Dennis R. Madison
Vice President - Hatch

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SOUTHERN COMPANY

May 8, 2012

Docket Nos.: 50-321

NL-12-0930

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

Edwin I. Hatch Nuclear Plant
Licensee Event Report 2012-002-00
Failure of 1C EDG Output Breaker to Close
Results in Condition Prohibited by Technical Specifications

Ladies and Gentlemen:

In accordance with the requirements of 10CFR50.73(a)(2)(i)(B), Southern Nuclear Operating Company hereby submits the enclosed Licensee Event Report concerning an event of non-compliance with Technical Specification 3.8.1 for the failure of the 1C emergency diesel generator (EDG) output breaker to close during a plant shutdown for refueling.

This letter contains no NRC commitments. If you have any questions, please contact Mr. B. D. McKinney at (205) 992-5982.

Respectfully submitted,

D. R. Madison
Vice President – Hatch

DRM/SBT/msc

Enclosure: LER 2012-002-00

cc: Southern Nuclear Operating Company
Mr. S. E. Kuczynski, Chairman, President & CEO
Mr. D. G. Bost, Executive Vice President & Chief Nuclear Officer
Mr. D. R. Madison, Vice President – Hatch
Mr. B. L. Ivey, Vice President – Regulatory Affairs
Mr. B. J. Adams, Vice President – Fleet Operations
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U. S. Nuclear Regulatory Commission
Mr. V. M. McCree, Regional Administrator
Mr. P. G. Boyle, NRR Senior Project Manager - Hatch
Mr. E. D. Morris, Senior Resident Inspector – Hatch

Enclosure

NL-12-0930

Edwin I. Hatch Nuclear Plant – Unit 1

Licensee Event Report 2012-002-00

Failure of 1C EDG Output Breaker to Close
Results in Condition Prohibited by Technical Specifications

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resources@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Edwin I. Hatch Nuclear Plant Unit 1	05000 321	1 OF 5

4. TITLE
Failure of 1C EDG Output Breaker to Close Results in Condition Prohibited by Technical Specifications

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	10	2012	2012	- 002 -	00	05	08	2012	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE
4

10. POWER LEVEL
0

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☒ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Edwin I. Hatch / Steven Tipps – Principal Engineer – Licensing	912-537-5880

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	EK	BKR	W120	Yes					

14. SUPPLEMENTAL REPORT EXPECTED

☒ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☐ NO

15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
	8	16	2012

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

During the performance of the 1C emergency diesel generator (EDG) loss of offsite power (LOSP) logic system functional test (LSFT), on March 10, 2012, at 2350 EST, the EDG output breaker failed to close and supply power to the 1G 4kV bus. This failure resulted in the inability to energize the 1G bus and the safety-related buses fed by this bus. The operating crew attempted to restore normal power to the bus, but was unsuccessful. A DC ground indication was also received when the 1C EDG output breaker failed to close. Troubleshooting revealed a connecting screw on the circuit breaker auxiliary switch making contact between terminals 8 and 10, creating a fault between the DC positive and negative when the LOSP test permissive was applied to the closing circuit for the 1C EDG output breaker. This short prevented the output breaker closing coil from functioning as required.

The direct cause for the failure of the breaker to close is attributed to an apparent vendor quality issue associated with the breaker that occurred at the vendor facility during the manufacturing/assembly process. This involved the installation of a screw on an auxiliary switch termination that penetrated the insulation of an adjacent lug, thereby creating a short circuit condition that could only be manifested during an LOSP condition. The breaker was replaced and testing was performed to confirm the output breaker "close" permissive functioned as required. The condition was reviewed for applicability to 10 CFR 21 and determined to not be a 10 CFR 21 condition.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
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NARRATIVE

