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 AUTH.NAME AUTHOR AFFILIATION
 CROOK,R.P. Carolina Power & Light Co.
 PEARSON,M.P. Carolina Power & Light Co.
 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 93-019-01:on 931222,H B Robinson Unit 2 in cold shutdown condition for forced outage.Caused by failure of EDG-B to start.Addition of scales to auto Adjustment Knobs for each EDG to allow determing position of knobs.W/940210 ltr.

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Carolina Power & Light Company
Robinson Nuclear Plant
PO Box 790
Hartsville SC 29550

Robinson File No: 13510C
Serial: RNP/94-0307
(10CFR50.73)

FEB 14 1994

United States Nuclear Regulatory Commission
Attn: Document Control Desk
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H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261
LICENSE NO. DPR-23
LICENSEE EVENT REPORT NO. 93-019-01

Gentlemen:

The enclosed Supplemental Licensee Event Report (LER), is submitted in accordance with 10 CFR 50.73. This supplement provides the results of the root cause investigation of the event and the corrective actions that will be taken. The revisions are indicated by a right-hand margin bar.

Very truly yours,

Marc P. Pearson
Plant General Manager

RDC:lst
Enclosure
c: Mr. S. D. Ebnetter
Mr. W. T. Orders
INPO

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9402280007 940210
PDR ADCK 05000261
S PDR

Highway 151 and SC 23 Hartsville SC

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NRC FORM 366 (5-92)			U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95				
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)										
FACILITY NAME (1) H. B. ROBINSON UNIT NO. 2						DOCKET NUMBER (2) 50-261		PAGE (3) 1 OF 6		
TITLE (4) DEGRADED CONDITION DUE TO EMERGENCY DIESEL GENERATOR INOPERABILITY										
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
11	22	93	93	-- 019 --	01	02	10	94	FACILITY NAME	DOCKET NUMBER
										05000
										05000
OPERATING MODE (9)		N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		0	20.402(b)		20.405(c)		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	
			20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)	
			20.405(a)(1)(iv)		<input checked="" type="checkbox"/> 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 R. D. Crook, Sr. Specialist-Regulatory Affairs								TELEPHONE NUMBER (Include Area Code) (803) 383-1179		
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).				<input checked="" type="checkbox"/> No						
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16) <p>On November 22, 1993, H. B. Robinson Unit 2 was in cold shutdown condition for a forced outage. While performing a scheduled surveillance test for the "A" Emergency Diesel Generator (EDG), the licensee Control Operator reported that when he field flashed the "A" EDG, the voltage did not automatically come up to the 480 volts required for operability. The "B" EDG was then tested, and subsequently failed to start. Because evidence existed that both EDGs were not operable with the plant previously at operating conditions, the plant was considered to have been in a degraded condition at that time.</p> <p>The cause of the "A" EDG failure is attributed to a misadjusted automatic voltage control knob on the Generator Control Panel. The primary cause of the "B" EDG failure is an inadequate test procedure, resulting in damage to the Air Start Distributor.</p> <p>This event had no impact on plant safety. Calculations have been performed which indicate that, although the "A" EDG was considered inoperable with the voltage setting below the required value of 480 volts, the safety function would have been met.</p> <p>This report is submitted pursuant to 10 CFR 50.73(a)(2)(ii).</p>										

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION				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 (MNB 7714), 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.							
FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)							
H. B. Robinson, Unit No. 2		50-261		<table border="1"> <tr> <td>YEAR</td> <td>SEQUENTIAL NUMBER</td> <td>REVISION NUMBER</td> </tr> <tr> <td>93</td> <td>-- 019 --</td> <td>01</td> </tr> </table>		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	93	-- 019 --	01
YEAR	SEQUENTIAL NUMBER	REVISION NUMBER									
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				PAGE (3)							
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TEXT (If more space is required, use additional copies of NRC Form 366A)

