NON-PUBLIC?: N

ACCESSION #: 9307160080
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Calvert Cliffs, Unit 1 PAGE: 1 OF 07

DOCKET NUMBER: 05000317

TITLE: Dual Unit Trip Due To Partial Loss of Offsite Power
EVENT DATE: 06/10/93 LER #: 93-003-00 REPORT DATE: 07/09/93

OTHER FACILITIES INVOLVED: Calvert Cliffs, U2 DOCKET NO: 05000318

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: D. W. Muth, Compliance Engineer TELEPHONE: (410) 260-3592

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On Thursday, June 10, 1993 at 8:28:13 a.m., a flashover relay in the Calvert Cliffs switchyard actuated, causing the loss of the 500 kv "Red" bus feeding Unit 2. Unit 2 immediately tripped on low coolant flow. Unit 1 was manually tripped 25 seconds later by operators anticipating a total loss of offsite power.

The most probable cause of the Unit 2 trip is induced vibration of the flashover relay. The decision to trip Unit 1 resulted from the Control Room Supervisor's having concluded that a loss of offsite power was underway.

We will train appropriate personnel on avoiding inadvertent relay actuation. We will minimize the protective features left operative when breakers are opened for extended periods. We will evaluate improvements to operator training.

END OF ABSTRACT

I. DESCRIPTION OF EVENT

On Thursday, June 10, 1993 at 8:28:13 a.m., a flashover relay in the Calvert Cliffs switchyard actuated, causing the loss of the 500 kv "Red" bus feeding Unit 2. Unit 2 tripped on a low reactor coolant flow signal. Unit 1 was manually tripped 25 seconds later. Unit 2 was in MODE 3 at 2250 psia and 532 degrees Fahrenheit and Unit 1 was in MODE 1 at 100 percent power at the time of the event.

At the time of the trip, modifications were being made in the switchyard to accommodate a new 500 kv transmission line. All 500 kv breakers were closed at the time of the trip except 552-61, 62, and 63, which were tagged out for the modification work (see Figure 1). The work was being done to connect the new line between breakers 552-62 and 552-63. Workers had finished constructing new panels and adding new wiring and relays and were performing wiring checks and cleaning up when the flashover protection relay for breaker 552-61 actuated.

Flashover protection is designed to isolate a generator breaker if the breaker is open and current is still present either due to an arc across the breaker gap (a "flashover") or failure of the breaker to open. For breaker 552-61 flashover protection is provided by a Westinghouse Type KC-4 relay which contains a fast acting overcurrent device for each phase (A, B, and C). Current transformers located at the breaker and main generator sense current through the breaker, indicating flashover. Breaker auxiliary switches permit flashover protection when the breaker is open.

When the relay actuated, it tripped breakers 552-21, 41, and 63 (which was already open), isolating the 500 kv Red Bus (see Figure 1). Loss of the Red Bus deenergized 13 kv Reactor Coolant Pump (RCP) Buses 21, 22, 23, and 24 which power the four Unit 2 RCPs; and 13 kv Service Buses 21 and 22 which power 4 kv Buses 14, 22, 23, and 24. Bus 14 supplies power to Unit 1 safety-related equipment, including Control Room panel 1Y10 which provides primary indication of Unit 1 control rod position. 4 kv Bus 24 supplies power to Unit 2 safety-related equipment and 4 kv Buses 22 and 23 supply non-safety-related Unit 2 equipment. The loss of power to the Unit 2 RCPs caused Unit 2 to trip on a low flow signal at 8:28:13 a.m.

As a result of the loss of 4 kv Buses 14 and 24, all normal Control Room

lighting went out. Emergency lighting came on as designed. Plant operators are trained to recognize that one of the symptoms of a loss of offsite power is the loss of Control Room lighting. In addition to noting the loss of Control Room lighting, the Unit 1 Control Room Supervisor (CRS) noted that the Red Bus

potential light was out and that he had lost all but the backup control rod position indication. He noted that the Trip Circuit Breakers had not tripped but was aware that work was going on in the switchyard and believed that the plant was in the process of losing power to both units. He therefore ordered the Unit 1 Reactor Operator to trip the unit. Unit 1 tripped at 8:28:38 a.m., 25 seconds after the Unit 2 trip.

Emergency Diesel Generators (EDGs) 12 and 21 started up on the loss of power to 4 kv Buses 14 and 24, respectively. Emergency Diesel Generator 21 breaker automatically closed in on 4 kv Bus 24 and the Shutdown Sequencer loaded the bus. As designed, EDG 12 had to be manually aligned to 4 kv Bus 14 since this was an Undervoltage Trip vice a Safety Injection Actuation Signal condition. EDG 12 was manually aligned to 4 kv Bus 14 at 8:34:23, roughly five minutes after event initiation. Since 4 kv Bus 11 was not deenergized, EDG 11 was not required to start.

The Shift Supervisor declared an Unusual Event at 8:50 a.m. After verifying that a common fault did not exist, the switchyard configuration was returned to its pre-event alignment by 11:50 a.m. After completing additional recovery actions, the plant exited the Unusual Event at 1:05 p.m.