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

During the performance of the 1C emergency diesel generator (EDG)(DG) loss of offsite power (LOSP) logic system functional test (LSFT), on March 10, 2012, at approximately 2350 EST, with Unit 1 in a refueling outage in cold shutdown (Mode 4), the EDG output breaker (EK) failed to close and supply power to the 1G 4kV bus. This failure resulted in the inability to energize the 1G bus and the safety-related loads fed by this bus. The operating crew attempted to restore normal power to the bus, but was unsuccessful. A DC ground indication was also received when the 1C EDG output breaker failed to close. There was an indicated ground on the positive leg of the 125 VDC battery system associated with this diesel generator. Initial attempts to isolate the ground were unsuccessful until the ground indication cleared during tagout of the circuit containing the undervoltage relay (EK) approximately 4 hours later. Additionally, the 125 VDC control power breaker for the normal and alternate supply breakers to the 1G 4kV bus was also opened during the same interval in which the ground cleared. An undervoltage relay (27GDX) in the closing circuit for the 1C EDG output breaker was subsequently determined to have experienced arcing during the breaker closure failure. Later it was determined that this short damaged the 1C EDG undervoltage relay in addition to preventing the closure of the output breaker. Subsequent to the "breaker close" failure, attempts to re-energize 4kV bus 1G from the normal supply breaker were unsuccessful with that breaker closing and then immediately tripping. The nature of the failure of the 1C EDG output breaker to close was determined to be limited to the condition that resulted in a grounded condition as a result of the relay failure which was subsequent to the electrical short that was created by a fault between the DC positive and negative when the LOSP test permissive was applied to the closing circuit for the 1C EDG output breaker.

CAUSE OF EVENT

The direct cause for the failure of the breaker to close is attributed to an apparent vendor quality issue associated with the breaker that occurred at the vendor facility during the manufacturing/assembly process. Troubleshooting revealed a connecting screw on the circuit breaker auxiliary switch making contact between terminals 8 and 10, creating a short between the DC positive and negative when the LOSP test permissive was applied to the closing circuit for the 1C EDG output breaker which prevented the closing coil from functioning properly. The apparent manufacturing/assembly error involved the installation of a screw on an auxiliary switch termination by the vendor that penetrated the insulation of an adjacent lug, thereby creating a short circuit condition that could only be manifested during an LOSP condition.

The root cause investigation and final report has not yet been completed and will address further technical and organizational causes as they are identified. Based on the results of this investigation a revision to this report will be submitted. The condition was reviewed for applicability to 10 CFR 21 and determined to not be a 10 CFR 21 condition.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This event is reportable as required by 10CFR50.73(a)(2)(i)(B), in that an event and associated condition occurred and existed that was prohibited by the Technical Specifications (TS) LCO 3.8.1, requiring the 1C EDG to be operable during the preceding operating cycle. The breaker containing the breaker auxiliary switch quality issue had a receipt inspection performed in February 2004. The receipt inspection involved visual inspection and complete preventive maintenance (PM) being performed on the

breaker that included checks of the cam, links, continuity tests and resistance checks with satisfactory results. This PM was developed based on direction from the vendor to the level of detail used by the vendor in performing similar PM and inspections in their shop. Because of the nature of the internal short caused by the vendor quality issue, functional tests consistent with plant procedures and industry best practices did not identify the presence of the short circuit condition. At the time of this receipt inspection the latent manufacturing/assembly quality issue was present.

The affected breaker was initially installed in the safety related 1E 4kV switchgear as the normal supply breaker, which is fed by the 1A EDG during LOSP conditions. When installed in this breaker location, the shorted points within this cubicle logic are both connected to DC negative and as a result did not affect the breaker function since there was no potential difference. The LOSP LSFT for the 1A EDG was performed March 2004 and every 24 months thereafter with no problems noted.

