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GENERAL MANAGER
CALVERT CLIFFS

April 26, 1991

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 91-002, Revision 00

Gentlemen:

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,

RED/MDM/bjd
Attachment

cc: D. A. Brune, Esquire
J. E. Silberg, Esquire
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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 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.

FACILITY NAME (1):

DOCKET NUMBER (2):

PAGE (3):

Calvert Cliffs, Unit 2

0 5 0 0 0 3 1 8 1 OF 0 7

TITLE (4) Engineered Safety Features Actuation System (ESFAS) Initiation Due to Operator
Error While Restoring ESFAS Logic Cabinet

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	27	91	91	002	000	04	26	91		05000
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11)										
OPERATING MODE (9)		20.402(b)		20.405(e)		X		50.73(a)(2)(iv)		73.71(b)
POWER LEVEL (10)		0100		20.405(a)(1)(i)				50.73(a)(2)(v)		73.71(a)
		20.405(a)(1)(ii)		50.36(a)(1)				50.73(a)(2)(vi)		OTHER (Specify in Abstract below and in Text, NRC Form 356A)
		20.405(a)(1)(iii)		50.36(a)(2)				50.73(a)(2)(vii)		
		20.405(a)(1)(iv)		50.73(a)(2)(i)				50.73(a)(2)(viii)(A)		
		20.405(a)(1)(v)		50.73(a)(2)(ii)				50.73(a)(2)(viii)(B)		
		20.405(a)(1)(vi)		50.73(a)(2)(iii)				50.73(a)(2)(ix)		

LICENSEE CONTACT FOR THIS LER (12)

NAME

TELEPHONE NUMBER

M. D. Milbradt, Compliance Engineer

AREA CODE

3 01 216 01 - 435 12

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

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 fifteen single-space typewritten lines) (16)

On March 27, 1991, at 11:51 a.m., an inadvertent Safety Injection Actuation Signal (SIAS) was initiated on Calvert Cliffs Unit 2. The incident occurred while utility licensed operators were attempting to re-energize the Engineered Safety Features Actuation System (ESFAS) Actuation Logic Cabinet. At the time of the event Unit 2 was in Cold Shutdown (MODE 5) with a Reactor Coolant System (RCS) temperature of 140 degrees Fahrenheit and a pressure of 220 psi. Unit 1 was operating at 100 percent power.

The root cause of the event was personnel error by the Senior Reactor Operator (SRO) who was directing the evolution. The SRO failed to fully comprehend two CAUTION statements contained within the procedure he was using and directed a Control Room Operator to perform steps out of order.

The inadvertent SIAS caused the closure of the Chemical and Volume Control System isolation valves and the start of a second charging pump. Shutdown Cooling was in-service maintaining RCS temperature and the High Pressure Safety Injection system was lined up for Low Temperature Over Pressure Protection. Both of these systems were unaffected by the SIAS activation.

Immediate corrective actions included counseling the operators and informing other personnel of the event. Continuing actions focus on improving procedure usage, pre-evolution briefings, involvement of supervisory personnel, and the content of procedures.

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TEXT (if more space is required, use additional forms)

I. DESCRIPTION OF EVENT

On March 27, 1991, at 11:51 a.m., an inadvertent Safety Injection Actuation Signal (SIAS) was initiated on Calvert Cliffs Unit 2. The incident occurred while utility licensed operators were attempting to re-energize the Engineered Safety Features Actuation System (ESFAS) AL Actuation Logic Cabinet. At the time of the event Unit 2 was in Cold Shutdown (MODE 5) with a Reactor Coolant System (RCS) temperature of 140 degrees Fahrenheit and a pressure of 220 psi. Unit 1 was operating at 100 percent power.

On Friday March 22, 1991, Engineering Test Procedure (ETP) 88-46 was performed to functionally test the ESFAS Diverse Scram System (DSS). While performing the ETP it was identified that the DSS Modules on Actuation Logic Cabinets A and B, and the DSS Sensor Module for Sensor Cabinet ZE required replacement.

On Wednesday March 27, 1991, at approximately 10:00 a.m. personnel from Instrument Maintenance (IM) requested permission from the Shift Supervisor on duty to work on the ESFAS. At the time of their request, operators were heating up the plant and progressing towards MODE 4. To avoid unnecessary safety system challenges while in MODEs requiring safety system operability, the Shift Supervisor decided to delay the heatup until work on the ESFAS was complete. An extra Senior Reactor Operator (SRO) on duty for startup and a Control Room Operator (CRO) were tasked with de-energizing/re-energizing the ESFAS Logic Cabinets to replace the DSS Logic Modules. Operations Instruction (OI)-34, Appendix E was used to de-energize the cabinet and OI-34, Appendix D was used to re-energize the cabinets. Appendix D also referred the operators to Appendix H to dial down the SIAS Pressurizer Pressure and Pressurizer Block setpoints to prevent initiation of SIAS during the cabinet re-energization.

