



Mark Flaherty  
Plant Manager

Calvert Cliffs Nuclear Power Plant  
1650 Calvert Cliffs Parkway  
Lusby, MD 20657

410 495 5205 Office  
443-534-5475 Mobile  
www.exeloncorp.com  
mark.flaherty@exeloncorp.com

10 CFR 50.73

July 29, 2016

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

Calvert Cliffs Nuclear Power Plant, Unit Nos. 1  
Renewed Facility Operating License No. DPR-53  
NRC Docket No. 50-317

Subject: Licensee Event Report 2016-003, Revision 00  
Unit 1 Automatic Trip on Loss of Load due to Spurious Steam Generator High  
Level Turbine Trip

The attached report is being sent to you as required by 10 CFR 50.73.

There are no regulatory commitments contained in this correspondence.

Should you have questions regarding this report, please contact Mr. Larry D. Smith at  
(410) 495-5219.

Respectfully,

*T.M. RITI*  
  
for Mark D. Flaherty  
Plant Manager

MDF/KLG/bjm

Attachment: As stated

cc: NRC Project Manager, Calvert Cliffs  
NRC Regional Administrator, Region I

NRC Resident Inspector, Calvert Cliffs  
S. Gray, MD-DNR

*EEZZ  
NRR*

**LICENSEE EVENT REPORT (LER)**

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/re3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@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.

<b>1. FACILITY NAME</b> Calvert Cliffs Nuclear Power Plant, Unit 1	<b>2. DOCKET NUMBER</b> 05000317	<b>3. PAGE</b> 1 OF 4
---	-------------------------------------	--------------------------

**4. TITLE**  
Unit 1 Automatic Trip on Loss of Load due to Spurious Steam Generator High Level Turbine Trip

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	
05	31	2016	2016	- 003	000	07	29	2016	FACILITY NAME	

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

<b>1</b>	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)

**10. POWER LEVEL**

<b>100</b>	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)

50.73(a)(2)(i)(C)       Specify in Abstract below or in NRC Form 366A

**12. LICENSEE CONTACT FOR THIS LER**

LICENSEE CONTACT Kenneth L. Greene, Regulatory Engineer	TELEPHONE NUMBER (Include Area Code) 410-495-4385
--	--

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	JC	IMOD	V132	Y					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b>	<b>15. EXPECTED SUBMISSION DATE</b>	MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO				

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

On May 31, 2016 at 1626, Calvert Cliffs Unit 1 experienced an automatic reactor trip. The cause of the trip was a spurious high level steam generator signal due to a failed Steam Generator 11 Channel B High Level Turbine Trip Under Voltage Logic Module, 12/4BL-XA27. The spurious high level trip signal resulted in a turbine trip followed by an automatic reactor protection system trip on loss of load. The failed under voltage logic module was sent off-site to the vendor to conduct a failure analysis. The analysis identified two most probable causes for the failure. The first most probable cause was due to an intermittent failure of an integrated circuit of the under voltage logic module. The second most probable cause was due to an inadvertent solder bridge between a pin on the integrated circuit chip and the board. A refurbished logic module was installed and subsequently tested prior to the unit returning to power. The corrective action planned to prevent recurrence is to replace the current Engineered Safety Features Actuation System (which includes the non-safety high level turbine trip) with a system that will eliminate single point vulnerabilities within this system.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/re3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollections.Resource@nrc.gov](mailto:Infocollections.Resource@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.

1. FACILITY NAME	2. DOCKET	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV. NO.
Calvert Cliffs Nuclear Power Plant, Unit 1	05000 317	2016	-- 003 --	00

**NARRATIVE**

**I. DESCRIPTION OF EVENT:**

Energy Industry Identification System (EIIIS) codes are identified in the text as [XX]

**A. INITIAL CONDITIONS:**

Unit 1 was operating in Mode 1 at 100 percent power on May 31, 2016 prior to the event.

**B. EVENT:**

On May 31, 2016 at 1626, Calvert Cliffs Unit 1 reactor [RCT] tripped. The cause of the trip was a spurious high level steam generator [SG] signal due to a failed Steam Generator 11 Channel B High Level Turbine Trip Under Voltage Logic Module [IMOD], 12/4BL-XA27. The spurious high level trip signal resulted in a main turbine [TRB] trip followed by an automatic reactor protection system [JD] (RPS) trip on loss of load. Following the reactor trip, all safety systems performed as designed to safely shutdown the unit in an uncomplicated trip. The unit remained in Mode 3 while troubleshooting was conducted.

