

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

Form Rev. 2.0

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		9 7 - 0 1 5 - 0 0			

TEXT Energy Industry Identification System (EIIIS) codes are identified in the text as [XX]

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2511 Mwt rated core thermal power.

EVENT IDENTIFICATION: The Electrical Protection Assembly failed due to aging and deterioration of the undervoltage release coil causing a loss of power to the Reactor Protection Bus 1B.

A. CONDITIONS PRIOR TO EVENT:

Unit: One Event Date: 041897 Event Time: 0727
Reactor Mode: 4 Mode Name: Cold Shutdown Power Level: 0

This report was initiated by Licensee Event Report 254\97-015.

Cold Shutdown (4) - Mode switch in Shutdown position with average reactor coolant temperature ≤ 212 degrees F.

B. DESCRIPTION OF EVENT:

On 041297, Operational Analysis Department (OAD) had performed the 18 month calibration of the 1B-2 Electrical Protection Assembly (EPA) using Work Request (WR) 960115654-01. Results of the calibration were satisfactory. The EPA settings were found to be within tolerance and no adjustments were made. On 041397 operations lined the 1B Reactor Protection Bus (RPS) [JC] bus back to the normal supply energizing the 1B-1 and 1B-2 EPAs. On 041597 Operations transferred the 1B RPS Bus to reserve de-energizing the 1B-1 and 1B-2 EPAs. On 041697 Operations returned the 1B RPS Bus back to normal supply energizing the 1B-1 and 1B-2 EPAs.

At approximately 0727 hours on 041897 the 1B RPS Bus de-energized. Operations investigated the problem and found the 1B-2 EPA breaker had tripped. Operations noted that the 1B-1 EPA was still energized from the Motor Generator (MG) Set. There was still input power to the 1B-2 EPA. The operator and the Shift Technical Advisor (STA) trainees (performing a system walkdown in the Auxiliary Electric room during the event) did not see any fault indicating lights lit. Operations reset the 1B-2 EPA breaker and energized the 1B RPS Bus from the normal supply (through EPA 1B-1 and 1B-2). The Sequence of Events Recorder (SER) shows no indication of a bus condition prior to the EPA de-energizing. The Control Room Shift Operators were interviewed and stated that there were no activities being performed on the 1B RPS Bus.

Some initial troubleshooting by OAD showed that the voltage and frequency were within acceptable range, 116 volts and 59.9 hertz. After Operations transferred the 1B RPS Bus to reserve power (de-energizing EPA 1B-1 and 1B-2) OAD performed their calibration of EPA 1B-1 and 1B-2 and found both within tolerance.

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On 042097 the fuses for the loads on the 1B RPS Bus were checked and were found to be acceptable. Electrical Maintenance (EM) removed the breaker from the EPA and performed a breaker test of the 1B-2 EPA breaker. They found that the breaker tripped prematurely. During the test the EM could not get the breaker to reset and noticed a burnt smell coming from the undervoltage release coil on the breaker. The breaker is a 3 pole breaker that is used in a 2 pole application.

C. CAUSE OF THE EVENT:

The root cause of the EPA trip is the EPA breaker, which had failed due to a combination of age and wrong application. GE addressed the causes of spurious trips of the EPA in Service Informational Letter (SIL) 496. GE recommended replacing the 3 pole breaker with a 2 pole breaker which is the proper application for this breaker. The degraded breaker that failed appears to be original equipment.

GE SIL 496, Rev 1 issued in September 1990 and Supplement 1 issued in October 1995, detailed spurious trips of the EPA being experienced. GE recommended replacing the printed circuit board and the breaker. The original breakers are a 3 pole breaker that is being used in a 2 pole application. Quad Cities has replaced the boards in 10 of the 12 EPAs on site. GE also recommended installing a kit with the new boards to latch the trip indicators.

The circuit board for EPA 1B-2 was replaced in 1996 with the new card as recommended by GE, model 148C118G002.

Material Engineering Group (MEG) Breaker Inspection Results:

MEG testing results are summarized as follows:

The Undervoltage Release (UVR) coil had been overheated. The coil wire leading to the main lead wire broke off due to excess current. The insulation system was blackish and carbonized. The insulation had broken down and there was evidence of outgassing on the top cover directly over the coil the failure mode is as follows: the first coil began to short out, current increased, heat rose, more coils shorted out and so on until the coil failed. When this happened, the breaker tripped open.

This was not an immediate failure. This type of failure is caused by a solenoid being energized over long periods of time.

D. SAFETY ANALYSIS OF EVENT:

A failure of the breaker undervoltage release coil will cause the breaker to fail in the fail safe condition. The breaker would trip open and it would be unable to be reset (closed). There is no known failure of the breaker undervoltage release coil which would cause it to fail to open the breaker. The purpose of this breaker is to open on an undervoltage, overvoltage, or underfrequency condition to protect the bus.

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The failure of the RPS EPA breaker did not endanger the health and welfare of the public. The breaker failing will cause the RPS bus to de-energize causing a partial PCI Group 2 and 3 initiation. This would put the plant in a safe condition.

Corrective Actions Completed:

The breaker and the circuit board were replaced in EPA 1B-2. Ref WR# 970044696.

Corrective Actions To Be Completed:

The breakers in EPAs 1A-1, 1A-2, 1AB-1, 1AB-2, 1B-1, 2B-1, 2A-1, and 2AB-2 will be replaced with new 2-pole breakers. The breakers in EPAs 1B-2, 2A-2, 2B-2, and 2AB-1 are newer 2-pole breakers. The breaker in 1B-2 was replaced with a 2-pole breaker at this time. (NTS# 254-180-97-01501). To be completed 050198.

F. PREVIOUS OCCURRENCES:

PIF 96-1856 from May 1996 describes the 1B RPS Bus de-energizing due to a spurious trip of the 1B-2 EPA. The PIF investigation could find no cause for the trip and the EPA was reset.

No previous LERs are related to this event.

G. COMPONENT FAILURE DATA:

GE molded case circuit breaker air: Part TFJ236175-WLN, 175A, 3 pole, w/12v DC undervoltage release coil # TFKUVA7RS.