Calvert Cliffs Nuclear Power Plant
Constellation Generation Group, LLC

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657

Constellation Energy

May 23, 2006

U.S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318; License Nos. DPR 53 & DPR 69
Licensee Event Report 2006-001
1A Diesel Generator Feeder Breaker Tripped Due to Low Design Setpoint

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. L. S. Larragoite at (410) 495-4922.

Very truly yours,

Joseph E. Pollock
Plant General Manager

JEP/ALS/bjd

Attachment: As stated

cc: P. D. Milano, 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, Unit 1	05000 317	1 OF 007

4. TITLE
1A Diesel Generator Feeder Breaker Tripped Due to Low Design Setpoint

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
									Calvert Cliffs, Unit 2	05000 318
03	24	2006	2006	- 01 -	00	05	23	2006	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE
6

10. POWER LEVEL
000

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)
A. L. Simpson, Engineering Consultant	410-495-6913

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	EK	BKR	W120	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 March 24, 2006 with Unit 1 shutdown in Mode 6, Motor Control Center (1MCC123) Feeder Breaker (52-1703) tripped on short-time overcurrent during performance of a surveillance test procedure. Unit 2 was operating in Mode 1 at the time of the event. The feeder breaker powers safety-related auxiliaries required for operation of the 1A Diesel Generator. As a result of the feeder breaker tripping, operations personnel secured the 1A Diesel Generator and secured the surveillance test. Subsequent investigation determined that the short-time overcurrent amptector setpoint was set too low and had drifted down to a value lower than the associated inrush starting current, resulting in the feeder breaker trip. An engineering evaluation determined that the original amptector design setpoint was not adequate because the setpoint did not consider all potential loads that could be realized upon a diesel generator start and load during a design basis event. Corrective action included installing a new amptector and increasing the amptector setting to provide adequate design margin considering the maximum estimated inrush current and setpoint drift. The 1A Diesel Generator was subsequently tested satisfactorily and returned to service on March 25, 2006.

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

I. DESCRIPTION OF EVENT

On March 24, 2006, with Unit 1 shutdown in Mode 6, the 1A Diesel Generator (1A DG) was secured by Operations during performance of Surveillance Test Procedure (STP) O-004A-1 (Unit 1 A-Train Engineered Safety Features Test). During the test, the 1A DG started and loaded on a 4 kV Bus 11 loss of voltage as expected however, an unexpected condition occurred when its vital Motor Control Center (MCC) (1MCC123) Feeder Breaker (52-1703) tripped on short-time overcurrent. The 1A DG ran for approximately 20 minutes loaded on the 4 kV bus but was secured by operations personnel when it was determined that the feeder breaker had tripped. Subsequent troubleshooting determined that the feeder breaker amptector short-time circuit design setting (2400A) was too low and had drifted to 2232A. When the 1A DG started and re-energized its dedicated busses including 1MCC123, the loads on 1MCC123 caused a normal current inrush of 2243A which is greater than the 2232A setting, tripping the MCC feeder breaker on its short-time setting.

II. CAUSE OF EVENT

The subject condition is applicable to one of the four emergency power sources, the 1A DG which is a Societe Alsacienne De Constructions Mecaniques De Mulhouse (SACM) design diesel generator. The other three diesel generators are of a different design (Fairbanks Morse) and are not susceptible to the subject condition. The Fairbanks Morse engines are cooled by service water and do not use electric radiator fans like the SACM diesel engines. The overcurrent settings for the Fairbanks Morse emergency diesel generator Auxiliary MCC were evaluated as a result of this activity and found to have acceptable margin. The feeder breakers for Fairbanks Morse auxiliary MCCs do not have a short-time overcurrent trip.

The 1A DG is a self supporting, radiator cooled diesel generator housed in its own concrete, safety-related building. The 1A DG vital auxiliaries powered from 1MCC123 include six radiator fans, four room ventilation fans, one building supply fan, one building exhaust fan, several room heaters, battery charger, battery exhaust fan, and a fuel oil transfer pump. The room ventilation fans start based on diesel generator room temperature. One of the ventilation fans is always running, a second fan starts at 85 degrees F, the third fan starts at 95 degrees F, and the fourth fan starts at 105 degrees F. The 1MCC123 Feeder Breaker (52-1703) is provided with amptector long-time, short-time, and ground overcurrent protection.

