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the southern electric system

W. G. Hairston, III
Senior Vice President
Nuclear Operations

April 19, 1990

ELV-01545
0342

Docket No. 50-424

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

Gentlemen:

VOGTLE ELECTRIC GENERATING PLANT
LICENSEE EVENT REPORT
LOSS OF OFFSITE POWER LEADS TO SITE AREA EMERGENCY

In accordance with 10 CFR 50.73, Georgia Power Company hereby submits the enclosed report related to an event which occurred on March 20, 1990.

Sincerely,

W. G. Hairston, III

W. G. Hairston, III

WGH,III/NJS/gm

Enclosure: LER 50-424/1990-006

xc: Georgia Power Company
Mr. C. K. McCoy
Mr. G. Bockhold, Jr.
Mr. R. M. Odom
Mr. P. D. Rushton
NORMS

U. S. Nuclear Regulatory Commission
Mr. S. D. Ebneter, Regional Administrator
Mr. T. A. Reed, Licensing Project Manager, NRR
Mr. R. F. Aiello, Senior Resident Inspector, Vogtle

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NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
VOGTLE ELECTRIC GENERATING PLANT - UNIT 1	0 5 0 0 0 4 2 4	1 OF 0 8

TITLE (4)
LOSS OF OFFSITE POWER LEADS TO SITE AREA EMERGENCY

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 3	2 0	9 0	9 0	— 0 0 6 —	0 0	0 4	1 9	9 0	VEGP - UNIT 2	0 5 0 0 0 4 2 5
										0 5 0 0 0

OPERATING MODE (9): 6
POWER LEVEL (10): 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)	[X] 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)	TS 4.8.1.1.3
[ ] 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 (AREA CODE)
R. M. ODOM, NUCLEAR SAFETY AND COMPLIANCE	4 0 4 8 2 6 - 3 2 0 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
X	L B	T S	C 0 2 3	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

[X] YES (If yes, complete EXPECTED SUBMISSION DATE) [ ] NO

EXPECTED SUBMISSION DATE (15): MONTH 0 9, DAY 3 0, YEAR 9 0

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On 3-20-90, Unit 1 was in a refueling outage and Unit 2 was operating at 100% power. At 0820 CST, the driver of a fuel truck in the switchyard backed into a support for the phase "C" insulator for the Unit 1 Reserve Auxiliary Transformer (RAT) 1A. The insulator and line fell causing a phase to ground fault. Both Unit 1 RAT 1A and Unit 2 RAT 2B High Side and Low Side breakers tripped, causing a loss of offsite power condition (LOSP). Unit 1 Diesel Generator (DG) 1A and Unit 2 DG2B started, but DG1A tripped, causing a loss of residual heat removal (RHR) to the reactor core since the Unit 1 Train B RAT and DG were out of service for maintenance. A Site Area Emergency (SAE) was declared and the site Emergency Plan was implemented. The Reactor Coolant System heated up to 136 degrees F from 90 degree F before the DG was emergency started at 0856 CST and RHR was restored. The initial notifications were not made within the required 15 minutes due to the loss of power to the Emergency Notification Network (ENN). At 0915 CST, the SAE was downgraded to an Alert after onsite power was restored.

The direct cause of this series of events was a cognitive personnel error. The truck driver failed to use proper backing procedures and hit a support, causing the phase to ground fault and LOSP. The most probable cause of the DG1A trip was the intermittent actuation of the DG jacket water temperature switches.

Corrective actions include strengthening policies for control of vehicles, extensive testing of the DG, replacement of suspect DG temperature switches, and improvements in the ENN system.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
VEGP - UNIT 1	0 5 0 0 0 4 2 4	9 0	— 0 0 6	— 0 0	0 2 OF 0 8

TEXT (If more space is required, use additional NRC Form 366A's) (17)

A. REQUIREMENT FOR REPORT

This event is reportable per: a) 10 CFR 50.73 (a)(2)(iv), because an unplanned Engineered Safety Feature (ESF) actuation occurred when the ESF Actuation System Sequencer started, and b) Technical Specification 4.8.1.1.3, because a valid diesel generator failure occurred. Additionally, this report serves as a summary of the Site Area Emergency event.

B. UNIT STATUS AT TIME OF EVENT

Unit 1 was in Mode 6 (Refueling) at 0% rated thermal power. The reactor had been shut down since 2-23-90 for a 45 day scheduled refueling outage. The reactor core reload had been completed, the initial tensioning of the reactor vessel head studs was complete, and the outage team was awaiting permission from the control room to begin the final tensioning. Reactor Coolant System (RCS) level was being maintained at mid-loop with the Train A Residual Heat Removal (RHR) pump in service for decay heat removal. The temperature of the RCS was being maintained at approximately 90 degrees F.

