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April 4, 1994

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

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant  
Unit No. 2; Docket No. 50-318; License No. DPR 69  
Licensee Event Report 94-002  
Inadvertent ESFAS Actuation Due to Less Than Adequate Self  
Verification

The attached report is being sent to you as required under 10 CFR 50.73 guidelines. Should you have any questions regarding this report, we will be pleased to discuss them with you.

Very truly yours,

CHC/CLS/bjd  
Attachment

cc: D. A. Brune, Esquire  
J. E. Silberg, Esquire  
R. A. Capra, NRC  
D. G. McDonald, Jr., NRC  
T. T. Martin, NRC  
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Director, Office of Management Information  
and Program Control

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**LICENSEE EVENT REPORT (LER)**

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNEB 7714), 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.

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

FACILITY NAME (1) <b>Calvert Cliffs, Unit 2</b>	DOCKET NUMBER (2) <b>05000 318</b>	PAGE (3) <b>1 OF 06</b>
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TITLE (4)  
**Inadvertent ESFAS Actuation Due to Less Than Adequate Self Verification**

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)
03	05	94	94	-- 002 --	00	04	04	94		05000
										05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (Check one or more) (11)								
		20.402(b)		20.405(c)	X	50.73(a)(2)(iv)		73.71(b)		
POWER LEVEL (10)	100	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
		20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)				(Specify in Abstract below and in Text, NRC Form 366A)
		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 <b>C. D. Sly, Compliance Engineer</b>	TELEPHONE NUMBER (include Area Code) <b>410-260-4858</b>
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-space typewritten lines) (16)

On March 5, 1994 Calvert Cliffs Unit 2 experienced an inadvertent engineered safety feature actuation during a Technical Specification required monthly logic test. The actuation occurred when an incorrect logic module was manually actuated during the test. The Unit was at 100 percent power at the time of the event.

The causes of the event have been identified as less than adequate use of our established self verification process and poor human factors configuration of the engineered safety features actuation system logic modules. No nuclear safety consequences resulted from this event.

Corrective actions include re-emphasizing expectations to restart the self-verification process if interrupted and evaluation of the need for human factors enhancements to the labeling and demarcation of the logic cabinets. This event has also been discussed with Operation Shift Crews to re-emphasize expectations and responsibilities of those performing important evolutions.

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TEXT (if more space is req. use additional copies of NRC Form 366A) (17)

## I. DESCRIPTION OF EVENT

On March 5, 1994 at 0256 hours, Calvert Cliffs Unit 2 experienced an inadvertent engineered safety feature (ESF) actuation during a monthly Technical Specification required ESF logic test. The actuation occurred when an incorrect logic module test button was manually depressed during the monthly logic test. The logic module immediately was reset and all affected plant equipment was restored to normal. The actuation had minimal impact on plant operations. Although a Containment Spray Pump was started, it did not discharge water into the Containment. It's isolation valve remained closed, as designed, because there was no Containment High Pressure Signal present. At the time of the event the Unit was in Mode 1 at 100 percent power.

Surveillance Test Procedure (STP) O-7A-2, "'A' Train Engineered Safety Features Logic Monthly Test," is a Technical Specification required functional test of the logic circuitry of the Engineered Safety Features Actuation System (ESFAS). On March 5, 1994, this surveillance was planned to include the first three sections:

- 6.1, SIAS A-1 Logic Test
- 6.2, SIAS A-2 Logic Test
- 6.3, SIAS A-3, SIAS A-7 and RAS A-1 Logic Test

Performing the surveillance were four NRC licensed individuals:

A "dedicated" Senior Reactor Operator (SRO) having overall control of the evolution and was the procedure reader.

Another SRO to activate the test trips on the safety injection actuation signal (SIAS) logic modules.

A Reactor Operator (RO) responsible for initiating a test trip signal on the SIAS Sensor Modules.

Another RO in the Control Room to verify the actuations and realign the systems following each test.

Surveillance Test Procedure (STP) O-7A-2 involves first establishing the initial conditions for the logic module to be tested. Because this test actually starts the equipment controlled by the modules, precautions are taken to ensure equipment is operated safely such as verifying the mini-flow recirculation paths are lined up (to prevent the pump operating without flow). To initiate an

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actuation, the RO in the Cable Spreading Room would depress and hold the test button on the SIAS Sensor Module. The SRO would then momentarily depress the SIAS Test button for the module to be tested. These actions would complete the 2 out of 4 logic requirement to actuate the module. The RO in the Control Room would then verify all equipment started as prescribed in the procedure. These actions are completed for each of the four independent circuit channels (ZD, ZE, ZF and ZG) with the following exception: pumps and valves are allowed to start and reposition themselves only with the actuation of the first channel tested. Their position is locked in for the remaining three channels to minimize the starts and stops.

