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Georgia Power

THE SOUTHWEST ELECTRIC SYSTEM

C. K. McCoy  
Vice President, Nuclear  
Vogtle Project

June 25, 1992

ELV-03850  
000-68

Docket No. 50-425

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

Gentlemen:

VOGTLE ELECTRIC GENERATING PLANT  
DIESEL GENERATOR NONVALID FAILURES DUE TO  
NEGATIVE REACTIVE POWER WHEN TYING TO THE GRID

In accordance with the requirements of 10 CFR 50.73, Georgia Power Company hereby submits the enclosed revised report related to an event which occurred on January 29, 1991. Subsequent investigation has revealed the true cause of this event, necessitating changes to the reportability determination, cause of event, and the corrective actions reported in the original Licensee Event Report.

Sincerely,

*C.K.M.C.*  
C. K. McCoy

CKM/NJS

Enclosure: LER 50-425/1991-003, Revision 1

xc: Georgia Power Company  
Mr. W. B. Shipman  
Mr. M. Sheibani  
NORMS

U. S. Nuclear Regulatory Commission  
Mr. S. D. Ebnetter, Regional Administrator  
Mr. D. S. Hood, Licensing Project Manager, NRR  
Mr. B. R. Bonser, Senior Resident Inspector, Vogtle

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)		DOCKET NUMBER (2)	PAGE (3)
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TITLE (4)  
DIESEL GENERATOR NONVALID FAILURES DUE TO NEGATIVE REACTIVE POWER WHEN TYING TO THE GRID

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	YEAR	SEQ NUM	REV	MONTH	DAY	YEAR	FACILITY NAMES		DOCKET NUMBER(S)
01	29	91	91	003	01	06	25	92			05000
											05000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (11)											
OPERATING MODE (9)	1	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)						
POWER LEVEL	90	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						
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	Abstract below)						
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	TS 4.8.1.1.3						
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)							

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
MEHDI SHEIBANI, NUCLEAR SAFETY AND COMPLIANCE	706 826-3209

COMPLETE ONE LINE FOR EACH FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORT TO NRPDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORT TO NRPDS
X	EK	83	D108	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (if yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

ABSTRACT (16)

On January 29, 1991, diesel generators (DGs) 2A and 2B experienced what are now classified as nonvalid failures during testing, due to indicated reactive power reaching a value of negative 6000 kVARs as the DGs were loaded to the grid. Initially, investigation was unable to determine a cause for these failures and further testing was unable to repeat the failure for either DG.

Following a similar DG failure on February 5, 1992, extensive research and testing was performed. A review of the test data concluded that, due to the sizing of the power potential transformers and the current transformers, there exists a small area within the leading KVAR range of the generator capability curve in which the voltage regulator will not function. Because this condition can only occur when the generator is operating in parallel with the grid, it does not affect DG response to emergency conditions. Procedural controls have been established to limit operation of the generator in this range of the curve while testing is being performed.

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TEXT

A. REQUIREMENT FOR REPORT

This revised report is being submitted in accordance with Technical Specification (TS) 4.8.1.1.3 because diesel generator (DG) failures occurred. The original version of this report was also conservatively submitted under the provisions of 10 CFR 50.73 (a)(2)(v) because a condition was thought to exist that alone could have prevented the fulfillment of the safety function of a system needed to mitigate the consequences of an accident. Subsequent investigation has established that the cause of these events was only applicable during testing and did not affect operation in emergency modes. Therefore, reportability per 10 CFR 50.73 (a)(2)(v) is no longer applicable and these failures have been reclassified as nonvalid.

B. UNIT STATUS AT TIME OF EVENT

At the time of this event, Unit 2 was operating in Mode 1 (Power Operation) at 90% of rated thermal power. Other than that described herein, there was no inoperable equipment which contributed to the occurrence of this event.

C. DESCRIPTION OF EVENT

On January 29, 1991 at 1506 CST, DG 2A was started for surveillance testing per Procedure 14980-2, "Diesel Generator Operability Test." At 1521 CST, operators paralleled DG 2A to the grid and the indicated reactive power value immediately reached negative 6000 kVARs. An attempt was made to raise the reactive power value, but was unsuccessful. The output breaker was opened, the system engineer was notified and DG 2A was declared inoperable. The DG remained running while the redundant rectifier bridge circuit was selected and, at 1556 CST, DG 2A was again loaded to the grid. Reactive power remained at normal levels and no other problems occurred. At 1721 CST, the DG surveillance was completed, and at 1953 CST, DG 2A was declared operable. The DG had been out of service for 4 hours and 32 minutes.

