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March 17, 2006

Docket No.: 50-366

NL-06-0330

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

Edwin I. Hatch Nuclear Plant - Unit 2  
Licensee Event Report  
Component Failure leads to Inoperability of the HPCI System

Ladies and Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a)(2)(v), Southern Nuclear Operating Company is submitting the enclosed Licensee Event Report (LER) concerning a Failed Analog Transmitter Trip System component that resulted in an inoperable High Pressure Coolant Injection System.

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

Sincerely,

A handwritten signature in black ink that reads "Lewis Sumner". The signature is written in a cursive, flowing style.

H. L. Sumner, Jr.

HLS/OCV/daj

Enclosure: LER 2-2006-001

cc: Southern Nuclear Operating Company  
Mr. J. T. Gasser, Executive Vice President  
Mr. D. R. Madison, 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

**LICENSEE EVENT REPORT (LER)**

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

Estimated burden per response to comply with this mandatory collection request: 50 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 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [infocollects@nrc.gov](mailto:infocollects@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.

1. FACILITY NAME Edwin I. Hatch Nuclear Plant - Unit 2	2. DOCKET NUMBER 05000-366	3. PAGE 1 OF 5
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4. TITLE  
Component Failure in an ATTS Card Leads to Inoperability of HPCI System

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER(S)
01	16	2006	2006	001	0	3	17	2006	FACILITY NAME	05000
									FACILITY NAME	DOCKET NUMBER(S) 05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § : (Check all that apply)			
	20.2201(b)	20.2203(a)(3)(i)	50.73(a)(2)(i)(C)	50.73(a)(2)(vii)
Mode 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. POWER LEVEL  72%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	OTHER Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME Edwin I. Hatch / Kathy A. Underwood, Performance Analysis Supervisor	TELEPHONE NUMBER (Include Area Code) (912) 537-5931
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	BJ	PB	G082	Y	X	BJ	PB	G082	Y

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE		
YES (If yes, complete 15. EXPECTED SUBMISSION DATE)	X NO		MONTH	DAY
				YEAR

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

On 01/16/2006 at 18:31 EST, Unit 2 was in the Run mode at a power level of 2023 CMWT (72 percent rated thermal power). At that time, several annunciators alarmed and the 2E41-F003, High Pressure Coolant Injection (HPCI) system Steam Supply Outboard Isolation Valve began to close rendering HPCI inoperable. Operations personnel closed valves 2E41-F002 and 2E41-F003, primary containment isolation valves, per the requirements of the Annunciator Response Procedure (ARP) and entered the appropriate Technical Specifications Conditions and Required Actions.

This event was caused by component failure. The 2E41-N658D ATTS card failed resulting in a low voltage signal to the 2E41-N660B ATTS card which initiates a HPCI isolation on High Differential Pressure. Subsequently, the 2E41-F003 began to close due to HPCI isolation signal from the 2E41-N660B ATTS card. The 2E41-F003 and 2E41-F002 valves were closed at this time per the Annunciator Response Procedures which ensured complete isolation of the associated Primary Containment Penetration. The voltage transient from the 2E41-N658D card also resulted in damage to the 2E41-N658B ATTS card. Personnel inspected and checked calibration on related ATTS cards and replaced the two failed cards. After the failed ATTS cards were replaced, valves 2E41-F002 and 2E41-F003 were opened, and the appropriate functional testing was completed. The HPCI system was declared operable at 05:44 EST on 01/17/2006.

**LICENSEE EVENT REPORT (LER)**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Edwin I. Hatch Nuclear Plant - Unit 2	05000-366	2006	-- 001	-- 00	2 OF 5

**17. NARRATIVE** (If more space is required, use additional copies of NRC Form 366A)

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor  
 Energy Industry Identification System codes appear in the text as (EIIIS Code XX).

