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

Edwin I. Hatch Nuclear Plant - Unit 1
Licensee Event Report
Failed Relay Coil Results in Unexpected
Actuations of Engineered Safety Features

Ladies and Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a)(2)(iv), Southern Nuclear Operating Company is submitting the enclosed Licensee Event Report (LER) concerning a failed relay coil resulting in unexpected actuations of engineered safety features.

Respectfully submitted,

Lewis Sumner

H. L. Sumner, Jr.

IFL/eb

Enclosure: LER 50-321-2000-003

cc: Southern Nuclear Operating Company
Mr. P. H. Wells, Nuclear Plant General Manager
SNC Document Management (R-Type A02.001)

U.S. Nuclear Regulatory Commission, Washington, D.C.
Mr. L. N. Olshan, Project Manager - Hatch

U.S. Nuclear Regulatory Commission, Region II
Mr. L. A. Reyes, Regional Administrator
Mr. J. T. Munday, Senior Resident Inspector - Hatch

IE22

NRC FORM 366 (06-1998) U.S. NUCLEAR REGULATORY COMMISSION

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. Forward comments regarding burden estimate to the Information and Records Management Branch (T-6 F33), 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. If a document 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)

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

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

TITLE (4)
Failed Relay Coil Results in Unexpected Actuations of Engineered Safety Features

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
01	29	2000	2000	003	00	02	22	2000		DOCKET NUMBER(S) 05000

OPERATING MODE (9)	4
POWER LEVEL (10)	0

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

20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(vii)
20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(ix)
20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
20.2203(a)(2)(ii)	20.2203(a)(4)	X 50.73(a)(2)(iv)	OTHER
20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Steven B. Tipps, Nuclear Safety and Compliance Manager, Hatch	(912) 367-7851

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	JM	RLY	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 1/29/2000 at approximately 1530 EST, Unit 1 was in cold shutdown with the residual heat removal shutdown cooling system in service. At that time, a relay coil failed, resulting in opening a fuse in the reactor protection system power supply to the primary containment isolation system control logic. The open fuse caused several engineered safety features to actuate. Several valves in the Group 1 and Group 2 primary containment isolation system closed automatically, and the mechanical vacuum pump tripped, as well as the steam packing exhaust blower. Licensed personnel verified the actuations by procedure. The fuse was subsequently replaced, and the affected valves were returned to their pre-event configurations.

The cause of this event was a failed relay coil. When the relay coil developed a short circuit, the fuse in its power supply experienced high current and opened as expected for high current. The cause of the failed relay coil appears to be related to problems experienced previously with this type of relay, a General Electric CR120A. The relay is installed in an application where it is continuously energized. After many years of this service, the windings of the coil began to short circuit turn-to-turn, leading to overheating and eventual failure.

Corrective actions for this event included replacing the fuse and the failed relay. In addition, the SNC response to General Electric Services Information Letter 229 will be reviewed by 8/31/2000.

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 1/29/2000, Unit 1 was in cold shutdown with the residual heat removal shutdown cooling system in service. At that time, shift personnel in the control room smelled the odor of an overheated electrical component and called electricians to investigate. When the electricians arrived, they located the source, relay 1A71B-K67 in control room panel 1H11-P623. Since the shutdown cooling system has isolation logic located in this panel, the relay logic could not be de-energized without first determining the potential effect on shutdown cooling. While discussions were ongoing, a short circuit occurred in the relay, resulting in fuse 1A71B-F22 opening. This occurred at approximately 1530 EST.

When the fuse opened, it actuated a portion of logic in the small-bore Group 1 and outboard Group 2 of the primary containment isolation system (PCIS) (EIIS Code JM). The systems powered through this fuse use fail-safe logic; that is, the systems are designed to revert to their "safe" or accident positions upon loss of power or control signal. However, since the plant was in the cold shutdown condition at the time, most of the equipment actuations that normally would have occurred had already been completed. The Group 1 valves that automatically closed were the outboard main steamline drain valve and the outboard reactor water sample valve. The Group 2 systems that experienced valve closures were the drywell leak detection system (EIIS Code IJ), the suppression pool air purge and ventilation lines (EIIS Code VB), the post-accident sampling system (EIIS Code IP), and the drywell floor drain valves (EIIS Code IJ). Also, indication was lost on the drywell floor drain valves because the fuse that supplies their actuation signal supplies the indicating lights. In addition to the safety-related components already mentioned, the mechanical vacuum pump (EIIS Code SH) and the steam packing exhaust blower (EIIS Code TC) tripped. With the exception of the drywell floor drain valves, control room personnel verified that expected actuations occurred. After the fuse was replaced, the light indication on the drywell floor drain valves was restored, and personnel confirmed at that time that the valves had closed as required.

At 1734 EST, a link in the circuit supplying the failed relay was opened, which allowed the fuse to be replaced. After this, all affected valves were returned to their pre-event lineups. The failed relay did not perform a safety-related function; its only function is to provide a trip signal to the mechanical vacuum pump and steam packing exhauster.