Due to TS 3.8.1.1 requirements for demonstrating the operability of the redundant diesel, DG 2B was started at 2349 CST. When operators paralleled DG 2B to the grid at 2359 CST, the reactive power value immediately reached negative 6000 kVARs. An attempt was made to raise the reactive power value, and it was raised to negative 4500 kVARs but this was still unacceptable. Diesel generator 2B was shut down and declared inoperable at 0003 CST on January 30, 1991. The DG 2B bridge circuit was then instrumented to assist in pinpointing any abnormal conditions and at 1412 CST on January 30, 1991, DG 2B was started. The DG was paralleled to the grid at 1423 CST, with no apparent problems. At 1512 CST, the output breaker was opened and at 1515 CST DG 2B was stopped. The DG 2B bridge circuit was transferred to redundant rectifier bridge, which was instrumented, and DG 2B was started at 1730 CST. Diesel generator 2B was tied to the grid without incident, then removed from the grid and stopped at 1751 CST. Diesel generator 2B was started at 1915 CST to prove operability. This surveillance was successfully completed and the DG was declared operable at 2154 CST. Diesel generator 2B had been out of service for 21 hours and 55 minutes.

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To demonstrate continued operability of the redundant diesel, DG 2A was started at 2229 CST on January 30, 1991, and successfully completed TS testing requirements. On February 1, 1991 at 1621 CST, DG 2A was removed from service to make resistance measurements on transfer relays K3, K4, and K5. These relays transfer control of voltage regulation from automatic to manual and vice versa. Contact resistance for contacts 2 and 8 of the K4 relay were found to be abnormally high and the K4 relay was replaced. The rectifier bridge was switched so that the bridge that had failed on January 29, 1991, could be instrumented and tested. After instrumentation was attached, DG 2A was started and loaded to the grid with no anomalies observed. The DG was stopped, a surveillance test was performed, and DG 2A was declared operable and returned to service. The DG had been out of service for 19 hours and 48 minutes.

## D. CAUSE OF EVENT

Testing of transfer relay contacts in the DG 2A control panel found a higher than normal resistance condition that was initially thought to be the cause of these events. However, after discussing it with the vendor we have determined that this condition could cause reactive power to fluctuate, but it would not cause a constant leading value for reactive power. Furthermore, the transfer relay contacts on the DG 2B rectifier bridge that had been in service on January 29, 1991, when the DG 2B failure occurred did not exhibit the same high resistance condition when tested. Therefore, a definitive root cause for these events could not be identified at that time.

On February 5, 1992, a similar failure occurred on DG 2B. This event is described in detail in Special Report 2-92-1, Revision 1. After extensive research and review, a test was conducted on April 1, 1992, to determine if the failure symptoms could be reproduced by paralleling the generator to the grid at approximately 50 volts below the system voltage. During this test, reactive power went to negative 2000 KVARs after the initial breaker closure. Reactive power was then adjusted to approximately 2600 KVARs negative when the low excitation alarm was annunciated and regulator control was lost. Reactive power went to approximately 4100 KVARs negative and could not be adjusted using the voltage control switch. Again, the output breaker was opened and voltage regulation returned to normal.

A review of the test data concluded that, due to the sizing of the power potential transformers and the current transformers, there exists a small area within the leading KVAR range of the generator capability curve in which the voltage regulator will not function. This condition was determined to be the cause of these DG failure events.

## E. ANALYSIS OF EVENT

Because this condition can only occur when the generator is operating in parallel with the grid, it does not affect DG response to emergency conditions. Based on this consideration, there was no adverse effect on plant safety or the health and safety of the public as a result of these events.

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TEXT

F. CORRECTIVE ACTIONS

1. The K4 transfer relays for both DGs 2A and 2B were replaced and each DG was demonstrated to be operable by completion of surveillance procedure 14980-2.
2. The transfer relay contacts on Unit 1 DG 1A were tested and no problems were found.
3. Because this condition can only occur when the generator is operating in parallel with the grid, it does not affect DG response to emergency conditions. Procedural controls have been established to limit operation of the generator in this range of the curve while testing is being performed.
4. By September 1, 1992, licensed operators will receive training regarding the consequences of operating in the negative region of the curve and will be advised of the details of the appropriate corrective actions.

Two other DG failures can be attributed to the same cause and, since the cause does not affect emergency operation, they have also been reclassified as nonvalid failures. One failure occurred on DG 2A on February 1, 1990, and is described in Special Report 2-90-2. The other failure occurred on February 5, 1992, and is described in Special Report 2-92-1, Revision 1.

Per these reclassifications, as of June 8, 1992, there have been no valid failures in the last 20 valid tests of DG 2B and a total of 1 valid failure in 81 valid tests. Also, there have been no valid failures in the last 20 valid tests of DG 2A and 2 valid failures in the last 100 valid tests. Following the February 5, 1992, failure, the test frequency of DG 2B had been increased to once per 7 days in accordance with TS table 4.8-1. However, since the DG 2B test frequency had already returned to a once per 31 day cycle prior to the reclassifications to nonvalid failures, the current testing frequency of once per 31 days has not been affected. The test frequency for DG 2A also remains at once per 31 days.

G. ADDITIONAL INFORMATION

1. Failed Components:

Transfer relay manufactured by Deltrol Controls  
Model \*B600

2. Previous Similar Events:

None

3. Energy Industry Identification System Code:

Diesel Generator System - EK