DESCRIPTION OF EVENT

On 01/16/2006 at 18:31 EST, Unit 2 was in the Run mode at a power level of 2023 CMWT (72 percent rated thermal power). Unit 2 Control Room received ECCS/RPS Division 2 Trouble annunciator. The alarm came in at 18:31 and immediately cleared. The same annunciator came in approximately 15 seconds later and remained in the annunciated state. The following annunciators then came in:

1. HPCI Turbine Trip Solenoid Energized
2. HPCI Isolation Trip Logic B Initiated
3. HPCI Isolation Valves 2E41-F002 and 2E41-F003 Not Fully Open
4. HPCI Steam Line Diff Press High

The HPCI Steam Line Diff Press High annunciator remained in the alarmed state for approximately 1 to 2 seconds and then reset. 2E41-F003 (HPCI Steam Line Outboard Isolation Valve) began closing automatically. At that time HPCI was rendered inoperable (HPCI, EIIIS Code BJ). Per the Annunciator Response Procedure (ARP), the switches for the 2E41-F003 and 2E41-F002 HPCI isolation valves were placed in the closed position. Personnel were dispatched to the ATTS panels to investigate problems associated with the Division 2 ATTS cards. No problems were noted with 2E41-N657B, 2E41-N660B, and 2E41-N658D at ATTS cabinet 2H11-P926. 2E41-N658B (HPCI Steam Line Low press) was downscale and had no indicating lights lit (status or gross failure). Secondary Containment parameters were normal. No radiation, leak detection, or sump level alarms were received during this event.

I&C personnel inspected the 2E41-N658B ATTS card and the transistor (VR1) was reported hot. 2E41-N658B was reading downscale and did not have any light indication. After removing the card, I&C personnel noted a small burn mark on the card in the location where the card inserts into the bus. The card was replaced and operated as expected. Following replacement of 2E41-N658B, card 2E41-N658D was removed and inspected. Visual inspection of 2E41-N658D revealed that a capacitor was burnt and a somewhat larger burn mark was observed in the rear near the bus. However, no damage was observed on the bus. The N658D card was subsequently replaced and operated as expected. Following the replacement of cards N658B and N658D, Master Trip Unit 2E41-N657B (HPCI Steam Line High Differential Pressure) and Slave Trip Unit 2E41-N660B cards were removed and inspected. Visual inspection revealed no damage to these cards. Nevertheless, these cards were also calibrated and all parameters were found in tolerance. Procedure 34SO-E41-001-2, High Pressure Coolant Injection (HPCI) System, was performed to return the system to standby. Required Action Statements (RAS) 2-06-007 and 2-06-008 were terminated and HPCI was declared operable at 05:44 EST on 01/17/2006.

**LICENSEE EVENT REPORT (LER)**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Edwin I. Hatch Nuclear Plant - Unit 2	05000-366	2006	-- 001	-- 00	3 OF 5

**17. NARRATIVE** (If more space is required, use additional copies of NRC Form 366A)

CAUSE OF EVENT

This event was caused by component failure. The most plausible scenario for the event is the ceramic input capacitor (C26) on the 2E41-N658D ATTS card partially shorted, opened, then fully shorted. During the full short, the capacitor pulled the voltage down on at least the last four components (cards) of the daisy chained circuit. This reduced voltage caused the 2E41-N660B to initiate a false "HPCI STEAM LINE DIFF PRESSURE HIGH" alarm after its three-second time delay. The trip of the 2E41-N660B card caused the HPCI isolation. Two seconds later the input capacitor (C26) failed (opening the connection) resulting in the 2E41-N658D indication and voltage returning to normal. When the voltage returned to normal, the "HPCI STEAM LINE DIFF PRESS HIGH" cleared and a step change in voltage was applied to 2E41-N658B. This voltage step change to the 2E41-N658B card caused a capacitor to fail (short) on the card. This caused the VR1 transistor collector to emitter to short, resulting in the card indication being down scale.

Only alarms associated with the previously discussed ATTS cards were received. Calibration of cards 2E41-N657B and N660B revealed all parameters to be within tolerance. Therefore, the extent of the failure is limited to cards 2E41-N658B and N658D. The damaged cards have been replaced and are responding as expected.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This event is reportable per 10 CFR 50.73 (a)(2)(v) because an event occurred in which the HPCI system, a single train safety system, was rendered inoperable.

The HPCI system consists of a steam turbine-driven pump and the necessary piping and valves to transfer water from the suppression pool or the condensate storage tank (EISS Code KA) to the reactor vessel. The system is designed to inject water to the reactor vessel over a range of reactor pressures from 160 psig through full rated pressure. The HPCI system starts and injects automatically whenever low reactor water level or high drywell pressure indicates the possibility of an abnormal loss of coolant inventory. The HPCI system, in particular, is designed to replace lost reactor coolant inventory in cases where a small line break occurs which does not result in full depressurization of the reactor vessel.