Due to the refueling outage maintenance activities in progress, some equipment was out of service and several systems were in abnormal configurations. The Train B Diesel Generator (DG1B) was out of service for a required 36 month maintenance inspection. The Train B Reserve Auxiliary Transformer (RAT 1B) had been removed from service for an oil change. The Train B Class 1E 4160 Volt switchgear, 1BA03, was being powered from the Train A RAT 1A through its alternate supply breaker. All non-1E switchgear was being powered from the Unit Auxiliary Transformers (UAT) by backfeeding from the switchyard. All Steam Generator (S/G) nozzle dams had been removed, but only S/G's 1 and 4 had their primary manways secured. Maintenance personnel were in the process of restoring the primary manways on S/G's 2 and 3. RCS level was being maintained at mid-loop for valve repairs and the S/G manway restorations. In addition, the pressurizer manway was removed to provide an RCS vent path.

C. DESCRIPTION OF EVENT

On March 20, 1990, at approximately 0817 CST, a truck driver with a security escort entered the protected area in a fuel truck. Although not a member of the plant operating staff, the driver was a Georgia Power Company employee belonging to a service group used to perform various plant services. The driver checked the welding machine that was in the area and found that it did not need fuel. He returned to the fuel truck and was in the process of backing out of the area when he hit a support holding the phase "C" insulator for RAT 1A. The insulator and line fell causing a phase to ground fault, and the transformer breakers tripped.

At 0820 CST, both Unit I RAT 1A and the Unit 2 RAT 2B High Side and Low Side breakers tripped causing a loss of offsite power condition (LOSP) to the Unit 1 Train A Class 1E 4160 volt Bus 1AA02, the Unit 2 Train B Class 1E Bus 2BA03, and the 480 volt busses supplied by 1AA02 and 2BA03. The Unit 1 Train B Class 1E 4160 volt bus 1BA03 also lost power since RAT 1A was feeding both Trains of Class 1E 4160 volt busses. The loss of power caused the associated ESF Actuation System Sequencers to send a start signal to one Unit 1 and one Unit 2 Diesel Generators. DG1A and DG2B started and sequenced the loads to their respective busses. Further description of the Unit 2 response to this event is provided in LER 50-425/1990-002.

One minute and twenty seconds after DG1A started and sequenced the loads to the Class 1E bus, the engine tripped. This again caused an undervoltage (UV) condition to class 1E bus 1AA02. The UV signal is a maintained signal at the sequencer. However, since DG1A was coasting down from the trip, the shutdown logic did not allow the DG fuel racks or starting air solenoids to open and start the engine. This properly caused the engine starting logic to lock up, a condition that existed until the UV signal was reset. For this reason, DG1A did not automatically re-start after it tripped.

After the trip, operators were dispatched to the engine control panel to investigate the cause of the trip. According to the operator, several annunciators were lit. The operator briefly reviewed several instrument read-outs and detected no immediate problem. In order to restore emergency power, the operator reset the annunciators without delaying to evaluate or record the annunciators that were present. During this time, a Shift Supervisor (SS) and a Plant Equipment Operator (PEO) went to the sequencer panel to determine if any problems were present on the 1A sequencer. The SS pushed the UV reset button, then reset the sequencer by deenergizing and energizing the power supply to the sequencer. This caused the DG air start solenoid to energize for another 5 seconds which caused the engine to start. This happened 19 minutes after the DG tripped the first time. The engine started and the sequencer sequenced the available loads as designed. After 1 minute and 10 seconds, the breaker and the engine tripped a second time. It did not automatically re-start due to the starting logic being blocked as described above. By this time, operators, a maintenance foreman and the diesel generator vendor representative were in the DG room. The initial report was that the jacket water pressure trip was the cause of the trip. This report was discounted because the maintenance foreman and vendor representative observed that the jacket water pressure at the gauge was about 12-13 PSIG. The trip setpoint is 6 PSIG and the alarm setpoint is 8 PSIG. Also, the control room observed a lube oil sensor malfunction alarm.

Fifteen minutes after the second DG1A trip, DG1A was started from the engine control panel using the emergency start breakglass button. The engine started and loads were manually loaded. When the DG is started in the emergency mode, all the trips except four are bypassed. However, all alarms will be annunciated. During the emergency run, no trip alarms were noticed by the personnel either at the control room or at the engine control panel. The only alarms noted by the control room operator assigned for DG operation were lube oil pressure sensor malfunction and fuel oil level high/low alarm, neither of which would have tripped the diesel.