The affected breaker remained installed as the normal supply breaker for the 1E 4kV switchgear normal supply breaker until the Unit 1 2010 refueling outage. When the LOSP LSFT for the 1C EDG was performed on 3/11/2010, the affected breaker was having PM performed on it and was not installed at that time. Following the PM on the breaker that included a visual inspection, continuity checks of the switch, and performance of a hi-pot test on the auxiliary switch and contacts, it was functionally tested in accordance with the normal functional test requirements for a 4kV breaker prior to installation in the field with no problems noted. The breaker containing the apparent breaker auxiliary switch quality issue was then placed into the 1G 4kV switchgear as the alternate supply breaker on 3/16/2010. It should be noted that the circuit containing the shorted connection was not in the logic string for normal EDG testing and loading of the EDG that is performed on a monthly basis. Only during the LOSP LSFT would the affected logic string be in the circuit. During the 2012 1C EDG LOSP LSFT the latent condition manifested itself when the shorted circuit was made up during the test. This condition prevented the 1C EDG output breaker from closing and re-energizing the 1G 4kV switchgear. As a result this latent condition has existed since 3/16/2010 which would have prevented the automatic closure of the 1C EDG output breaker in the event of an LOSP condition during that operational window. The condition was discovered during the Unit 1 2012 refueling outage at a time when the 1C EDG was not required to be operable, but a review of the condition and associated timeline was performed and it was determined that the condition had existed for a time frame greater than that allowed by the TS.

This event occurred during the performance of routine TS surveillance testing of EDG 1C during the Unit 1 refueling outage during which time the 1C EDG was not one of the EDGs required to be operable. The 1A and 1B EDGs were operable at the time the 1C EDG failed to tie to its emergency bus. During the preceding operating cycle the 1A EDG was inoperable on three occasions ranging from approximately 34 hours to 101 hours not considering the very brief periods of inoperability during monthly surveillance testing. The 1B EDG was inoperable on 10 occasions ranging from approximately 8 hours to 126 hours not considering the very brief periods of inoperability during monthly surveillance testing. At no time during the operating cycle were both the 1A and 1B EDGs inoperable at the same time. With either the 1A or 1B EDG inoperable and given the fact that the 1C EDG could not tie to its emergency bus due to the latent equipment problem, there were periods of time during the preceding operating cycle when two of the three Unit 1 EDGs were inoperable. In determining the impact of this condition on nuclear safety a review was performed to determine what the impact would be of having periods of time when one diesel was operable and available to perform the required safety function in the event of a design basis accident involving an loss of coolant accident (LOCA)/LOSP.

The methods and models used to analyze the consequences of the LOCA/LOSP have been refined during the plant lifetime in the form of the SAFER/GESTR-LOCA analysis. This analysis provides results and consequences associated with the LOCA using realistic evaluation methods as documented in the FSAR. The SAFER/GESTR-LOCA analyses were performed with a bounding maximum average planar heat generation rate at the most limiting power and exposure combination and concluded that the peak clad temperature for the nominal or expected case is insufficient to

cause perforation of the fuel cladding. As a result no cladding perforations were considered for the LOCA and no fuel damage results. This analysis concludes that the reactor can be brought to a cold shutdown condition and maintained in that condition on a long term basis with either two RHR low pressure coolant injection (LPCI) pumps or one core spray pump and one LPCI pump. The 1A EDG provides power for the 'A' LPCI pump, the 'A' RHRSW pump and the 'A' core spray pump. The 1B EDG serves the 'C' and 'D' RHR LPCI pumps and 'C' RHRSW pump. The 1C serves the 'B' LPCI pump, the 'B' core spray pump, and the 'B' and 'D' RHRSW pumps. Either the 1A or 1B EDG can provide the needed low pressure pumps and RHRSW pump(s) to satisfy the minimum assumptions in the SAFER/GESTR-LOCA analysis for Unit 1. For this reason there was no loss of function on Unit 1 during the previous operating cycle.

The 1G 4kV bus also provides normal emergency power to the Unit 2 'B' RHR LPCI valve load center which contains the 'B' LPCI injection valve. The 1E 4kV bus provides the normal emergency power to the Unit 2 'A' RHR LPCI valve load center that contains the 'A' LPCI injection valve. The alternate emergency power supply for the Unit 2 'A' RHR LPCI valve load center is provided by the Unit 2 2F 4 kV bus which requires a manual alignment to use this power source for the desired valve load center.

