Georgia Power Company
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201
Telephone 205 877-7279

J. T. Beckham, Jr.
Vice President - Nuclear
Hatch Project

Georgia Power
the southern electric system

November 28, 1995

Docket No. 50-366 HL-5076

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Edwin I. Hatch Nuclear Plant - Unit 2
Licensee Event Report
Actuations of Engineered Safety Features
Result From a Trip of Reactor Protection System Power Supply

Gentlemen:

In accordance with the requirements of 10 CFR 50.73 (a)(2)(iv), Georgia Power Company is submitting the enclosed Licensee Event Report (LER) concerning actuations of engineered safety features which resulted from a trip of the reactor protection system power supply.

Sincerely,

J. T. Beckham, Jr.

JKB/ld

Enclosure: LER 50-366/1995-007

cc: *Georgia Power Company*
Mr. H. L. Sumner, Nuclear Plant General Manager
NORMS

U.S. Nuclear Regulatory Commission, Washington, D.C.
Mr. K. Jabbour, Licensing Project Manager - Hatch

U.S. Nuclear Regulatory Commission, Region II
Mr. S. D. Ebneter, Regional Administrator
Mr. B. L. Holbrook, Senior Resident Inspector - Hatch

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NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED 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 (MNBB7714), 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)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Edwin I. Hatch Nuclear Plant - Unit 2	0 5 0 0 0 3 6 6	1 OF 5

TITLE (4)
Actuations of Engineered Safety Features Results From a Trip of Reactor Protection System Power Supply

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 NAME	DOCKET NUMBER(S)
1 1	0 1	9 5	9 5	– 0 0 7	– 0 0	1 1	2 8	9 5		0 5 0 0 0
									FACILITY NAME	0 5 0 0 0

OPERATING MODE (9)	4
POWER LEVEL (10)	0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR ?: (Check one or more of the following) (11)

20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
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)
Steven B. Tipps, Nuclear Safety and Compliance Manager, Hatch	AREA CODE 9 1 2 3 6 7 - 7 8 5 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

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 11/1/95 at 2130 EST, Unit 2 was in the Cold Shutdown mode with preparations in progress for the Primary Containment integrated leak rate test. At that time, both output breakers for the motor-generator (MG) set which supplies Reactor Protection System (RPS) bus 'B' tripped. As systems powered by RPS are designed to "fail safe", several engineered safety features received actuation signals. Because of the plant condition, only certain actuations occurred, including the Main Control Room Environmental Control System (MCRECS) entering the pressurization mode, one drywell purge valve closing, and the Residual Heat Removal/Shutdown Cooling System suction valve closing. Upon investigation, the MG set output voltage was found higher than normal. Power was restored to the affected RPS bus from its alternate supply by 2145 EST and appropriate system restorations were performed. Shutdown cooling was interrupted for only about 35 minutes before being restored. The cause of this event appears to have been a dirty potentiometer in the feedback sensing circuit of the voltage regulator. This resulted in a "noisy" feedback connection through this potentiometer, which caused generator excitation to be erratic. It appears that the machine response to the erratic feedback caused the output to vary outside of the close tolerances of this power supply system and resulted in actuations of the protective relays. Corrective actions included replacing the voltage regulator with a new one, installing two minor design changes, and performing other checks to ensure the reliability of the motor-generator set.

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor
Energy Industry Identification System codes appear in the text as (EIIS Code XX).

DESCRIPTION OF EVENT

On 11/1/95 at 2130 EST, Unit 2 was in the Cold Shutdown mode with preparations in progress for the Primary Containment integrated leak rate test (ILRT). At that time, both output breakers for the motor-generator (MG) set which supplies Reactor Protection System (RPS, EIIS Code JC) bus 'B' tripped. Systems powered by RPS are designed to "fail safe" (i.e., perform their accident or emergency functions upon loss of power or control signal), and several engineered safety features received actuation signals. Since the pressurization of the Primary Containment for the ILRT was in progress at that time, most systems powered by the RPS power supply were not in service. Therefore, only limited actuations occurred, including the Main Control Room Environmental Control System (MCRECS, EIIS Code VI) entering the pressurization mode, the drywell nitrogen purge valve 2T48-F103 (EIIS Code LK) closing, and the Residual Heat Removal/Shutdown Cooling System (RHR/SDC, EIIS Code BO) suction valve 2E11-F008 closing. The 'A' RHR pump tripped as a result of the suction valve closing. With the RHR/SDC suction valve closed, shutdown cooling was interrupted. With the nitrogen purge valve closed, pressurization of the Primary Containment for the ILRT was also interrupted.

Power was restored to the affected RPS bus from its alternate supply by 2145 EST and pressurization of the Primary Containment for the ILRT was resumed through the nitrogen purge valve. Shutdown cooling was restored by 2205 EST. During the time shutdown cooling was isolated, reactor coolant temperature slightly increased from 119 degrees Fahrenheit to 123 degrees Fahrenheit as measured at the inlet to the 'A' RHR heat exchanger.

CAUSE OF EVENT

The cause of this event was not conclusively determined. However, the event appears to have been the result of a dirty potentiometer in the single phase sensing circuit of the voltage regulator for the 'B' RPS MG set. With this potentiometer dirty, the sensed feedback signal was "noisy" as it entered the voltage regulator. It appears that the machine response to the erratic feedback caused the output to vary outside the close tolerances required by the RPS power supply, and the protective relays actuated to trip the output breakers as designed. A plant equipment operator who immediately investigated the MG set trip found the unloaded output of the MG set at 127 volts AC as compared

to its normal output of 120 volts AC. The high voltage trip setpoint is 130 volts. Within minutes, however, the voltage read by electricians who were investigating the event had decreased to 125 volts AC, indicating that the feedback potentiometer was still behaving erratically.

