10 CFR 50.73

Virginia Electric and Power Company
Surry Power Station
P. O. Box 315
Surry, Virginia 23883

January 29, 1993

U. S. Nuclear Regulatory Commission
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Washington, D. C. 20555

Serial No.: 93-047
Docket No.: 50-280
License No.: DPR-32

Gentlemen:

Pursuant to Surry Power Station Technical Specifications, Virginia Electric and Power Company hereby submits the following Licensee Event Report for Unit 1.

REPORT NUMBER

50-280/93-001-00

This report has been reviewed by the Station Nuclear Safety and Operating Committee and will be reviewed by the Corporate Management Safety Review Committee.

Very truly yours,

M. R. Kansler
Station Manager

Enclosure

cc: Regional Administrator
Suite 2900
101 Marietta Street, NW
Atlanta, Georgia 30323

Mr. M. W. Branch
NRC Senior Resident Inspector
Surry Power Station

IE22

NRC FORM 366 (6-89) | U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104). OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Surry Power Station Unit 1	0 5 0 0 0 2 8 0	1 OF 0 7

TITLE (4) Reactor Trip and Safety Injection Due to Spurious High Consequence Limiting Safeguards Signal Caused by Malfunctioning Relay

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 NAMES	DOCKET NUMBER(S)
0 1	0 8	9 3	9 3	- 0 0 1	- 0 0	0 1	2 9	9 3		0 5 0 0 0
										DOCKET NUMBER(S) 0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	[X] 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 (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	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	TELEPHONE NUMBER
M. R. Kansler, Station Manager	AREA CODE 8 0 4 3 5 7 - 3 1 8 4

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

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	
X	JE	RLY	W120	Y							
X	IG	RI	W120	Y							

SUPPLEMENTAL REPORT EXPECTED (14)

[ ] YES (If yes, complete EXPECTED SUBMISSION DATE)	[X] NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

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

On January 8, 1993 at 1729 hours, with Unit 1 operating at 100% power, a reactor trip and safety injection occurred due to spurious initiation of the train "A" high consequence limiting safeguards (Hi-CLS). The spurious signal was generated during troubleshooting by either a loose negative lead or an intermittently closing contact on relay 3/4-CLS-1A. On January 9, 1993 at 0722 hours, with Unit 1 at hot shutdown, a spurious initiation of train A safety injection occurred during testing after replacement of relay 3/4-CLS-1A. The spurious signal was caused by testing prior to removal of a temporary modification (electrical jumper). After both spurious actuations, operators used the appropriate procedures to stabilize the unit. Failed components were replaced and a root cause evaluation was conducted. An engineering evaluation will be performed to identify single point failures which can cause spurious actuations. Circuitry modifications and relay preventive maintenance will be evaluated. A drawing error will be corrected and the event will be discussed in safety evaluation training. This report is required by 10 CFR 50.73(a)(2)(iv).

1.0 - DESCRIPTION OF THE EVENT

On January 8, 1993 at 1729 hours, with Unit 1 operating at 100% power, a reactor trip and safety injection occurred due to spurious initiation of the train "A" high consequence limiting safeguards (Hi-CLS) [EIIS: JE].

Prior to the spurious Hi-CLS signal, surveillance testing of the train A Hi-CLS logic had been in progress in accordance with procedure 1-PT-8.4, "Consequence Limiting Safeguards (Hi Train)". The channels I and II portions of this test had been completed satisfactorily. Following testing of channel III with a circuit test switch in the test position, the "test terminate" pushbutton was depressed but the logic did not return to the normal mode. At 1425 hours, the eight hour action statement in effect for surveillance testing was exited and a twelve hour action statement was entered in accordance with Technical Specification (TS) 3.7.C, Action 14, due to the inoperable train A Hi-CLS logic. Troubleshooting was initiated to determine if relay 3-CLS-1AM [EIIS: JE, RLY] was energizing as required to enable the train A Hi-CLS logic to return to normal (See Figure 1). The troubleshooting involved depressing and holding the test terminate pushbutton while checking the circuitry required to energize relay 3-CLS-1AM. When the "CLS reset" pushbutton was depressed simultaneously with the test terminate pushbutton and the logic did not return to normal, it was concluded that the test switch was not the cause of the malfunction. It was determined that the malfunction was in another part of the circuit, most likely in contact 9 of relay 3/4-CLS-1A [EIIS: JE, RLY] . Voltage readings taken across contact 9 indicated either no voltage was being supplied to the contact or that the contact was closed. The electricians removed their voltmeter probes from the contacts and exited the relay cabinet to evaluate their readings. Following this action, with the test terminate pushbutton still depressed, the spurious train A Hi-CLS signal occurred and train A safety injection actuated as designed.