I. DESCRIPTION OF EVENT

On November 17, 1993, H. B. Robinson Unit 2 was taken to cold shutdown condition for a forced outage. On November 22, 1993, while performing scheduled surveillance test OST-401, "Emergency Diesels" for the Emergency Diesel Generator "A" (EDG-A), the licensee Control Operator reported that when he field flashed EDG-A (EIIS: EK), the voltage came up to only 440 volts rather than the 480 volts required for operability. After noting that the Automatic Voltage Control Knob on the Generator Control Panel had been turned to the minimum position, he adjusted the voltage to 480 volts and the test was completed satisfactorily. Because EDG-A did not automatically come up to its required voltage, the ability of the diesel to perform its intended safety function prior to the testing was questioned.

EDG-B was then tested under OST-401, and subsequently failed to start. An investigation was initiated to repair EDG-B and to evaluate the failure mode.

The NRC was notified on November 22, 1993, at 0854 hours via the ENS of the EDG inoperability in accordance with 10 CFR 50.72(b)(2)(i) of a degraded condition found while shutdown. Because evidence existed that both EDGs were not operable with the plant previously at operating conditions, the plant was considered to have been in a degraded condition at that time. A chronology of events is attached to this LER.

II. CAUSE OF EVENT

The misadjusted Automatic Voltage Adjustment Knob occurred during recent painting of the Generator Control Panel. Painting has historically been conducted under a "generic" Work Request with no special precautions or instructions applied to the specific application. Both EDG Generator Control Panels (on which these knobs are located) were painted on the morning of November 11, 1993, as a part of generic building painting upgrade.

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FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)							
H. B. Robinson, Unit No. 2		50-261		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;">YEAR</td> <td style="width: 33%; text-align: center;">SEQUENTIAL NUMBER</td> <td style="width: 33%; text-align: center;">REVISION NUMBER</td> </tr> <tr> <td style="text-align: center;">93</td> <td style="text-align: center;">-- 019 --</td> <td style="text-align: center;">01</td> </tr> </table>		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	93	-- 019 --	01
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II. CAUSE OF EVENT (Continued)

The root cause of the failure of the EDG-B to start is an inadequate test procedure. Evaluation of the distributor assembly by an independent consultant found damage to the distributor cam, wear to the air pilot valves and the sleeves, and damage to the springs and spring sleeves. This wear and damage was caused by the valves being accelerated in their bores at a rate which was beyond the ability of the springs to force them to track the cam surface. This action also resulted in a twisting motion to be applied to the springs, causing accelerated fatigue. The consultant postulated that the additional wear on the pistons and bores resulted in a sufficient gap that would allow the accumulation of debris, which could have caused the pistons to stick. The cause for this accelerated wear on the distributor was air being applied to the distributor while the engine was running.

On December 27, 1993, an independent evaluation team was formed. Initial activities of the team included reviewing available information, and developing a fault tree, troubleshooting plan, and a special procedure to document testing activities. The troubleshooting plan was based on credible failures from the fault tree. Additional instrumentation was also added to the diesel generator to gather information on the next attempted start.

The independent evaluation discovered that when OST-404, "Diesel Generators Emergency Field Flashing and Manual Closure of Generators Main Breaker," was conducted on October 19, 1993, and October 20, 1993, starting air was applied to the "B" Diesel at rated speed (i.e., 900 RPM) for 50 to 60 minutes.

Based on a review of OST-404, it was found that the procedure had been revised prior to the two EDG-B runs on October 19, 1993, and October 20, 1993, to include the testing that resulted in the application of starting air to the Air Distributor. This revised test was also performed on EDG-A but the diesel was only run for 5 to 10 minutes with air applied to the Air Start Distributor. Therefore, the problems incurred on EDG-B did not affect EDG-A.