On March 5, the first two sections of the procedure had been completed and Section 6.3 was in progress. In preparation for testing the A-7 module, the RO was directed to depress and hold the Sensor Module test button for channel ZF. The SRO was then directed to momentarily depress the A-7 Test 1 button. His verification process included ensuring the proper panel (AL), the proper module (A-7) and the proper test button (Test 1) while allowing adequate time for the dedicated SRO to correct any errors. Just as the button was to be pushed, all the SIAS test lights did not illuminate as the SRO expected distracting his attention to the RO holding in the sensor module test button. The blinking of these lights is an indication of intermittent contact of the sensor test switch. Once normal indications were re-established, he returned his attention to the Test 1 button, saw that his finger had drifted to the adjacent Test 2 button. He compensated by moving his finger one button to the right and depressed a Test 1 button before the dedicated SRO could act to stop him. Unfortunately, this Test 1 button was for the adjacent A-8 module causing an actuation of a module outside of the planned sequence.

The error was recognized immediately. The reset button was depressed removing the ESFAS signal from the affected components. Equipment that did start was immediately secured by the RO in the Control Room.

The apparent cause of the distraction was intermittent switch contacts in the SIAS Sensor Module. Issue Reports were written and submitted to document the intermittent switch and the error in execution of the procedure.

II. CAUSE OF EVENT

A formal root cause analysis was performed on this issue. This analysis identified the following causes contributed to this event.

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- A. The SRO manipulating the test buttons exercised less than adequate self verification. The verification process should have been re-performed following a distraction.
- B. The dedicated SRO having overall control of the evolution missed an opportunity to prevent the inappropriate action by failing to stop the testing sequence when abnormal indications were experienced. When the intermittent indicating lights disrupted the flow of the STP, the evolution should have been suspended until the problem was resolved.
- C. The poor human factors configuration of the SIAS modules is a contributing cause to this event. The poor labeling and demarcation between modules with the close proximity of the test pushbuttons presents a challenge to effective man-machine interface.

### III. ANALYSIS OF EVENT

There are no nuclear safety consequences to this event. Actuating the SIAS A-8 Logic Module placed it in the tripped position. The equipment controlled by this module was performing its intended function. No components of ESFAS were rendered inoperable by this event.

Of the components started with the actuation of the A-8 SIAS Logic Module, No. 21 Containment Spray Pump poses the greatest potential risk to safety if its flow would be enabled to the Unit 2 Containment. This potential safety significance is minimized by the fact that another component must fail (valves leaking by) or another ESFAS module (high containment pressure) must trip coincident with the A-8 module to allow the isolation valve to open. This was again minimized by the short duration of the actuation and resultant pump run. The operator in the Control Room had the pump secured in a matter of seconds of being directed to secure it by the dedicated SRO.

The Operations Section at Calvert Cliffs has included the STAR (Stop, Think, Act, Review) program of Self Verification in their everyday watchstanding culture. The STAR program uses an action sequence that becomes a programmed response when the process becomes fully a part of an operators culture. Our implementation of this self verification technique has been effective in supporting our event free operation program. There are no generic implications to this event.



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This event is considered reportable in accordance with 10 CFR 50.73(a)(2)(iv), "Any event or condition that results in a manual or automatic actuation of any engineered safety feature (ESF)."

IV. CORRECTIVE ACTIONS

Immediate corrective action included resetting the logic module, restoring all affected plant equipment to a normal status, and initiating issue reports to document the intermittent contact of the sensor test switch and the error in procedural execution.

Actions to prevent recurrence of this event include the following:

- A. We re-emphasized expectations regarding our STAR program of self verification. Should the sequence of STAR be interrupted, the process must be restarted from the beginning in order to be effective.
- B. This event has been discussed with all of the Operations Shift Crews. The event was used as an example of a missed opportunity by the dedicated SRO to prevent the inappropriate action during the test under his direction. The event was also used to reinforce the procedural responsibilities of the dedicated SRO to ensure safe completion of the evolution being performed.
- C. We are evaluating the need for human factor enhancements to the labeling and demarcation lines on the ESFAS cabinets in our Cable Spreading Rooms.

V. ADDITIONAL INFORMATION

- A. Identification of Components Referred to in this LER

	IEEE 803 EIS Funct	IEEE 805 System ID
Engineered Safety Features	N/A	JE
Sensor	IMOD	JE
Logic Module	IMOD	JE
Containment Spray Pump	P	BE
Safety Injection Actuation System	N/A	BP, BQ, CB
Containment Spray Isolation Valve	V	BE

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B. Previous Similar Events

There have been no similar previous inadvertent ESPAS actuations since implementation of the STAR self verification process.

There have been several past LERs that occurred prior to the implementation of the STAR process that could have been prevented by the program. These LERs include the following:

- LER 317-89-003
- 317-89-004
- 317-90-03
- 318-85-13
- 318-90-01
- 318-90-02