs Updated Final Safety Analysis Report (UFSAR), Safety Analysis to be a turbine trip from 100 percent power without a concurrent reactor trip and with both the atmospheric dump valves and the turbine bypass valves inoperable. Because of the immediate loss of turbine load reactor trip and the acceptable operation of these valves there is no safety significance associated with this event.

The most limiting loss of feedwater event described in the UFSAR, Safety Analysis is a simultaneous closure of both feedwater regulating valves (FRV) from 102 percent power without automatic initiation of auxiliary feedwater (AFW) in conjunction with certain reactor protection trips. In this case, the event is terminated when the operator initiates AFW flow 10 minutes into the event. Though main feedwater flow was lost, AFW flow to the steam generators was promptly initiated with the starting of No. 11 and No. 13 AFW pumps. When No. 11 AFW pump was subsequently secured, the redundant steam driven AFW pump No. 12 was placed in service. Therefore, there was no safety significance associated with this event.

The current SGFP speed control system is not consistently capable of lowering speed quickly enough to compensate for the pressure rise caused by the FRV closure. This condition has been evaluated. The loss of main feedwater following a reactor trip is not safety significant.

IV. CORRECTIVE ACTIONS

Immediate Corrective Actions

A. Operations personnel stabilized the plant in accordance with established plant procedures and immediately implemented appropriate Emergency Response Plan procedures.

B. Security and Fire Protection personnel responded to the scene, ensured that the fire was extinguished and quarantined the area under the Shift Supervisors' direction.

C. The area was roped off and caution signs were hung warning of high voltage and restricting access without Shift Supervisor permission (also done on Unit 2)

D. The bus and duct were cleaned and inspected. No permanent damage to the buswork was observed. No other foreign objects were found inside the duct. A thorough search of the area near the Bus Ducts revealed no loose parts which could have caused the window to collapse.

E. A SIFT was activated to investigate the event.

F. The damaged "A" and "C" phase windows and gaskets were replaced. Post-maintenance electrical checks were satisfactory and the

isophase bus duct system was returned to service on November 25, 1992.

G. No. 11 AFW pump was inspected and the inboard journal bearing was replaced. Post-maintenance testing was completed satisfactorily and the pump was declared OPERABLE on November 26, 1992.

Actions to Prevent Recurrence

I. Training will be provided to the appropriate maintenance personnel to reemphasize their responsibility to protect plant equipment from incidental damage. Potential personnel safety hazards when working around plant equipment will be discussed. Activities such as maintenance planning, pre-job briefs, system walkdowns, and standard work practices will be addressed.

J. Permanent caution signs will replace the temporary signs hung after the event.

K. We are considering the replacement of all isophase bus duct upper inspection windows with solid metal plates and all lower inspection windows with transparent resilient material.

L. On December 10, 1992, at the site-wide Quarterly Communications Meeting, the Plant General Manager discussed the event. Personal safety was emphasized.

M. On December 21, 1992, the Plant General Manager issued a memorandum to all Site Supervisors that provided details of the event, its potential personal safety consequences, and expected actions to prevent recurrence of similar problems.

N. A root cause analysis is currently being conducted on the inboard journal bearing failure of No. 11 AFW pump.

V. ADDITIONAL INFORMATION

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

Component or System	IEEE 803a/83 Funct. Ident.	IEEE 805/84 System Code
Reactor Protection System	NA	JC
Isolated Phase Bus	IPBU	EA
Turbine	TRB	TA
Generator	GEN	TB
Feedwater Pump	P	SJ
Feedwater Regulatory Valve	FCV	SJ
Auxiliary Feedwater (AFW)	NA	BA
AFW Pump	P	BA
Disconnect	DISC	EA

B. Previous Similar Events

No similar events have been reported involving a turbine/reactor trip due to a ground fault detected in the isophase bus duct system.