The failed under voltage logic module was sent off-site to the vendor to conduct a failure analysis. The analysis identified two most probable causes for the failure. The first most probable cause was an intermittent failure of an integrated circuit of the under voltage logic module. The second most probable cause was an inadvertent solder bridge between pin 6 on the U5 chip and board.

Following installation of a refurbished under voltage logic module and subsequent testing of the module, the unit commenced startup activities. Unit 1 was returned to Mode 1 at 2040 on June 1, 2016. The unit returned to full power on June 2, 2016 at 1040.

**C. INOPERABLE STRUCTURES, COMPONENTS, OR SYSTEMS THAT CONTRIBUTED TO THE EVENT:**

There were no structures, systems or components inoperable at the start of the event that contributed to the event.

**D. DATES AND APPROXIMATE TIMES OF MAJOR OCCURRENCES:**

May 31, 2016 – 1626: Spurious hi level trip signal from 12/4BL-XA27 resulting in a main turbine trip. The main turbine trip resulted in an automatic reactor trip due to loss of load.

June 1, 2016 – 1819: Following troubleshooting and determination of cause of trip, Unit 1 entered Mode 2.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/re3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@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.

1. FACILITY NAME	2. DOCKET	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Calvert Cliffs Nuclear Power Plant, Unit 1	05000 317	2016	-- 003 --	00

**NARRATIVE**

June 1, 2016 – 2040: Unit 1 entered Mode 1.

June 1, 2016 – 2355: Paralleled Unit 1 Main Generator to the grid.

June 2, 2016 – 1040: Unit 1 returned to 100% power.

**E. FAILURE MODES:**

The failed under voltage logic module was refurbished and installed during the 2016 Unit 1 refueling outage. Following the Unit 1 trip, 12/4BL-XA27 reset shortly after the trip without any external input. The under voltage logic module subsequently tripped and reset several more times during the hours following the reactor trip. After initial on-site troubleshooting, the under voltage logic module was sent off-site to the vendor. The vendor's evaluation determined two most probable causes for the failure of the under voltage logic module. The first most probable cause was an intermittent failure of an integrated circuit of the under voltage logic module. The second most probable cause was due to an inadvertent solder bridge between pin 6 on the U5 chip and the board. A refurbished logic module was installed and subsequently tested satisfactorily prior to the unit returning to power.

**F. METHOD OF DISCOVERY:**

The method of discovery was self-revealing upon the failure of 12/4BL-XA27 while in operation. This event is documented in the site's Corrective Action Program under IR 02676088.

**II. CAUSE OF EVENT**

**A. SAFETY CONSEQUENCES:**

There were no human performance issues related to the reactor trip or the following recovery and the unit shutdown.

The spurious high level trip signal of 12/4BL-XA27 resulted in an automatic RPS actuation due to loss of load following the main turbine trip. The loss of load trip from 100 percent power is an analyzed anticipated operational occurrence event and the plant responded according to the analysis, with no complications.

The steam generator high level trip function is a non-Engineered Safety Features Actuation System [JE] (ESFAS) function. The purpose of this trip is to protect the main turbine against damage from water carryover.

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@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.

1. FACILITY NAME	2. DOCKET	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Calvert Cliffs Nuclear Power Plant, Unit 1	05000 317	2016	-- 003 --	00

**NARRATIVE**

This event satisfies the criteria in NUREG-1022, Revision 3, for RPS actuation. Therefore, this event is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A). An immediate event notification report (51967) was also made pursuant to 10 CFR 50.72(b)(2)(iv)(B).

**B. CORRECTIVE ACTIONS:**

The faulty under voltage logic module was replaced with a refurbished under voltage logic module.

The corrective action planned to prevent recurrence is to replace the current ESFAS (which includes the non-safety high level turbine trip) with a system that will eliminate single point vulnerabilities within ESFAS.

A supplemental licensee event report will be submitted if additional information is subsequently developed that would significantly change the corrective actions for this event.

**III. PREVIOUS SIMILAR EVENTS:**

A review of Calvert Cliffs' licensee event reports in the last four years was performed. This review did not identify an event that involved the same underlying concern or reason for this event.

**A. COMPONENT INFORMATION:**

COMPONENT	IEEE 803 FUNCTION ID	IEEE 805 SYSTEM ID
Logic Module, 12/4BL-XA27	IMOD	JC

12/4BL-XA27, 11 SG high level turbine trip under voltage logic module was manufactured by Vitro Labs and was recently refurbished by FTI, Inc.