Following the train A Hi-CLS signal and safety injection, the following safety systems automatically actuated as designed: train A and B reactor trip generated by the safety injection signal (all control rods inserted into the core), turbine trip, trip of both main feedwater pumps and feedwater isolation, phase 1 and 2 containment isolation, start of both motor driven auxiliary feedwater pumps, start of the turbine-driven auxiliary feedwater pump on low-low steam generator water level, discharge of one bank of the main control room air bottles, start of emergency filtered exhaust fan 1-VS-F-58A and associated ventilation damper alignment, start of emergency diesel generator No. 1 (loading was not required), and AMSAC. In addition, operators manually initiated reactor trip, turbine trip, and safety injection in accordance with emergency operating procedure 1-E-0, "Reactor Trip or Safety Injection". This caused train B safety injection actuation and the following automatic safety system initiations: start of emergency filtered exhaust fan 1-VS-F-58B and associated ventilation damper alignment,

1.0 - DESCRIPTION OF THE EVENT (CONT'D)

discharge of the second bank of the main control room air bottles, and start of emergency diesel generator No. 3 (loading was not required). Safety systems functioned as designed except for source range neutron flux monitor N-31 [EIIS: IG, RI], which did not indicate as expected after its high voltage power supply re-energized following the reactor trip.

On January 9, 1993 at 0722 hours, with Unit 1 at hot shutdown, a spurious initiation of train A safety injection occurred during testing after replacement of relay 3/4-CLS-1A. Following recovery from the January 8, 1993 reactor trip, troubleshooting of the Hi-CLS circuitry had continued. A temporary modification (TM), consisting of a jumper across contact 2 of safety injection actuation relay CR-CLS-1A1, had been installed to maintain the train A safety injection signal in order to prevent additional spurious safety injection signals from occurring during troubleshooting. Relay 3/4-CLS-1A was replaced. Testing of the train A Hi-CLS was then performed with the jumper in place to prevent a spurious safety injection signal in the event relay 3/4-CLS-1A was not the only problem in the circuit. After completion of testing, when the test terminate pushbutton was depressed, the train A safety injection signal occurred.

Following the safety injection signal, the following automatic actuations occurred as designed: train A safety injection, trip of the running main feedwater pump, start of both motor-driven auxiliary feedwater pumps, discharge of one bank of the main control room air bottles, start of emergency filtered exhaust fan 1-VS-F-58A and associated ventilation damper alignment, and start of emergency diesel generator No. 1 (loading was not required). Safety injection was not manually initiated following the automatic initiation because the operators correctly diagnosed that the signal was spurious.

This report is required by 10 CFR 50.73(a)(2)(iv), because automatic and manual engineered safety features actuations took place.

2.0 - SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS

The Hi-CLS signal is designed to actuate safety injection and other engineered safety features systems upon receipt of a high containment pressure signal indicative of a loss of primary or secondary coolant inside containment. Although the Hi CLS signal and the safety injection signal in this event were not caused by an actual high containment pressure condition, plant systems functioned to place the plant in a safe and stable condition. Source range neutron flux monitor N-32 was operable and capable of

2.0 - SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS (CONT'D)

performing its safety functions. There were, therefore, no adverse consequences to public health and safety.