The affected RPS bus remained on its alternate supply until 11/6/95. At that time, a logic system functional test (LSFT) was to be performed which required the 'A' RPS bus to be powered from the alternate supply. This required that the 'B' RPS bus to be disconnected from the alternate supply and energized from its MG set. Therefore, the dirty potentiometer was cleaned and the 'B' RPS MG set was returned to service temporarily on 11/6/95. The MG set performed without anomaly. Subsequently, additional troubleshooting was performed to ensure that no other fault remained undetected. The protective relays, output breakers, RPS MG set, and voltage regulator were checked as follows. The appropriate calibration procedures were run on the protective relays. All the relays, including the ones related to the high voltage trip, were found to be operating within their required tolerances. The output breakers for the MG set were tested on a breaker test stand and were found to operate as expected. Machine windings on the MG set, including the drive motor field, the exciter field, the exciter rotor, the generator field, and the generator armature were "meggered" and checked for resistance. These were all found to have acceptable winding conductance and insulator resistance. The shaft mounted exciter rectifier was disconnected and the field diodes and thyrite were confirmed to be operating properly. A new voltage regulator was first bench tested and then installed incorporating a design change which replaces the potentiometer in the single phase sensing circuit with a resistor of fixed value. With this regulator installed, the MG set, output breakers, voltage regulator, and protective relays were dynamically tested on a resistive/reactive load bank for two days at a power factor of 0.6 to approximate actual load conditions encountered when the MG set is supplying the bus. During this load test, the operation of the voltage regulator was checked by ensuring that the generator output remained within 120 to 122 volts from no load to full load. A check was performed to ensure the voltage regulator maintained correct machine output voltage even after the MG set drive motor was de-energized and the set began to coast down. None of these checks identified any other problems or likely failure mechanisms in the RPS MG set power supply. The old voltage regulator was also bench tested and found to be functioning normally with the newly cleaned potentiometer in place.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This event is reportable per 10 CFR 50.73 (a)(2)(iv) because an event occurred involving the unplanned, automatic actuations of engineered safety features. Specifically, the MCRECS initiated its pressurization mode and two Primary Containment Isolation Valves (PCIVs) closed in response to a loss of power on RPS power supply bus 'B.'

The RPS power supply system is designed to supply stable 120-volt AC power to a variety of plant instrumentation systems including the Process Radiation Monitoring System (EIIS Code IL), the Neutron Monitoring System (EIIS Code IG), the Reactor Protection System, the Primary Containment Isolation System (EIIS Code JE), and the Offgas Radiation Monitoring System (EIIS Code IL). A high degree of power stability is achieved by using two motor-generator sets to condition the power supplied by the RPS power supply system. The electrical output of each motor-generator set energizes one of two RPS busses. The design of systems powered by the RPS bus is "fail-safe," i.e., the systems initiate their accident or emergency functions upon loss of power or control signal. Therefore, the trip of the output breakers supplying the 'B' RPS bus resulted in the appropriate system actuations as designed.

In this event, only a small subset of the systems listed above was in operation as a Primary Containment integrated leak rate test was in progress. Therefore, the only engineered safety features which actuated were MCRECS and two PCIVs. MCRECS initiated its pressurization mode of operation per design when power was lost to instrumentation in its initiation logic. Valves 2E11-F008 and 2T48-F103 both closed automatically as a result of the RPS bus trip. Valve 2E11-F008 is the suction valve from the reactor vessel for the RHR system when it is in the shutdown cooling mode. When it closed, the operating RHR pump tripped and shutdown cooling was interrupted for about 35 minutes, during which time reactor coolant temperature slightly increased from 119 degrees Fahrenheit to 123 degrees Fahrenheit. When shutdown cooling was returned to service, reactor coolant temperature returned to its pre-event level within approximately 20 minutes. Valve 2T48-F103 is one of two valves through which a nitrogen purge is introduced into the drywell. In this event, the drywell was being pressurized for the ILRT through this valve. When the valve closed, drywell pressurization was temporarily halted. After the affected RPS bus was energized through its alternate supply, this valve was opened, and pressurization of the drywell resumed. If this event had occurred in conjunction with a design basis accident, all affected systems mentioned above would have already assumed their accident or emergency configurations.

Based on this analysis, it is concluded that this event had no adverse impact on nuclear safety. This analysis applies to all operating conditions.

CORRECTIVE ACTIONS

1. The voltage regulator was replaced with a new one incorporating a minor design change in which the potentiometer in the single phase sensing circuit has been replaced with a resistor of fixed value. This action is complete.

2. A minor design change has been installed to add a resistance to the exciter field circuit to enhance the operation of the silicon controlled rectifier in the voltage regulator. This design improves the stability of voltage regulation and, consequently, stabilizes the generator output as well. This action is complete.

ADDITIONAL INFORMATION

1. No systems other than those already mentioned in this report were affected by this event.

2. Failed Component Information: No failed components were identified in connection with this event.

3. Previous Similar Events: Events reported in the last two years in which engineered safety features have experienced unplanned, automatic actuations due to trips originating in RPS power supplies are described in the following LERs:

50-321/1994-01, dated 4/12/94	50-321/1995-02, dated 3/14/95
50-321/1994-05, dated 5/25/94	50-321/1995-03, dated 6/12/95
50-321/1994-08, dated 8/08/94	50-321/1995-04, dated 7/17/95

Corrective actions for these events included tightening loose connections, replacing failed components, rewiring a panel and examining others for similar problems, and connecting a power quality monitoring device. All of these actions were carried out on the Unit 1 'B' RPS power supply system as there have been no failures in the past two years of other RPS power supplies. In addition, none of those corrective actions were designed to address the cause of this event.