At approximately 11:30 a.m. the SRO and the CRO went to the Unit 2 Cable Spreading Room to de-energize the ESFAS Logic Cabinets. When the operators arrived they found all four Sensor Modules for the SIAS Pressurizer Pressure were tripped and the SIAS trip signal was blocked by the Pressurizer Block logic. Since the plant was in cold shutdown at 220 psi, the operators expected to find the SIAS Pressurizer Pressure and Block modules in the condition found. The ESFAS is designed such that the SIAS Sensor Modules trip on a decreasing Pressurizer pressure at approximately 1740 psi and a SIAS signal is generated when 2 out of 4 modules trip. The block signal is manually initiated as pressure falls during a cooldown, before the SIAS setpoint is reached, when 3 out of 4 block modules trip at approximately 1785 psi.

The operators proceeded to de-energize the ESFAS AL Logic Cabinet per OI-34, Appendix E. ESFAS BL Logic Cabinet remained energized. The CRO stood at the ESFAS cabinet while the SRO read him the procedure and signed for the completed steps. Before starting the evolution, the CRO had reviewed Appendix E, but not D or H. The maintenance to replace the DSS Logic Module took approximately five

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minutes. The CRO reviewed Appendix D (re-energizing the cabinets) while the maintenance work was being performed.

The operators started Appendix D to re-energize the ESFAS AL Logic Cabinet after the DSS module was replaced. Step B.1 in Appendix D referred them to Appendix H to dial down the SIAS setpoints. The SRO called the Control Room and reported to the RO that he would be dialing down the SIAS and block potentiometers before re-energizing the Logic Cabinet. Steps 1-3 of Appendix H required the operators to dial down the potentiometers for all four SIAS Pressurizer Pressure Modules. Each step contained specific information that was to be applied to all four modules. A CAUTION statement before these steps stated, "Perform steps 1 through 3 for an individual Sensor Cabinet, repeating the steps for each subsequent Sensor Cabinet". A second CAUTION statement on the next page read, "The previous steps must be successfully completed for all four channels prior to continuing".

Steps 4-6 of Appendix H on the next page required the operators to dial down the potentiometers for all four Block Modules. The SRO was aware of the importance of dialing down a channel's SIAS Module before its Block Module, but interpreted the CAUTION statements to mean steps 1-3 had to be performed prior to performing steps 4-6 on any given Sensor Cabinet. The SRO directed the CRO to dial down the Sensor Cabinet ZD SIAS potentiometer and reset the Module. He then directed the CRO to dial down the Sensor Cabinet ZD Block potentiometer and reset the module. At this point, the operators had removed the SIAS trip and Block signals for Module ZD.

The SRO then directed the CRO to step 1 for Module ZE and they completed steps 1-4 for Module ZE. Step 4 removed the block signal from ZE's Sensor Block Module to the block logic. With two of the four block signals now removed, the three out of four logic required to maintain a valid block signal was no longer satisfied. Since the block signal was removed and SIAS Modules ZF and ZG were still tripped, a SIAS was generated on the energized BL Logic Cabinet.

The ESFAS actuation started a second Charging Pump and shut the Chemical and Volume Control System (CVCS) Letdown Isolation valves. This caused pressurizer level to increase by approximately 30 inches with a corresponding pressurizer pressure increase of 5 psi. Additionally, No. 21 and No. 12 Emergency Diesel Generators started and were secured a short time later. The RCS temperature remained constant with shutdown cooling in service. High Pressure Safety Injection was prevented from automatic start by the Low Temperature Over Pressure Protection (LTOP) controls that were in place.

This event resulted in an automatic ESFAS actuation and is reportable in accordance with 10 CFR 50.73(a)(2)(iv). There were no other components or systems which were inoperable and/or out of service which contributed to this event. No plant system or component failures resulted from this event.

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II. CAUSE OF EVENT

A Root Cause Analysis investigation was initiated after the event. The findings of this investigation indicated that the root cause of the event was personnel error by the SRO who was directing the evolution. Specifically, the SRO established a mindset on clearing the SIAS trip before removing the block which caused him to misunderstand the two CAUTION statements and fail to follow the procedure. The CAUTION statements require performing steps 1-3 for all four SIAS Pressurizer Pressure Modules prior to performing steps 4-6 on any Block Module.

