



March 31, 2005

U.S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 1; Docket No. 50-317; License No. DPR 53
Licensee Event Report 2005-001
Main Feedwater Isolation Valve Inoperability Due to Handswitch Wiring

The attached report is being sent to you as required under 10 CFR 50.73 guidelines. The condition was discovered on April 10, 2004, but not identified as a reportable condition until February 2, 2005. Should you have questions regarding this report, we will be pleased to discuss them with you.

Very truly yours,

A handwritten signature in black ink, appearing to read "DA Holm", written over a horizontal line.

for
David A. Holm
Plant General Manager

DAH/MJY/bjd

Attachment: As stated

cc: R. V. Guzman, NRC
S. J. Collins, NRC

Resident Inspector, NRC
R. I. McLean, DNR

JE22

(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, 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.

LICENSEE EVENT REPORT (LER)

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CALVERT CLIFFS, UNIT 1	05000 317	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	02 OF 005
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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

I. DESCRIPTION OF EVENT

On April 10, 2004, with Unit 1 shutdown in Mode 5, the 12 Main Feedwater Isolation Valve, 1-FW-4517-MOV, failed to shut on the "A" Steam Generator Isolation Signal (SGIS) during performance of Surveillance Test Procedure STP-O-56A-1. The valve also failed to shut on the "B" SGIS during the subsequent performance of STP-O-56B-1. Surveillance testing under STP-O-69-1 also revealed that the valve would not operate on receipt of a Containment Spray Actuation Signal (CSAS). Investigation and troubleshooting into the cause of the malfunction determined that a lead was terminated at the wrong location on the handswitch for 1-FW-4517-MOV. The handswitch for 1-FW-4517-MOV, 1HS4517, is located on Control Panel 1C03 in the Control Room. The improperly wired handswitch caused an open electrical circuit for the 1-FW-4517-MOV SGIS/CSAS functions. Manual operation of 1-FW-4517-MOV via handswitch 1HS4517 was not compromised by this condition. The lead was relocated to the proper terminal and subsequent testing of 1-FW-4517-MOV was satisfactorily performed on April 10, 2004.

Further investigation determined that 1-FW-4517-MOV was last tested successfully on February 19, 2002, during the previous Unit 1 Refueling Outage. No other structures, components, or systems were inoperable at the start of this event that would have contributed to or influenced the event.

The main feedwater isolation valves (MFIVs) function, upon receipt of an SGIS or CSAS, to limit the inventory added to the steam generator following a high energy line break (HELB). Limiting the inventory to the steam generator provides protection by limiting the energy released to the Containment Building, thereby limiting containment pressure after an HELB. Closure of the MFIVs effectively terminates the addition of feedwater to an affected steam generator, limiting the mass and energy release for feedwater line or steam line breaks inside the Containment Building, and reducing cooldown effects for steam line breaks. The MFIVs close on receipt of an SGIS generated by low steam generator pressure and upon receipt of a CSAS. The wiring deficiency identified in this event challenged this safety function.

This was a self-revealing issue that was identified through required surveillance testing. Unit 2 was not impacted by this event, as evidenced by the last successful completion of STP-O-56A-2 and STP-O-56B-2 on February 15, 2003.

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II. CAUSE OF EVENT

The root cause of the improperly wired handswitch termination was Human Performance errors, which directly challenged the operability of 1-FW-4517-MOV. Specific contributors to the Human Performance aspect of this event are as follows:

1. A lack of proper application of Human Performance Event Free Tools ("Stop, Think, Act, and Review" Method, Peer Checks, and Independent Verification) prevented identification and restoration of the improperly wired lead in the correct location.
2. Supervision was not informed of the potential problem when the wire in question came out of the compression termination during earlier maintenance. This failure prevented supervision from providing direction or guidance at the time the error was first identified.
3. The initial error in the wiring was not detected because the Post-Maintenance Operational Test did not verify the CSAS/SGIS isolation function prior to returning the valve to service after the 2002 refueling outage.
4. The cluttered and congested layout of the wiring underneath Control Room Panel 1C03 resulted in challenges to error free preventive and corrective maintenance when work was performed inside the panel.