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II. CAUSE OF EVENT (Continued)

This testing caused increase wear on the distributor, resulting in binding of the Air Start Pilot Valves, and caused the failure to start on October 25, 1993. No event or condition could be found to substantiate or refute the possibility of air being applied to the distributor during diesel operation after the springs were replaced in October. Analyses of the distributor removed from the EDG-A also indicated there was much less wear and damage than was present on the EDG-B Distributor. However, a new Air Distributor was installed on EDG-A.

III. ANALYSIS OF EVENT

This event had no impact on plant safety. Calculations performed by the licensee's Nuclear Engineering Department indicated that, although the "A" EDG was considered inoperable with the voltage setting at 440 versus the required value of 480 volts, the safety function would have been met. The EDG would have been able to supply the voltage necessary for vital equipment required for safe shutdown.

During the time that both Emergency Diesel Generators were inoperable, the off-site power source was available. The assumed loss of both EDGs concurrent with a total loss of AC power for the vital AC busses is beyond the plant's design basis as provided in Chapter 15 of the Updated Final Safety Analysis Report. However, Plant Procedure EPP-1, "Loss of All AC Power" provides guidance for mitigating the consequences of such an event. This procedure provides steps for restoring AC power, and provides contingency actions if AC power cannot be restored. Also, the Dedicated Shutdown System would be available to provide the capability to safely maintain the unit in hot shutdown, and to continue to cold shutdown if required.

This report is submitted pursuant to 10 CFR 50.73(a)(2)(ii)(A).

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(5-92)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
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IV. CORRECTIVE ACTIONS

Corrective actions for the incorrect setting include the addition of scales to the Auto Adjustment Knobs for each EDG to allow determining the position of the knobs. The settings are being checked each shift to verify their position. Additionally, protective clear plastic covers have been placed over the knobs to prevent inadvertent operation. The use of "generic" Work Requests for painting in the power block has been discontinued.

Additional corrective actions include revising OST-404 to assure that the Air Start Solenoids do not remain de-energized after the diesel has started.

The Air Start Solenoid Valves and the Fuel Oil System Check Valves will be included in the Preventive Maintenance Program.

Additional temporary instrumentation has been added to the diesel to determine if air is being applied to the distributor when the EDG is at rated speed. This instrumentation will be removed if and when a management decision is made that it is no longer needed.

V. ADDITIONAL INFORMATION

A. Component Failures

None

B. Previous Similar Events

LER 87-028-01

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(5-92)

U.S. NUCLEAR REGULATORY COMMISSION

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Chronology of Events: October - December, 1993

Oct. 19 Plant in cold shutdown for Refueling Outage 15. OST-404 performed on EDG-B, but was aborted when frequency could not be adjusted properly.

Oct. 20 OST-404 performed satisfactorily on EDG-B.

Oct. 20 OST-404 performed satisfactorily on EDG-A.

Oct. 25 EDG-B fails to start during OST-163 (SI Test)

Oct. 26 EDG-B starts during performance of OST-163.

Oct. 26 Broken springs found in Air Start Distributor.

Oct. 27 EDG-B starts during performance of OST-163.

Oct. 29 New springs installed in EDG-B Air Start Distributor.

Oct. 29 EDG-B starts during performance of OST-401.

Nov. 8 EDG-A and EDG-B successfully complete OST-401, and set at 480 Volts.

Nov. 11 EDG-A and EDG-B Generator Control Panels painted. Voltage adjustment knob inadvertently turned.

Nov. 17 H. B. Robinson taken to cold shutdown condition.

Nov. 22 EDG-A fails to come up to required voltage during OST-401.

Nov. 22 0644 hours: EDG-B fails to start during OST-401.

Dec. 7 EDG-B spring failure identified after a successful start.

Dec. 9 Independent evaluation concluded that Air Start Check Valve could have contributed to Oct. 25 and Nov. 22 failures to start.

Dec. 21 EDG-B Air Start Distributor replaced. Old distributor shipped to consultant for analysis.

Dec. 23 Consultant completes analysis. Failure mechanism identified.

Jan. 9 EDG-A Air Distributor installed.