At 1040 CST, RAT 1B was energized to supply power to 4160 volt bus 1BA03. DG1A supplied power to 4160 volt bus 1AA02 until 1157 CST, at which time bus 1AA02 was tied to RAT 1B.

A Site Area Emergency was declared at 0840 CST, due to a loss of all offsite and onsite AC power for more than 15 minutes. The Emergency Director signed the notification form used to inform offsite government agencies of the emergency at 0848 CST. The shift clerk attempted to initiate offsite notification utilizing the primary ENN in the control room but found it inoperable due to loss of power. The shift clerk then went to the back-up ENN and initiated notification after roll call on this system at 0857 CST. Due to the loss of power, which rendered the primary Emergency Notification Network (ENN) inoperable, and some mis-communication, the initial notification was not received by all agencies until 0935 CST.

The Emergency Director instructed personnel to complete various tasks for restoring containment and RCS integrity. All work was accomplished and maintenance personnel exited containment by 1050 CST.

The SAE was downgraded to an Alert Emergency at 0915 CST after restoration of core cooling and one train of electrical power. By 1200 CST, plant conditions had stabilized with both trains of electrical power being supplied from an offsite source (RAT 1B). After discussions with the NRC and local government agencies, the emergency was terminated at 1247 CST and all agencies were notified by 1256 CST.

D. CAUSE OF EVENT

Direct Cause:

1. The direct cause of the loss of offsite Class 1E AC power was the fuel truck hitting a pole supporting a 230kV line for RAT 1A. This was a cognitive personnel error on the part of the truck driver. There were no unusual characteristics of the work location that directly contributed to this personnel error.

2. The direct cause of the loss of onsite Class 1E AC power was the failure of the operable DG, DG1A, to start and load the LOSP loads on buss 1AA02.

3. The direct cause of the failure of the primary ENN system in the control room was the loss of electrical power to Unit 1. The primary ENN in the control room is powered from Unit 1 Class 1E AC power. Therefore, when Unit 1 lost Class 1E AC electrical power, the primary ENN in the control room did not work.

Root Cause:

1. The truck driver met all current site training and qualification requirements, including holding a Class 2 Georgia driver's license. However, site safety rules, which require a flagman for backing vehicles when viewing is impaired, were violated.

2. The root cause for the failure of DG1A has not been conclusively determined. There is no record of the trips that were annunciated after the first trip because the annunciators were reset before the condition was fully evaluated. Therefore, the cause of the first trip can only be postulated, but it was most likely the same as that which caused the second trip. The second trip occurred at the end of the timed sequence of the group 2 block logic. This logic allows the DG to achieve operating conditions before the trips become active. The block logic timed out and the trip occurred at about 70 seconds. The annunciators observed at the second trip included jacket water high temperature along with other trips. In conducting an investigation, the trip conditions that were observed on the second DG trip on 3-20-90 could be duplicated by venting 2 out of 3 jacket water temperature sensors, simulating a tripped condition. The simulation duplicated both the annunciators and the 70 sec. trip time. The most likely cause of the DG trips was intermittent actuation of the jacket water temperature switches.

   Following the 3-20-90 event, all three jacket water temperature switches, which all have a design setpoint of 200°F, were bench tested. Switch TS-19110 was found to have a setpoint of 197 degrees F, which was approximately 6 degrees below its previous setting. Switch TS-19111 was found to have a setpoint of 199 degrees F, which was approximately the same as the original setting. Switch TS-19112 was found to have a setpoint of 186 degrees F, which was approximately 17 degrees F below the previous setting and was re-adjusted. Switch TS-19112 also had a small leak which was judged to be acceptable to support diagnostic engine tests and was reinstalled. The switches were recalibrated with the manufacturer's assistance to ensure a consistent calibration technique.

During the subsequent test run of the DG on 3-30-90, one of the switches (TS-19111) tripped and would not reset. This appeared to be an intermittent failure because it subsequently mechanically reset. This switch and the leaking switch (TS-19112) were replaced with new switches. All subsequent testing was conducted with no additional problems.

A test of the jacket water system temperature transient during engine starts was conducted. The purpose of this test was to determine the actual jacket water temperature at the switch locations with the engine in a normal standby lineup, and then followed by a series of starts without air rolling the engine to replicate the starts of 3-20-90. The test showed that jacket water temperature at the switch location decreased from a standby temperature of 163 degrees F to approximately 156 degrees F and remained steady.