III. ANALYSIS OF EVENT

This event is reportable in accordance with the following:

10 CFR 50.73(a)(2)(i)(B); "Any operation or condition which was prohibited by the plant's Technical Specifications."

Technical Specification 3.7.15, Main Feedwater Isolation Valves (MFIVs), Limiting Condition for Operation (LCO) states, "Two MFIVs shall be OPERABLE." Condition A of this Technical Specification allows one or more MFIVs to be inoperable for up to 72 hours while in Modes 1, 2, or 3. Condition B then requires action to reach Mode 3 within 6 hours and Mode 4 within 12 hours. The inability of 1-FW-4517-MOV to close on a SGIS caused the valve to be inoperable from June 16, 2002 until Unit 1 was shutdown and entered Mode 4 on April 10, 2004 for refueling. Unit 1 exceeded the LCO for inoperable MFIVs 72 hours after entering Mode 3 on June 16, 2002 at 0021 hours.

The safety function of the MFIVs is to provide isolation of the main feedwater flow in the event of a HELB upstream of the main steam isolation valves or downstream of the MFIVs. This function can still be maintained by other components in the Main Feedwater System in the event of a challenge to MFIV operability. While these components are not typically credited in the Updated

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Final Safety Analysis accident analyses, they can be credited when considering safety function operability. Specifically, the main feedwater regulating valves will ramp closed upon a reactor trip signal. The main feedwater bypass valves will open and allow a small (approximately 3.8% of full flow) amount of flow. Additionally, the steam generator feed pumps will be isolated from steam pressure by the main steam isolation valves and will receive a trip signal from SGIS. This combination of additional valve operation and the loss of motive force to the steam generator feed pumps ensures that the safety function of main feedwater flow isolation is maintained. A probabilistic risk assessment of this event determined that the failed automatic closure of 1-FW-4517-MOV would increase the Unit 1 core damage frequency approximately $1.5E-08$ per year (very low safety significance).

No significant safety consequences resulted from this event. At no time during the period of inoperability did the lack of automatic closure of 1-FW-4517 result in a challenge to plant operations or safety limits.

IV. CORRECTIVE ACTIONS

- A. Calvert Cliffs Nuclear Power Plant addressed an overall weakness in Human Performance with a site-wide initiative. This initiative included the creation of a group of interdepartmental procedures addressing specific Human Performance attributes. Specific tools and verification practices were put in place in an effort to reverse the declining trend observed site wide in Human Performance. Additional controls and expectations were implemented to improve pre-job briefings and post-job critiques. A direct result of these initiatives has been a site wide improvement in human performance, as noted by both NRC and Institute of Nuclear Power Operations evaluation results.
- B. The Human Performance Procedures also have established the expectation that workers stop and notify supervision when off-normal or unexpected conditions arise.
- C. Industry best practices have been benchmarked and incorporated into site procedures for functional testing.
- D. Procedure changes have been implemented to allow the use of ring-tongue lugs when performing wire terminations on new or re-worked wiring during maintenance in control panels.

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V. ADDITIONAL INFORMATION

A. Component Identification

Component	IEEE 803 EIS Function	IEEE 805 System ID
Main Feedwater Isolation Valve (1-FW-4517-MOV)	ISV	SJ
Main Feedwater Header Check Valve (1-CKVFW-130)	VLV	SJ
12 Feedwater to Steam Generator Isolation Valve Handswitch (1HS4517)	HS	SJ
Condensate and Feedwater Control Panel (1C03)	PL	JL
Main Steam Isolation Valve	ISV	SB
Steam Generator Feed Regulating Valve	FCV	SJ
Steam Generator Feed Regulating Bypass Valve	FCV	SJ
Steam Generator Feedwater Pump	P	SJ

B. Previous Occurrences

No other previous similar events have occurred within the past three years.