The investigation identified several contributing causes including:

1. Tunnel Vision - Both the SRO and CRO concentrated on the details of the evolution and did not consider the overall intended results of their actions.
2. Poor Pre-evolution Briefing - The operators discussed why they were de-energizing the ESFAS Logic Cabinet and what procedure they would be using. They did not discuss the procedure in detail, nor did they do a step-by-step walk through or consider possible problems.
3. Inadequate Supervisory Method - Because the SRO was reading the procedure to the CRO at the ESFAS panel there was no independent oversight of the work being performed. He did not read the CAUTION statements to the CRO and the CRO was not reading along in the procedure. This resulted in one individual making a significant interpretation with no concurrence.
4. Procedure Content - The first CAUTION statement reads, "Perform steps 1 through 3 for an individual Sensor Cabinet, repeating the steps for each subsequent Sensor Cabinet". This CAUTION statement contains a directive and could have been written as a numbered step instead of a CAUTION statement.

III. ANALYSIS of EVENT

The inadvertent SIAS caused the closure of the CVCS isolation valves and the start of a second charging pump. The charging pump injected borated water into the RCS and raised pressurizer level approximately 30 inches. Additionally, No. 21 and No. 12 Emergency Diesel Generators started and were secured a short time later. Shutdown Cooling was in-service maintaining RCS temperature and the High Pressure Safety Injection system was lined up for LTOP conditions. This event did not challenge the integrity of the RCS, nor violate the limits of 10 CFR 50 Appendix G, "Fracture Toughness Requirements."

Had the event occurred during water solid plant operations, the charging pump flow would have caused an increase in RCS pressure until the Power Operated

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Relief Valves (PORVs) lifted. The PORVs would have rapidly reduced RCS pressure, preventing violation of 10 CFR 50 Appendix G limits. Administrative controls exist to maintain all but one charging pump out of service and all HPSI pumps and/or flow paths out-of-service during water solid conditions.

Based on the above, it is concluded that this event resulted in no significant safety consequences.

IV. CORRECTIVE ACTIONS

Immediate:

1. The SRO involved in this event received appropriate personnel actions as a result of his actions. The CRO involved was counseled for his actions.
2. To promptly inform Operations personnel of this event, an event summary was placed in the Operation's Night Orders. Additionally, a crew expectation sheet was generated and training on the event was administered to operations personnel.
3. Line Management held meetings with their personnel to clearly convey the philosophy regarding proper usage of procedures, pre-evolution briefings, and supervisory involvement.

Continuing:

1. To reinforce the proper usage of procedures so that personnel do not "blindly" follow procedures without fully understanding their actions, the written policies containing philosophy for procedure usage will be further clarified.
2. To ensure adequate pre-evolution briefings are held, written policies containing philosophy for pre-evolution briefings will be further clarified. Operations issued a pre-evolution briefing checklist through a memo and plans to incorporate the checklist into a procedure.
3. The involvement of supervisory personnel in key evolutions will be clearly established in a written statement of philosophy. The philosophy will not allow a supervisor to participate in tasks to the point that an error on his part will, in itself, prevent successful completion of a task.
4. To ensure procedures are written to be an effective tool in helping the user avoid serious errors, a self-assessment of our procedure writing process will be performed to determine if key concepts are being successfully implemented. These concepts include wording CAUTION statements to contain only information that needs to be emphasized but is

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not directive; ensuring the proper use of one procedure step for multiple channels is used appropriately; and providing assistance to the procedure user in understanding the purpose of actions during complex evolutions.

V. ADDITIONAL INFORMATION

A. Identification Of Components Referred To In This LER

	IEEE 803 EIIIS Funct.	IEEE 805 System ID
Reactor Coolant System	N/A	AB
Engineered Safety Features	N/A	JE
Safety Injection System	N/A	BP, BQ, CB
Chemical Volume Control System	N/A	CB
Pressurizer	PZR	AB
Sensor	IMOD	JE
Bistable module	IMOD	JE
Trip module	IMOD	JE
Isolation Valves	ISV	CB
High Pressure Safety Injection Pump	P	BQ
Low Pressure Safety Injection Pump	P	BP
Charging Pump	P	CB
Emergency Diesel Generator	DG	EK

B. There have been 6 previous events involving inadvertent ESFAS actuations caused by the use of procedures.

1. LER 317/85-04 reported an inadvertent SIAS actuation due to an inadequate procedure that occurred during steps to remove the SIAS Pressurizer pressure block signal.

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2. LER 317/85-05 reported an inadvertent ESFAS actuation due to not having the handswitch keys in the handswitches used for blocking an ESFAS signal prior to reaching the setpoint during plant cooldown.
3. LER 318/85-05 reported an inadvertent ESFAS actuation due to inadequate attention to a procedural precaution.
4. LER 318/85-013 reported an ESFAS actuation due to a failure to use the correct section of an Operating Instruction for energizing an ESFAS cabinet.
5. LER 317/89-003 reported a SIAS actuation due to personnel failure to follow a STP in a step-by-step fashion.
6. LER 317/89-004 reported a partial ESFAS actuation due to personnel inadvertently skipping two steps in procedure while re-energizing an ESFAS cabinet.