H. L. Sumner, Jr.
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SOUTHERN COMPANY
Energy to Serve Your World℠

December 21, 2005

Docket No.: 50-321

NL-05-2224

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

Edwin I. Hatch Nuclear Plant
Licensee Event Report
Main Transformer Failure Causes Turbine Trip and Reactor Scram

Ladies and Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a)(2)(iv)(A), Southern Nuclear Operating Company is submitting the enclosed Licensee Event Report (LER) concerning a main transformer failure which resulted in a turbine trip and a subsequent reactor scram.

This letter contains no NRC commitments. If you have any questions, please advise.

Sincerely,

H. L. Sumner, Jr.

HLS/OCV/daj

Enclosure: LER 1-2005-002

cc: Southern Nuclear Operating Company
Mr. J. T. Gasser, Executive Vice President
Mr. G. R. Frederick, General Manager – Plant Hatch
RTYPE: CHA02.004

U. S. Nuclear Regulatory Commission
Dr. W. D. Travers, Regional Administrator
Mr. C. Gratton, NRR Project Manager – Hatch
Mr. D. S. Simpkins, Senior Resident Inspector – Hatch

NRC FORM 366 (1-2001) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1(@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 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.

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TITLE (4)
Main Transformer Failure Causes Turbine Trip and Reactor Scram

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) 05000
10	29	2005	2005	002	00	12	21	2005		DOCKET NUMBER(S) 05000

OPERATING MODE (9)	1
POWER LEVEL (10)	100%

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

20.2201(b)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
20.2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)
20.2203(a)(1)	50.36(c)(1)(i)(A)	X 50.73(a)(2)(iv)(A)	73.71(a)(4)
20.2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)
20-2203(a)(2)(ii)	50.36(c)(2)	50.73(a)(2)(v)(B)	OTHER
20-2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iv)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	
20.2203(a)(2)(v)	50.73(a)(2)(i)(B)	50.73(a)(2)(vii)	
20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)	
20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Kathy A. Underwood, Performance Analysis Supervisor, Plant Hatch	(912) 537-5931

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	EA	XFMR	G080	Yes					

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 10/29/2005 at 1330 EST, Unit 1 was in the Run mode at an approximate power level of 2804 CMWT (100 percent rated thermal power). At that time, the reactor tripped on turbine control and stop valve fast closures. The turbine and generator tripped when the main power transformer experienced a fault which resulted in a main generator neutral ground overcurrent lock-out. Following the reactor scram, water level decreased due to void collapse from the rapid reactor pressure increase, reaching a minimum of approximately sixteen inches below instrument zero (about 142 inches above the top of the active fuel). The decrease in water level resulted in closure of the Group 2 primary containment isolation valves per design. The operating reactor feedwater pump restored level to its design set point. Reactor pressure peaked at approximately 1145 psig, resulting in all eleven main steam safety relief valves opening as designed to reduce pressure.

The event was caused by an internal fault in the main power transformer. Heat from the fault resulted in an explosive rupture of the transformer shell at its top edge, and a subsequent fire within the transformer. A Notice of Unusual Event was declared, and the installed fire suppression system along with the on-site fire brigade extinguished the fire. The transformer was replaced, and all systems and components affected by the fire or the transformer fault were inspected and repaired.

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 10/29/2005 at 1330 EST, Unit 1 was in the Run mode at a power level of 2804 CMWT (100 percent rated thermal power). At that time, the reactor automatically tripped on turbine control and stop valve (EIIS Code TA) fast closures caused by main turbine (EIIS Code TA) and main generator (EIIS Code TB) trips. The turbine and generator tripped when the main power transformer (EIIS Code EA) experienced a fault which resulted in a main generator neutral ground overcurrent lock-out. The main power transformer is a generator step up transformer, 24kv to 230kv. Actuation of this lockout generated direct turbine and generator trip signals and the main turbine and generator tripped per design. These trips resulted in fast closure of the turbine control and stop valves. Fast closure of either the turbine control valves or stop valves is a direct input to the reactor protection system (EIIS Code JC).

Following the automatic reactor trip, vessel water level decreased due to void collapse from the rapid reactor pressure increase. Water level reached a minimum of approximately 16 inches below instrument zero (about 142 inches above the top of the active fuel) resulting in closure of the Group 2 primary containment isolation valves (EIIS Code JM). The operating reactor feedwater pump (EIIS Code SJ) recovered reactor vessel water level, restoring level to between 23 and 48 inches above instrument zero for the remainder of the event. Level did not decrease to the point of a Group 1 isolation. Therefore, the main steam isolation valves remained open throughout the event.