Numerous sensor calibrations (including jacket water temperatures), special pneumatic leak testing, and multiple engine starts and runs were performed under various conditions. After the 3-20-90 event, the control systems of both engines have been subjected to a comprehensive test program. Subsequent to this test program, DG1A and DG1B have been started at least 18 times each and no failures or problems have occurred during any of these starts. In addition, an undervoltage start test without air roll was conducted on 4-6-90 and DG1A started and loaded properly.

Based on the above facts, it is concluded that the jacket water high temperature switches were the most probable cause of both trips on 3-20-90.

E. ANALYSIS OF EVENT

The loss of offsite power to Class 1E bus 1BA03 and the failure of DG1A to start and operate successfully, coupled with DG1B and RAT 1B being out of service for maintenance, resulted in Unit 1 being without AC power to both Class 1E busses. With both Class 1E busses deenergized, the RHR System could not perform its required safety function. Based on a noted rate of rise in the RCS temperature of 46 degrees F in 36 minutues, the RCS water would not have been expected to begin boiling until approximately 1 hour and 36 minutes after the beginning of the event.

Restoration of RHR and closure of the containment equipment hatch were completed well within the estimated 1 hour and 36 minutes for the projected onset of boiling in the RCS. A review of information obtained from the Process and Effluent Radiation Monitoring System (PERMS) and grab sample analysis indicated all normal values. As a result of this event, no increase in radioactive releases to either the containment or the environment occurred.

Additional systems were either available or could have been made available to ensure the continued safe operation of the plant:

1. The maintenance on RAT 1B was completed and the RAT was returned to service approximately 2 hours into the event.

2. Offsite power was available to non-1E equipment through the generator step-up transformers which were being used to "back-feed" the Unit Auxiliary Transformers (UAT) and supply the non-1E busses. Provided that the phase to ground fault was cleared, Class 1E busses 1AA02 and 1BA03 could have been powered by feeding through non-1E bus 1NA01.

3. The Refueling Water Storage Tank could have been used to manually establish gravity feed to the RCS to maintain a supply of cooling water to the reactor.

Consequently, neither plant safety nor the health and safety of the public was adversely affected by this event. A more detailed assessment of this event and an assessment of the event had it occurred under more severe circumstances will be performed and included in a supplemental LER.

F. CORRECTIVE ACTIONS

1. A management policy on control and operation of vehicles has been established.

2. Temporary barricades have been erected with signs which direct authorization for control of switchyard traffic to the SS.

3. The Loss of Offsite Power (LOSP) diesel start and trip logic has been modified on Unit 1 so that an automatic "emergency" start will occur upon LOSP. Therefore, non-essential diesel engine trips are blocked upon LOSP. The Unit 2 DG's will be modified by 4-30-90.

4. The DG1A test frequency was increased to three times per week until 4-20-90 when the test frequency will be changed to once every 7 days in accordance with Technical Specification Table 4.8-1. This frequency will be continued until 7 consecutive valid tests are completed with no more than one valid failure in the last 20 valid tests. Including the two valid failures of this event, there have been a total of four valid failures in 69 valid tests of DG1A as of 1157 CST on 3-20-90.

NRC FORM 366A (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

5. The defective DG temperature switches have been replaced. In addition, a test program will be conducted at Wyle Laboratories to investigate the reliability of this type of temperature switch under various conditions. This program is designed to aid in determining the failure mode of the suspect switches.

6. A back-up ENN system powered from the AT&T system, which previously existed and was operational for South Carolina agencies, has been extended to include Georgia local and state agencies. Instructions have been given to Emergency Directors and Communicators concerning use of the emergency communication systems.

7. Further corrective actions will be addressed in a supplemental LER.

G. ADDITIONAL INFORMATION

1. Failed Components:

   Jacket Water High Temperature Switches manufactured by California Controls Company.
   Model #A-3500-W3

2. Previous Similar Events:

   None

3. Energy Industry Identification System Code:

   Reactor Coolant System - AB
   Residual Heat Removal System - B
   Diesel Generator Lube Oil System - LA
   Diesel Generator Starting Air System - LC
   Diesel Generator Cooling Water System - LB
   Diesel Generator Power Supply System - EK
   Safety Injection System - BQ
   13.8 kV Power System - EA
   1460 volt non-1E power system - EA
   1460 volt Class 1E power system - EB
   Chemical and Volume Control System - CB
   Containment Building - NH
   480 volt Class 1E Power System - ED
   Engineered Safety Features Actuation System - JE
   Radiation Monitoring System - IL