

LICENSEE EVENT REPORT (LER)															Form Rev. 2.0											
Facility Name (1) Quad Cities Unit One										Docket Number (2) 0 5 0 0 0 2 5 4					Page (3) 1 of 0 5											
Title (4) The Residual Heat Removal Service Water System was made inoperable due to uncertainties related to 4 KV Air Magne-Blast Horizontal Gas (AMHG) circuit breakers, which had experienced cracks in the auxiliary switches mounting channels.																										
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 Number(s)																
0	4	0	9	9	7	9	7	--	0	1	1	--	0	0	0	4	3	0	9	7	Quad Cities Unit 2	0 5 0 0 0 2 6 5				
OPERATING MODE (9)			1				THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)																			
POWER LEVEL (10)		1		0		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)														
						20.405(a)(1)(i)		50.36(c)(1)		X 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)														
						20.405(a)(1)(iii)		X 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 Charles Peterson, Regulatory Affairs Manager, ext. 3609										TELEPHONE NUMBER AREA CODE 3 0 9 6 5 4 - 2 2 4 1																
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																	
B	E	B	5 2	N																						
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 fifteen single-space typewritten lines) (16)

ABSTRACT:

The 4 KiloVolt (KV) circuit breakers at buses 13, 14, 23 and 24 were declared inoperable on 040997 at 1330 hours due to cracks in 4 KV Air Magne-Blast Horizontal Gas (AMHG) circuit breaker auxiliary switches. The affected breakers included Residual Heat Removal (RHR) Service Water (SW) and offsite power distribution breakers. The apparent cause of the event was a improper manufacturer's switch mounting design. Unit one was shut down due to Technical Specification 3.8.A. Action 1.d for both RHR SW subsystems being declared inoperable.

A design change has been completed to install a mounting strap around auxiliary switches for all affected Unit 1 4 KV breakers and the Unit 2 4 KV breaker which provide a path for backup power to Unit 1 from the Unit 2 Reserve Auxiliary Transformer. The same design will be completed for the remaining Unit 2 breakers prior to start up from Q2R14.

The impact on Safety was minimal in that power would have always been available to Alternating Current (AC) powered Emergency Core Cooling (ECCS) Equipment from Diesel Generator Supplied 4 KV Essential Service buses 13-1, 14-1, 23-1 and 24-1.

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TEXT Energy Industry Identification System (EIS) 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 Residual Heat Removal Service Water System was made inoperable due to uncertainties related to 4 KV AMHG breakers, which had experienced cracks in the auxiliary switches mounting channels.

A. CONDITIONS PRIOR TO EVENT:

Unit: One Event Date: 040997 Event Time: 1330
 Reactor Mode: 1 Mode Name: POWER OPERATION Power Level: 100%

POWER OPERATION Mode (1): Mode switch in the Run position with average reactor coolant temperature at any temperature.

Unit: Two Event Date: 040997 Event Time: 1330
 Reactor Mode: 5 Mode Name: REFUELING Power Level: 000%

REFUELING Mode (5): Mode switch in the Shutdown or Refueling position with average reactor coolant temperature \leq 140 degrees F and fuel in the reactor vessel with one or more vessel head closure bolts less than fully tensioned or with the head removed.

B. EVENT DESCRIPTION:

On 040197 during installation and construction testing of new Sulfur Hexafluoride (SF6) Air Magne-Blast Horizontal Gas (AMHG) 4 KV Circuit Breakers [EB] on Unit 2 at Bus 23-1, a breaker auxiliary switch (52 AUX/UPPER) was found broken loose from the mounting bracket. These breaker auxiliary switch contacts are used in the breaker trip circuits, breaker close circuits, breaker anti-pumping circuit, breaker position indication circuits and for various other control functions depending on the switchgear cubicle in which the breaker is installed. These AMHG 4 KV Circuit Breakers are being installed in the General Electric Air Magne-Blast Horizontal (AMH) Type Switchgear to replace the existing General Electric AMH 4KV Circuit Breakers. This was the third broken auxiliary switch found on AMHG breakers. The first auxiliary switch was found during factory production testing at Pacific Breaker Systems (PBS) on 021197. The broken switch was replaced at the factory.

The second broken auxiliary switch was found at Quad Cities Station on 030597 after the breaker had been staged on the turbine floor prior to installation. Problem Identification Form (PIF) 97-0822 was prepared in response to this.

Additionally, 12 installed, in-service auxiliary switches were found to be cracked. These switches were installed at buses 23 and 24. These cracked switches were found during a field walkdown/inspection on 040897.

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An operability determination determined that all the breakers on buses 13, 14, 23 and 24 [EB] were inoperable on 040997 at 1205 hours. A shutdown was commenced at 1330 hours on Unit one due to Technical Specification 3.8.A. Action 1.d for both Residual Heat Removal (RHR) [BO] Service Water (SW) [BI] subsystems inoperable. The 4 KV AMHG breakers installed at buses 13 and 14, which include all four RHRSW pump breakers and off-site power distribution breakers, had been determined to be inoperable due to cracked auxiliary switch mounting channels. Operations made an ENS notification at 1337 hours due to the Technical Specification required shutdown per 10CFR50.72.b.1.i.A and the inoperable RHRSW subsystem per 10CFR50.72.b.2.iii.B.