Vessel pressure reached a maximum value of 1145 psig after receipt of the reactor trip. This pressure is within the band of the electronic actuation setpoints as well as the pressure relief setpoints for the safety/relief valves (S/RVs) (EIIS Code SB). Consequently, all eleven of the S/RVs actuated properly to reduce reactor pressure. The Low Low Set function armed and operated to initially reduce reactor pressure and controlled reactor pressure down to 847 psig. Since the main steam isolation valves (EIIS Code SB) remained open, the main turbine bypass valves (EIIS Code JI) functioned to control vessel pressure thereafter.

CAUSE OF EVENT

This event was caused by an internal fault in the main power transformer. An ongoing investigation is underway by station personnel to determine the root causes of the internal fault.

In March 2005, a trend was identified of increasing dissolved gas in the main power transformer oil, and bi-weekly oil sampling was initiated. In July 2005, daily oil samples were begun to monitor the gas levels and the rate of gas formation. On two occasions (09/08 through 09/12/05 and 10/17 through 10/25/05), the transformer was connected to an on-line oil processing skid to reduce total dissolved gas levels. An oil sample taken the morning of the failure indicated no unusual gas levels or rates of gas formation.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This report is required by 10 CFR 50.73 (a)(2)(iv)(A) because of the unplanned actuation of reportable systems. Specifically, the reactor protection system actuated on turbine control valve and stop valve fast closure when both the main turbine and generator tripped following the detection of a fault in the main power transformer. Group 2 primary containment isolation valves closed and all eleven safety/relief valves opened on high vessel pressure; four of the valves continued to operate in the low-low set mode until pressure decreased to their respective closure setpoints.

Fast closure of the turbine control and stop valves is initiated from the main turbine and generator trips. The valves close as rapidly as possible to prevent overspeed of the turbine-generator rotor. Valve closing causes a sudden reduction in steam flow that, in turn, results in a reactor vessel pressure increase. If the pressure increases to the pressure relief setpoints, some or all of the safety/relief valves will briefly discharge steam to the suppression pool (EIIS Code BL).

Reactor scram initiation by turbine control or stop valve fast closure prevents the core from exceeding thermal hydraulic safety limits following a main turbine trip. Closure of the valves results in the loss of the normal heat sink (main condenser, EIIS Code SQ) thereby increasing reactor pressure, neutron flux, and heat flux transients that must be limited. A reactor scram is initiated on the valve fast closures in anticipation of these transients. The reactor trip ensures that the minimum critical power ratio safety limit is not exceeded.

In this event, the main turbine and generator tripped when the main generator experienced a neutral ground overcurrent lock-out. The turbine and generator trips actuated the reactor protection system and scrammed the reactor. All required safety systems functioned as expected given the water level and pressure transients caused by the turbine, generator and reactor trips. Vessel water level was maintained well above the top of the active fuel throughout the transient.

Based upon the preceding analysis, it is concluded this event had no adverse impact on nuclear safety. The analysis is applicable to all power levels.

CORRECTIVE ACTIONS

The main power transformer was removed from service and taken to an on-site storage area for further inspection. Cause analysis will proceed under the plant corrective action program. A replacement transformer was installed, and all equipment and structures affected by the transformer failure and associated fire were inspected, replaced or repaired. The main generator was returned on line 11/15/05.

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		YEAR	SEQUENTIAL YEAR	REVISION NUMBER	
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TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

ADDITIONAL INFORMATION

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

This LER does not contain any licensing commitments.

Failed Component Information:

Master Parts List Number: 1S11-S001
Manufacturer: General Electric
Serial Number: H409280
Type: Transformer
Manufacturer Code: G080

EIIS System Code: EA
Reportable to EPIX: Yes
Root Cause Code: X
EIIS Component Code: XFMR

The most recent previous similar events in which the reactor tripped automatically while critical were reported in the following Licensee Event Reports:

50-321/2001-002, dated 03/29/2001
50-366/2001-002, dated 10/26/2001
50-366/2001-003, dated 12/25/2001

Corrective actions for these previous similar events could not have prevented this event because they involved different components and were the result of different direct causes.

The main power transformer has been in service for approximately thirty years. In 1990, during a Spring reactor refueling outage, a planned, routine inspection found loose or missing wood blocking in the transformer. It was removed from service for one reactor operating cycle to make internal repairs, with a spare transformer installed in its place. During the next refueling outage, in September 1991, the repaired transformer was put back in place.

In January 1996, the transformer experienced unexpected rates of gas formation and levels of concentration. A reactor refueling outage occurred in March 1996, and the transformer was removed from service. An internal inspection of the transformer found a loose flux shield ground connector. Repairs were made and the transformer was returned to service prior to the refueling outage completion.