CAUSES OF EVENT

This event was caused by component failure. A failed relay resulted in a short circuit which caused a fuse to open, resulting in the actuations listed previously.

The failure of the relay appears to be related to problems experienced generically with General Electric -type CR120A relays as explained in General Electric Services Information Letter (SIL) 229, dated April, 1994. This SIL addresses failures of GE-type CR120A relays that meet several criteria, including a date of manufacture before May 1974, continuously energized service, and a coil voltage rating below the actual in situ voltage of its application. This relay fits all these criteria. The date stamp indicated a pre-1974 age. The coil had a 115-volt rating, and it was installed in a 120-volt logic application where it remained continuously energized. It was found blackened in the two areas where the electric power wires connect to the coil. Upon disassembly, the coil areas beneath the connections were found to be burned and embrittled. After removing some of the insulation around the coil, melting was evident where the coil wires had shorted turn-to-turn.

Despite these facts, some data were inconsistent with previous experience. The failed relay had been subjected to periodic examination by thermography and did not show the expected signs of impending failure. Per the above-mentioned GE SIL, a pre-1974 relay should be replaced at the next opportunity if the working temperature of its coil is 95°C (203°F) or higher. Hatch put a relay monitoring process in place in accordance with the SIL recommendations, with thermography readings taken in April 1998 showing the relay at 80.6°C (177°F). Subsequent readings taken in November 1998 and again in November 1999 showed the relay at 75°C (167°F) and 66.1°C (151°F), respectively. Therefore, based on thermography readings, a failure of the relay coil was unexpected. The relationships between coil temperature and expected life, as given in GE SIL 229, are stated below. (These data apply to relay coils manufactured prior to May 1974.)

Coil Temperature °C (°F)	Expected Life
<76 (<169°F)	None stated in SIL
76 - 80°C (169 - 176°F)	20 - 30 years
81 - 85°C (178 - 185°F)	15 - 20 years
86 - 90°C (187 - 194°F)	10 - 15 years
91 - 95°C (196 - 203°F)	5 - 10 years
>95°C (>203°F)	Replace at next opportunity

Site practice on relay coil replacement is based on the guidance provided in the SIL, but also incorporates a factor for conservatism by replacing relays if they show a temperature of 82°C (180°F) or higher. The relay involved in this event showed a maximum temperature of 80.6°C in April 1998; thus, it had a worst-case expected life of 20 - 30 years. Based on the two most recent thermography results and the guidance provided in the SIL, the expected life of the relay was indefinite.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This event is reportable per 10 CFR 50.73(a)(2)(iv) because unplanned actuations of engineered safety features occurred. Specifically, several outboard valves in the Group 1 and Group 2 PCIS closed automatically upon receipt of a signal that resulted from an open fuse.

The primary containment isolation system is designed to close valves in pipes penetrating the containment boundary when the possibility of a leak is indicated. The PCIS valves (PCIVs) are divided into several groups, each group sharing similar characteristics. Group 1 PCIVs are those which communicate directly with the reactor coolant system, including the main steamline isolation valves, the main steamline drain valves, and the reactor water sample valves. Group 2 PCIVs are those which communicate with the primary containment atmosphere but typically not with the reactor coolant system. In general, PCIVs are controlled by logic whose design is "fail-safe;" that is, the valves are maintained in the open position by a continuously energized control circuit and automatically shift to their safe or emergency configuration upon loss of power or control signal.

In this event, a failed relay coil resulted in a fuse being opened in the reactor protection system logic supplying control signals to the Group 1 and Group 2 PCIS valves previously mentioned. Upon loss of power, all affected valves performed their design function by isolating the containment as required. No other actuations were associated with this event. When the fuse was replaced, all safety-related components were restored to their pre-event configurations.

Based on the foregoing analysis, it is concluded that this event had no adverse impact on nuclear safety. This analysis bounds all operating conditions.

CORRECTIVE ACTIONS

1. The opened fuse was replaced and affected components were restored to their pre-event status.
2. The failed relay was replaced with a new relay.
3. A review of the SNC response to SIL 229 will be performed to determine if more actions need to be taken than are recommended by the SIL based on the findings associated with this event. This review will be completed by August 31, 2000.

ADDITIONAL INFORMATION

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

2. Failed Components Information:

Master Parts List Number:	1A71B-K67
Type:	Relay
Manufacturer:	General Electric
Model Number:	CR120A04002AA
Manufacturer Code:	G080
EIIS System Code:	JM
EIIS Component Code:	RLY
Cause Code:	X
Reportable to EPIX:	Yes

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

4. Previous Similar Events: One event in which a fuse opened and resulted in unplanned actuations of engineered safety features has been reported in the past two years. That event was reported in LER 50-321/1998-002, dated April 28, 1998. In that event, the cause of the fuse opening was not identified. Hence, no corrective actions that would have prevented this event were implemented. No events involving a failure of a CR120 relay have been reported in the past two years.