II. CAUSE OF EVENT

The most probable cause of the Unit 2 trip is induced vibration of the KC-4 relay. However, the specific source of the induced vibration could not be absolutely established. While work was in progress in the general area, none needed to be done in the immediate vicinity of the relay. None of the workers in the Switchyard Control House reported being near the relay at the time of the trip. All other means of relay failure, including valid breaker flashover, accidental electrical operation, internal ground fault, and defect in the relay, have been examined and eliminated as possible causes. The breaker was electrically disconnected, preventing possible flashover. No work was ongoing in circuitry connected to the relay that could have accidentally energized it. Inspection and testing found the relay within specifications and acceptable for use.

Contributing to the Unit 2 trip was that the flashover protection for breaker 552-61 was enabled when it was not needed to protect an electrically isolated breaker. Only breakers 552-62 and 63 actually needed to be tagged out for the work being performed. The decision to open breaker 552-61 was made after the crews reported to the switchyard and was an unnecessary change in system configuration. The protective circuitry for breaker 552-61 should have been

considered as part of the change in the system configuration and not been left enabled when the breaker was opened.

The decision to trip Unit 1 resulted from the CRSs having quickly analyzed various inputs and concluded that a loss of offsite power was underway, His decision was conservative. However, manual trip of the unit was not optimal since Unit 1 would not have tripped on loss of the Red Bus. The CRS believed, based on the loss of Control Room lighting and trip of Unit 2, that the plant was in the process of losing power to both units. He did not fully recognize and synthesize all available information. This was due in part to distractions caused by the automatic shutdown of Unit 2. The CRS had been recently trained on the loss of 4 kv Bus 14 and the resultant loss of panel 1Y10. He had also received training on loss of offsite power. The situation in which he found himself in this event, however, was sufficiently unfamiliar that he appropriately took conservative action.

III. ANALYSIS OF EVENT

The worst-case Loss of Coolant Flow transient described in the Updated Final Safety Analysis Report assumes a simultaneous loss of all four RCPs on a unit operating at 100 percent power and concludes that no significant safety consequences will result from this event. This analysis is bounding for the Unit 2 trip. Unit 1 was tripped manually and shut down normally. There are no significant safety consequences resulting from this event.

This item is reportable under the provisions of 10 CFR 50.73 (A)(2)(iv) as a Reactor Protection System actuation.

IV. CORRECTIVE ACTIONS

Immediate Corrective Actions

A. The flashover protection relay for breaker 552-61 was replaced. The old relay was examined for possible defects. None were

found.

Preventive Actions

A. Access to relay protection equipment is restricted. However, in light of the number of people working in the Switchyard Control House at the time of this incident, and the number of inadvertent relay actuations that have occurred in the Baltimore Gas and Electric Company system, we will review possible additional relay

protection. This review will consider different methods to desensitize the relay as much as possible, including increased relay gap, as well as additional panel bracing. We will also evaluate the use of distinctive colors, labels, or signs to identify the relays that are more sensitive and susceptible to trips.

B. We will reinforce training for personnel with access to relays on the methods employed to indicate sensitive relays and the means to avoid inadvertent
actuation.

C. We will evaluate a policy that requires review of protective features when transmission system breakers are opened for an extended period of time. The goal of such a policy would be to ensure that protective features are left enabled only if they are needed.

D. To assist operators in maintaining a questioning attitude when contacted about switchyard operation and maintenance, we plan to develop a matrix of protective features associated with 500 kv breakers and incorporate it into the Operations procedure governing operation of the 500 kv switchyard.

E. We will discuss this event in operator training, with particular emphasis on the organization's support for taking conservative actions even when, in hindsight, the result is less than optimal from the power production standpoint.

F. We will expand operator training to provide additional criteria for operators to evaluate events involving loss power.

G. We will evaluate improvements to simulator training to better

model distractions associated with dual-unit transients.

V. ADDITIONAL INFORMATION

A. Affected Component Identification:

IEEE 803 IEEE 805
Component or System EIIS Funct System ID

Flashover Protection Relay BDMP FK

500 kv Breaker BKR FK

Reactor Coolant Pump P AB

Reactor Trip Breakers BKR JC

Emergency Diesel Generator DG EK

B. Previous Similar Events:

LER 50-318/87-012 described a similar condition involving a dual unit trip on loss of both 500 kv buses due to a tree touching one line and a defective logic circuit card tripping breakers on the other line. This event did not involve induced vibration on a relay.

Figure 1 "500 kv SWITCHYARD RING BUS" omitted.

BALTIMORE
GAS AND
ELECTRIC

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

CHARLES H. CRUSE
PLANT GENERAL MANAGER
CALVERT CLIFFS

July 9, 1993

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

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 and 2; Docket Nos. 50-317 and 50-318;
License Nos. DPR 53 and DPR 69
Licensee Event Report 93-003
Dual Unit Trip Due to Partial Loss of Offsite Power

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/DWM/bjd
Attachment

cc: D. A. Brune, Esquire
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