The breaker auxiliary switch is a subcomponent of the 4 KV breakers. The affected breakers are all the SF6 AMHG circuit breakers provided with these switches. These circuit breakers are installed and in service on Unit 1 at safety related busses 13, 14 and on Unit 2 at safety related buses 23 and 24. They are presently being installed on Unit 2 at safety related buses 23-1 and 24-1. Installation is scheduled for Unit 1 safety related buses 13-1 and 14-1 during the next Unit 1 refueling outage (Q1R15). These breakers are also installed and in service at non-safety Station Black Out (SBO) buses 61 and 71.

On 041197 Golden Gate Switchboard Company issued a Notification of Potential Defect under the Requirements of 10CFR21.21b.

C. APPARENT CAUSE OF THE EVENT:

The apparent cause of the event was an improper manufacturer's switch mounting design. There is a design weakness in the auxiliary switch mounting that manifests itself in cracks in the switch mounting channels. In extreme cases sufficient cracking can occur to cause the switch to separate from the mounting plate.

A failure of the auxiliary switch mounting can result in a failure of these auxiliary contacts to reposition following opening or closing the breaker which may disable the circuit in which the switch is wired. For example, if the normal power supply breaker, Transformer 11 to Bus 14 (Main Feed), spuriously trips open the Transformer 12 to Bus 14 (Reserve Feed) breaker would not receive the auto-close signal if the auxiliary contacts fail to reposition.

The manufacturer of the Breakers (Merlin Gerin) is investigating the cause of the event. The results of this investigation will be reported per the requirements of 10CFR21.21.

D. SAFETY ANALYSIS OF THE EVENT:

The consequences of this event are considered minimal. There was no effect on the public or the control room personnel due to this event.

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During a design basis accident, the RHRSW system functions to support the RHR system to limit suppression pool temperatures as required to maintain Emergency Core Cooling Systems (ECCS) pump suction head. In addition, there are two RHRSW pumps for each RHR heat exchanger to provide redundancy. During a design basis accident one RHRSW pump provides adequate cooling water flow to the associated RHR heat exchanger. No in-service breaker failures actually occurred at Quad Cities, so the likelihood of losing all four RHRSW pumps when needed during an event due to breaker failure from this phenomenon or a random failure is extremely low.

The breakers for the 4 KV Essential Service buses 13-1, 14-1 and 24-1 have not been replaced. The breakers for 4 KV service for 23-1 were in the process of being replaced when the problem was identified. These four buses supply power to all of the AC Emergency Core Cooling System (ECCS) Equipment. These buses have backup power supplied from Emergency Diesel Generators (EDGs). Thus when the Units were operating, AC power was never in question for the ECCS equipment as a result of this issue.

E. CORRECTIVE ACTIONS:

Corrective Actions Completed:

1. PIF 97-1276 was written to investigate the cause of the improper manufacturer's switch mounting design. A level 2 investigation for PIF 97-1276 is in progress.
2. All 4 KV breakers which utilize a Merlin Gerin auxiliary switch were declared inoperable, and a shutdown on Unit 1 was completed.
3. Breakers were sent to corporate Materials Engineering Group for additional testing and the performance of a failure mode assessment. This testing identified that the breakers could have performed their design function with cracking present in the switch mounting plastic and that a design change to install a strap on the auxiliary switches would be effective.
4. On April 11, 1997, Golden Gate Switchboard Company issued a "Notification of Potential Defect under the Requirements of 10CFR21.21(b)."
5. A design to install a mounting strap around the rear of the upper and lower auxiliary switches to ensure they remain securely fastened to their mounting brackets was performed for all affected Unit 1 4 KV breakers and the Unit 2 4 KV breaker which provide a path for backup power from the Unit 2 Reserve Auxiliary Transformer to Unit 1. Unit 1 was completed by Design Change Package (DCP) 9700134. The Unit 2 breakers were completed by DCP 9700141.
6. Operations Department has implemented periodic inspection requirements to visually check the position indicator flag on each circuit breaker and weekly log the number of breaker cycles to ensure that the number of cycles for which the repair has been tested and qualified is not exceeded.

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7. Maintenance department has implemented periodic inspection requirements to visually check the mounting straps on the upper and lower auxiliary switches.

Corrective Actions to be Completed

1. Complete DCP 9700144 to install a mounting strap for Unit 2 breakers prior to start up from Q2R14. (NTS # 2541809701101)
2. Evaluate the feasibility of extending the qualification of the mounting strap design by the end of Q1R15 (NTS 2541809701102) and Q2R15 (NTS 2541809701103 and NTS 2541809701104).

F. PREVIOUS EVENTS:

There have been no previous reportable events regarding failure of the auxiliary switches for the 4 KV AMHG breakers.

G. COMPONENT FAILURE DATA:

Component Description: 4 KV Breaker Auxiliary Switch
 Manufacturer: Merlin Gerin
 Breaker Model Number: (Fluarc FG2) AMHG
 Part Numbers: Upper switch 7183404A, Lower switch 7183401B