3.0 - CAUSE OF THE EVENT

A root cause evaluation determined that the January 8, 1993 Hi CLS initiation was caused by intermittent cycling of relay 3-CLS-1AM. This relay is normally energized and de-energizes on a Hi-CLS signal. It is de-energized during logic testing and is re-energized at the conclusion of testing by depressing the test terminate pushbutton. During the troubleshooting steps, relay 3-CLS-1AM energized, resulting in the test switch returning to normal because the test terminate pushbutton was being held in. It then quickly de-energized, initiating the train A Hi-CLS and safety injection as designed. The root cause evaluation team identified two conditions which could have caused the spurious cycling.

First, the negative lead on relay 3/4-CLS-1A was found to be loose during relay replacement. The loose connection could have caused an intermittent cycling of relay 3-CLS-1AM, since the negative terminal of 3-CLS-1AM was wired to the negative terminal of 3/4-CLS-1A.

The second condition was high resistance across contact 9 on relay 3/4-CLS-1A, which could cause an intermittent cycling of relay 3-CLS-1AM. The high resistance was caused by oxidation and dust accumulation.

The failure of source range neutron detector N-31 to indicate was due to a short circuit condition across the center conductor and the inner shield of its signal cable. The short circuit was determined to be internal to the detector and was the result of age-related degradation.

The January 9, 1993 safety injection initiation was caused by testing the Hi-CLS logic before removing the jumper installed to maintain the train A safety injection signal. Testing before removal of the jumper was the result of cognitive error by licensee engineering personnel.

During preparation and review of the TM and associated safety evaluation, it was decided that testing should be performed with the protection of the jumper. This decision was based on the understanding that a failure of the test switch had possibly contributed to the spurious Hi-CLS actuation and that the jumper would prevent additional actuations. During the Hi-CLS actuation on January 8, 1993, personnel at the relay cabinet had not seen or heard relay 3-CLS-1AM cycle. This relay is required to

3.0 - CAUSE OF THE EVENT (CONT'D)

energize in order for the test switch to return to normal. Since the personnel at the cabinet did not detect any cycling of relay 3-CLS-1AM, their first indication of the Hi-CLS actuation was the sound of the test switch unlatching and returning to normal. This led to the belief that the test switch may have returned to normal without the required relay actuation. The sequence of events recorder later showed that relay 3-CLS-1AM had actually cycled twice within a 0.3 second interval. Therefore, the relay actuation had occurred but was not detected.

The NSSS vendor elementary diagram for safety injection was reviewed to determine if testing before jumper removal would create any adverse effects. This drawing indicated that no spurious actuations would occur; however, the drawing did not show contact 2 of test switch TS-CLS-1A, which is in series with the jumpered contact. The test switch contact initiated the spurious safety injection signal when it was opened then re-closed, which de-energized then re-energized the safety injection output relay, during the testing sequence. The station elementary diagram for Hi-CLS correctly shows the two contacts in series.

4.0 - IMMEDIATE CORRECTIVE ACTIONS

Following the Hi-CLS actuation and the safety injection actuation, operators used the appropriate emergency operating procedures to stabilize the plant. The shift technical advisor reviewed the critical safety function status trees to ensure plant parameters remained within safe bounds.

5.0 - ADDITIONAL CORRECTIVE ACTIONS

A multi-discipline root cause evaluation team was formed to investigate the event.

Relay 3/4-CLS-1A and source range / intermediate range detector assembly N-31/N-35 were replaced. Evaluations of the causes of the component failures were conducted.

After completion of the required repairs, testing, and post-trip reviews, Unit 1 was restarted. The unit was critical at 0701 hours and on line at 1507 hours on January 11, 1993.

6.0 - ACTIONS TO PREVENT RECURRENCE

Single point relays (relays whose failure could cause spurious safety system actuations) will be identified. The feasibility of modifying circuitry to remove single point failures will be evaluated.

6.0 - ACTIONS TO PREVENT RECURRENCE (CONT'D)

Preventive maintenance and/or periodic replacement of these relays will be evaluated.

The incomplete NSSS vendor elementary diagram will be updated.

The event will be discussed in training sessions for safety evaluation preparers and reviewers.