During the previous operating cycle, the 1A EDG was inoperable on three occasions ranging from approximately 34 hours to 101 hours not considering the very brief periods of inoperability during monthly surveillance testing. The 1A EDG provides emergency power to the 1E 4kV bus that provides the normal emergency power to the Unit 2 'A' RHR LPCI valve load center. Prior to removing the 1A EDG from service for planned maintenance, plant procedures required the Unit 2 2F 4kV bus to be realigned to provide the alternate emergency power to the Unit 2 'A' RHR LPCI valve load center. The same SAFER/GESTR-LOCA analysis for Unit 2 assumes the presence of the same combination of low pressure pumps in order to automatically restore reactor vessel inventory and to bring the unit to cold shutdown and allow it to be maintained long term in that condition. In the case of a DBA LOSP/LOCA on Unit 2 and an LOSP on Unit 1 with the 1A and 1C EDGs inoperable, both Unit 2 core spray pumps remain operable and will recover Unit 2 reactor vessel inventory and allow the reactor to be safely shut down. With the LOCA/LOSP occurring on Unit 2, the swing EDG would normally be realigned to provide power to the Unit 2 2F 4kV bus and therefore restore alternate emergency power to the Unit 2 'A' LPCI load center. However, in the assumed condition the 1A EDG is out of service for maintenance and the 1C EDG output breaker will fail to close. For these reasons the swing EDG will remain dedicated to Unit 1 to maintain this unit in a safe condition during LOSP conditions. Based on the nature of the direct cause for the 1C EDG output breaker failing to close, Operations would identify this condition on the 1C EDG and their procedures provide the needed direction to manually close the 1C EDG output breaker. Based on discussions with licensed Operations personnel this could be reasonably expected to be accomplished within 1 to 2 hours from the occurrence of the event. This action restores the Unit 2 'B' RHR LPCI/shutdown cooling flow path before reaching the conditions necessary to allow shutdown cooling to be placed into service. Once RHR shutdown cooling has been placed into service the reactor will be brought to cold shutdown and maintained in that condition.

During the previous operating cycle, when either the 1A or 1B EDG was inoperable there was always one of these EDGs that would remain operable and capable of performing its safety function on Unit 1. Additionally, based on the discussion in the previous paragraph, if a design basis LOCA had occurred on Unit 2 along with an LOSP on both units when the 1A EDG was inoperable, there would be no loss of safety function on Unit 2. In the event that the swing EDG was inoperable with the same conditions present the Unit 2 'A' RHR LPCI load center would continue to have its emergency power source operable which also assures there is no loss of safety function on Unit 2. Based on the nature of the direct cause for the 1C EDG output breaker failing to close, Operations procedures provide the needed direction to allow closure of the 1C EDG output breaker in a matter of 1 to 2 hours thereby providing additional margin in the event of a design basis accident (DBA) LOSP/LOCA condition for either unit.

Based on the fact that the safety function is retained with one EDG on Unit 1 and considering the impact this would have on Unit 2 should the events described actually occur during the previous operating cycle, there was always one Unit 1 EDG operable and adequate low pressure pumps operable on Unit 2 such that this event did not result in a loss of function on either unit. This being the case the event was determined to be of low safety significance.

CORRECTIVE ACTIONS

The LOSP/LOCA LSFT was successfully completed that demonstrated that the 1C EDG output breaker would close as required to perform its safety function. The breaker was replaced by a different breaker and testing of the circuit that had previously contained the apparent latent manufacturing/assembly quality issue was performed to confirm the output breaker "close" permissive functioned as required. Similar breakers on the remaining Unit 1 emergency 4kV switchgear were inspected to confirm the manufacturing/assembly quality issue was not present on these breakers. Plans are to inspect the safety related Unit 2 breakers in an upcoming outage. A search of industry operating experience and contact with the vendor revealed no similar conditions in the industry that caused a similar failure. Based on the information learned thus far this condition is considered to be isolated to the breaker that failed to function.

The root cause investigation and final report have not yet been completed and will address further technical and organizational causes as they are identified, and will result in additional corrective actions. Based on the results of this investigation a revision to this report will be submitted.

ADDITIONAL INFORMATION

Other Systems Affected: None

Failed Components Information: None

Commitment Information: This report does not create any new permanent licensing commitments.

Previous Similar Events