The backup for the HPCI system is the Automatic Depressurization System (ADS) together with two low pressure injection systems: the Low Pressure Coolant Injection (LPCI, EISS Code BO) system and the Core Spray (EISS Code BM) system. The Core Spray system is composed of two independent, redundant, 100 percent capacity subsystems. Each subsystem consists of a motor driven pump, its own dedicated spray sparger located above the core, and piping and valves to transfer water from the suppression pool to the sparger. Upon receipt of an initiation signal, the Core Spray pumps in both subsystems start. Once ADS has reduced reactor pressure sufficiently, Core Spray system flow begins.

**LICENSEE EVENT REPORT (LER)**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Edwin I. Hatch Nuclear Plant - Unit 2	05000-366	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 5
		2006	-- 001	-- 00	

**17. NARRATIVE** *(If more space is required, use additional copies of NRC Form 366A)*

LPCI is an operating mode of the Residual Heat Removal (EIS Code BO) system. There are two independent, redundant, 100 percent capacity LPCI subsystems, each consisting of two motor driven pumps and piping and valves to transfer water from the suppression pool to the reactor vessel. Upon receipt of an initiation signal, all four LPCI pumps automatically start. Once ADS has reduced reactor pressure sufficiently, the LPCI flow to the reactor vessel begins.

In this event, the HPCI system was rendered inoperable upon the automatic closure of valve 2E41-F003. The operators subsequently placed the switches for both isolation valves, 2E41-F003 and 2E41-F002, in the closed position. This effectively isolated the HPCI turbine steam supply thus preventing the isolation valves from performing their intended function to open to supply steam to the HPCI Turbine. During the time the HPCI system was inoperable, however, the Reactor Core Isolation Cooling (RCIC, EIS Code BN) system was available to inject high pressure water into the reactor vessel. Although not an emergency core cooling system, the RCIC system is designed, maintained, and tested to the same standards and requirements as the HPCI system and therefore should reliably inject water into the reactor vessel when required. If a break exceeded the capacity of the RCIC system (400 gallons per minute), the ADS was available to depressurize the reactor vessel to the point that either the Core Spray or LPCI systems could have been used to provide water to the reactor core. The capacity of one loop of the Core Spray system is equal to that of the HPCI system (4250 gallons per minute each); the capacity of one loop of the LPCI system is approximately three times that of the HPCI system. Therefore, any one of the four loops of the low pressure injection systems would have provided sufficient injection capacity for a small break loss-of-coolant accident.

Based on this analysis, it is concluded that this event had no adverse impact on nuclear safety. This analysis is applicable to all power levels and operating modes in which a loss-of-coolant accident is postulated to occur.

**CORRECTIVE ACTIONS**

Maintenance personnel replaced failed ATTS cards 2E41-N658B and 2E41-N658D. Operations personnel performed procedure 34SO-E41-001-2, High Pressure Coolant Injection (HPCI) System, to ensure proper operation of the replaced cards as well as verify proper system alignment for placing HPCI in standby. Operations personnel then terminated the associated Required Action Statements. HPCI was declared operable at 05:44 EST on 01/17/2006.

Hatch also performed an operating experience review which revealed a very low failure rate, and thus a high reliability, for Hatch ATTS cards. As result of this review, SNC believes this is an isolated event, not indicative of a declining trend.

**LICENSEE EVENT REPORT (LER)**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Edwin I. Hatch Nuclear Plant - Unit 2	05000-366	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 5
		2006	-- 001	-- 00	

**17. NARRATIVE** (If more space is required, use additional copies of NRC Form 366A)

ADDITIONAL INFORMATION

Other Systems Affected: No systems other than those already mentioned in this report were affected by this event.

Failed Components Information:

Component 1

Master Parts List Number: 2E41-N658B  
 Manufacturer: General Electric  
 Model Number: 184C5988G101  
 Type: Board, Printed Circuit  
 Manufacturer Code: G082

EIIS System Code: BJ  
 Reportable to EPIX: Yes  
 Root Cause Code: X  
 EIIS Component Code: PB

Component 2

Master Parts List Number: 2E41-N658D  
 Manufacturer: General Electric  
 Model Number: 184C5988G101  
 Type: Board, Printed Circuit  
 Manufacturer Code: G082

EIIS System Code: BJ  
 Reportable to EPIX: Yes  
 Root Cause Code: X  
 EIIS Component Code: PB

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

Previous Similar Events: There are no similar events in the last two years in which a single-train safety system was rendered inoperable.