7.0 - SIMILAR EVENTS

Licensee Event Report 50-280/88-029: A reactor trip and safety injection occurred due to spurious initiation of train A Hi-CLS during performance of a periodic test. The spurious Hi-CLS initiation was caused by failure of a contact in relay 3-CLS-1AM to close when the test terminate pushbutton was depressed. The relay was replaced.

8.0 - ADDITIONAL INFORMATION

Failed Components:

a. Westinghouse Model BFD44S relay

b. Westinghouse Source and Intermediate Range Detector Assembly - Part No. WL 23823

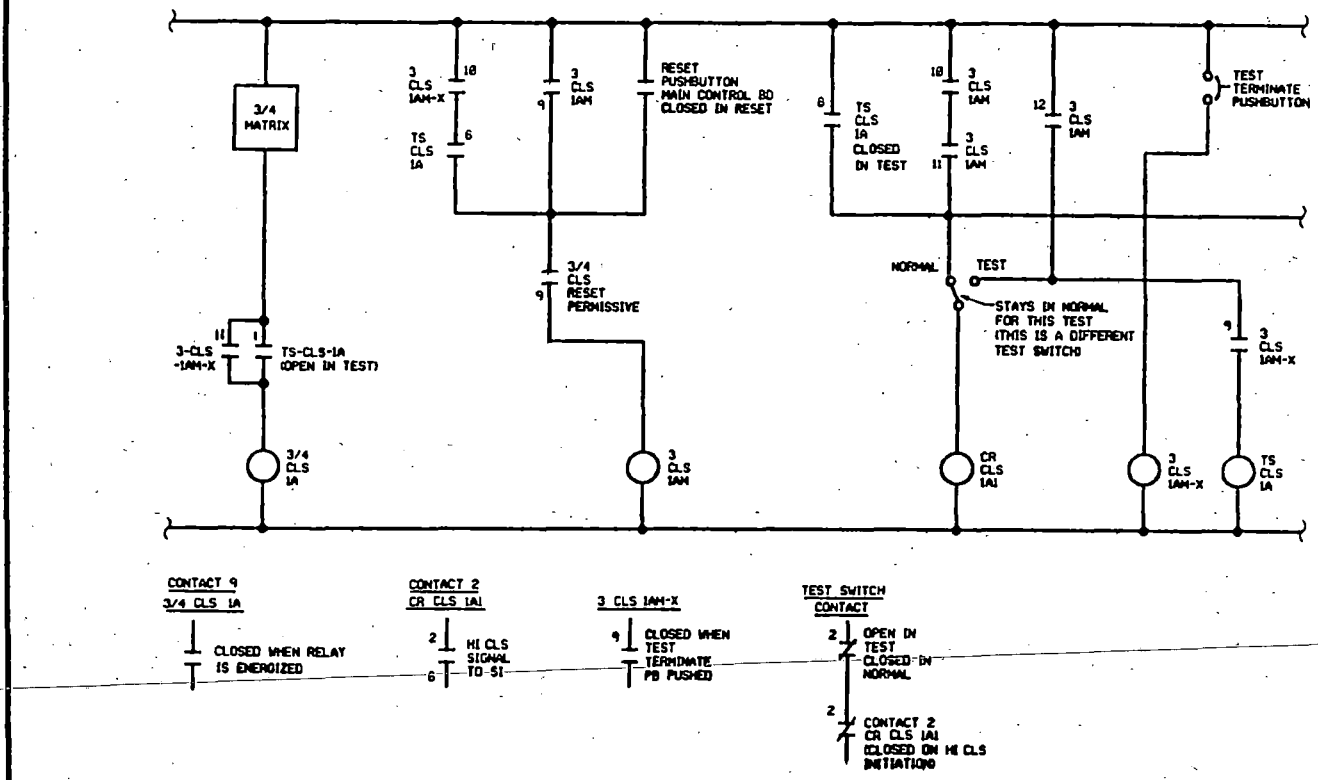

Figure 1

Hi-CLS Simplified Logic Schematic