Calvert Cliffs Nuclear Power Plant
Constellation Generation Group, LLC

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657

Constellation Energy

February 12, 2007

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 2006-004
Reactor Trip Due to Loose Wire During Maintenance on Turbine Control System

The attached report is being sent to you as required by 10 CFR 50.73. Should you have questions regarding this report, please contact Mr. Jay S. Gaines at (410) 495-4922.

Very truly yours,

Joseph E. Pollock
Plant General Manager

JEP/SMR/bjd

Attachment: As stated

cc: D. V. Pickett, NRC
S. J. Collins, NRC
Resident Inspector, NRC
R. I. McLean, DNR

IE22

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

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)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Calvert Cliffs Nuclear Power Plant	05000 317	1 OF 004

4. TITLE
Reactor Trip Due to Loose Wire During Maintenance on Turbine Control System

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
12	12	2006	2006	- 04 -	00	02	12	2007	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE
1

10. POWER LEVEL
100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☒ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
S. M. Reichard, Engineering Analyst	410-495-3648

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	TA	SCV	G080	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On December 12, 2006 at 0907 a.m., Unit 1 was manually tripped due to a pressure transient on the primary system during performance of a turbine control system maintenance activity. Subsequent trouble-shooting identified a wire was broken at the wire-to-connector interface in the electrical cabinet to Turbine Control Valve 3. The broken wire resulted in inaccurate position feedback and initiated control valve closure, which caused the pressure transient. The wire was repaired and additional inspections were performed to verify there were no other broken wires. The turbine control system was tested to verify correct response and returned to service. Unit 1 was returned to service December 16, 2006.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

I. DESCRIPTION OF EVENT

On December 12, 2006, maintenance was being performed on Unit 1 to replace Variable Servo Valve Operator (VSVO) cards on the new Mark VI turbine control system. In order to perform the maintenance on-line, one logic branch was de-energized at a time. When the first logic branch was de-energized, Turbine Control Valve 3 unexpectedly began to shut. Subsequent investigation determined that the turbine control valve shut due to a malfunctioning control valve position indication circuit. Control Room Operators manually tripped the reactor when they observed increasing Reactor Coolant System pressure.

Prior to the event, Unit 1 was operating in Mode 1 at 100 percent. The Reactor Coolant System was at normal operating pressure and temperature. There were no systems, structures, or components inoperable that contributed to the event.

All plant systems responded as designed during this event. Decay heat was removed via normal methods through the turbine bypass valves to the condenser, all control rods fully inserted as expected, the steam generators remained on normal feed throughout the event, and no power-operated relief valves or pressurizer safety valves lifted during the transient. Therefore the Unit 1 reactor trip is considered an uncomplicated trip.

The reactor was restarted on December 14, 2006 and paralleled to the grid on December 16, 2006.

II. CAUSE OF EVENT

The Mark VI turbine control system was installed during the Unit 1 Refueling Outage in 2006. The Mark VI turbine control system allows for on-line maintenance based on the redundancy of the circuitry.

Following troubleshooting of the Mark VI turbine control system for an incorrect valve stroke indication, Engineering personnel determined that certain VSVO cards were not updating correctly. The vendor (General Electric) was contacted and determined that the VSVO cards in question should be replaced. Discussion with the vendor and review of operating experience determined that the replacement could be safety performed while the unit remained at full power. Replacement cards were obtained and maintenance was scheduled for December 12, 2006.

An unexpected reactor coolant pressure increase occurred when one of the VSVO cards was de-energized during replacement. Turbine Control Valve 3 also changed position unexpectedly as a result of this condition. Operations manually tripped the reactor per procedure due to increasing reactor coolant pressure. All valves on the Unit 1 main turbine shut as expected and the trip had no unexpected results.

A review of the trip and activities associated with the main turbine maintenance determined that the affected turbine control valve unexpectedly stroked shut when the selected VSVO card was deenergized because a broken wire on another VSVO card caused an erroneous position indication for the affected turbine control valve. Under these operating conditions, the turbine control valve should have remained 56 percent open. However, the erroneous position indication caused the control system to assume the valve was 93 percent open. The Mark VI turbine control system attempted to correct the indicated valve position by closing the valve further. The closure of the affected turbine control valve resulted in a rise in reactor coolant pressure since less energy was removed from the Reactor Coolant System.

An inspection was performed on the valve interface box for the affected turbine control valve and a broken wire was found on the Linear Variable Differential Transformer field cable. The wire was re-lugged and testing was performed to verify that the system was operating properly. Maintenance was completed on the system with replacement of the VSVO cards prior to restart of the Unit.

An apparent cause evaluation (IRE-018-885) determined that the cause of the trip was the broken wire. The wire was repaired and additional inspections were performed to verify there were no other broken wires.

III. ANALYSIS OF EVENT

The planned maintenance activity on December 12, 2006 involved de-energizing one of the three redundant logic branches of the MARK VI turbine control system. The control system self-diagnostics did not detect the broken wire on the Linear Variable Differential Transformer field cable from the interface box. The turbine control system began shutting the affected turbine control valve due to the combination of the de-energized logic branch plus the broken wire. Control Room Operators manually tripped the reactor when Reactor Coolant System pressure increased.

This event resulted in manual actuation of the Reactor Protective System and is therefore reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A). An immediate Event Notification Report was made to the Nuclear Regulatory Commission (NRC Event Number 43046). Condition Report IRE-018-885 was initiated to capture this event.

There were no actual nuclear safety consequences incurred from this event. An estimated conditional core damage probability of 3E-06 and an estimated conditional large early release probability of 1E-07 were calculated for this event.

IV. CORRECTIVE ACTIONS

A. The wire was repaired and additional inspections were performed to verify there were no other broken wires. Preventative maintenance will be performed during refueling outages to check for wire integrity.

B. A software upgrade will be installed during the 2008 Refueling Outage to allow the observation of Linear Variable Differential Transformer field input values and failures.

V. ADDITIONAL INFORMATION

A. Component Identification

Component	IEEE 803 EIIS Function	IEEE 805 System ID
Main Turbine Control Valve 3	SCV	TA

B. Previous Occurrences

A review of Calvert Cliffs' events over the past several years was performed. No previous occurrences were identified involving a reactor trip due to a broken wire in the main turbine control system.