To determine the cause of the event, Calvert Cliffs Nuclear Power Plant (CCNPP) electricians inspected the feeder breaker and found that the Amptector I-A Short-Time Overcurrent Trip Flag was set. The electricians also identified that the short-time setting had drifted to 2232A (a 7 percent drop from the 2400A setting). The associated loads on 1MCC123 were found to be operating satisfactorily and the associated steady-state currents were found to be within the vendor's nameplate data. Therefore, the electricians concluded that the amptector did not actuate on a fault condition.

Engineering evaluated the inrush currents associated with energizing 1MCC123 during an under voltage (UV) DG start event. The evaluation determined that an expected inrush current of 2675A exists with all four ventilation fans starting along with the other auxiliary loads. The 2675A is well above the 2400A amptector short-time setting. As stated earlier, the ventilation fans start based on diesel generator room temperature. During performance of the STP, diesel generator room temperature was below 85 degrees F, therefore only one ventilation fan was running. With one ventilation fan running, the estimated inrush current is 2243A which is below the 2400A nominal amptector short-time setting. However with the 7 percent amptector drift, the as-found setting of 2232A which is less the 2243A inrush current with one ventilation fan running, would trip the MCC feeder breaker on short-time overcurrent. The 2400A nominal amptector setting has existed since the diesel generator was placed in service in 1996. The surveillance tests are typically performed in the spring, during refueling outages, when diesel building temperature is below 85 degrees F and only one ventilation fan is running. With only one fan running, the 2400A setpoint would not result in a trip unless the setpoint drifts below the estimated inrush current of 2243A. This may explain why previous surveillance tests were performed successfully. However, it is clear that the short-time setting of 2400A was inadequate and lacked appropriate design margin for simultaneous starting of all radiator and all ventilation fan motors upon a 1A DG start and load with an UV event under all design bases conditions. Therefore, an engineering change was issued raising the setpoint to 3600A which is well above the maximum estimated inrush current of 2675A.

The 1MCC123 Feeder Breaker (52-1703) trip occurred due to an inadequate short-time overcurrent setting that had drifted below the starting inrush currents that existed during performance of the STP. The short-time overcurrent setting design basis was not adequate because the setting did not include the inrush currents associated with the maximum potential loading on the vital MCC. The short-time overcurrent setting of 2400A was based on starting the largest motor with the MCC supplying all other loads and while providing coordination with upstream protection. The causal analysis performed to address this event determined that the event was caused by a latent design error due to lack of technical rigor in which inadequate design margin was applied in the short-time overcurrent setting associated with the amptector. The setting did not take into consideration the total inrush current on the associated MCC which includes the total inrush current associated with the simultaneous starting of six radiator fan motors and at least one ventilation fan motor.

The design basis for the original 2400A setting states that the short-time setting was based on the starting of the single largest motor while the MCC was powering all other loads. The basis is not completely adequate because during an undervoltage (UV) event, the diesel starts and load stripping/sequencing occurs and 1MCC123 will simultaneously power all six radiator fans and at least one ventilation fan motor. This results in an expected inrush current which could challenge the 2400A amptector short-time setting.

Further, with at least two ventilation fans running, the expected inrush current would exceed the 2400A amptector short-time setting.

The causal analysis performed to address this event identified system post-modification testing as a potential barrier that could have identified the inadequate short-time setting. However, the post-maintenance test did not verify operation under all design bases conditions. Specifically, the system was not tested with all four ventilation fans starting simultaneously simulating a maximum temperature condition. Had the post-modification test simulated a maximum temperature condition, the breaker would have tripped and the error would have been detected and corrected. Another potential barrier identified during the causal analysis is the owner acceptance review required by plant procedures. An owner acceptance review was performed when the calculation was issued in 1994. However, an owner acceptance review is a check to ensure the reasonableness of inputs, assumptions and results, not design verification. The design verification was performed by the Appendix B supplier of the engineering product.

III. ANALYSIS OF EVENT

This event is reportable in accordance with the following:

> 10 CFR 50.73(a)(2)(v)(D); "Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

The evaluation assumed a linear drift from the as-left setpoint (2424 A on April 15, 2005) to the as-found setpoint (2232A on March 25, 2006) and concluded that the setpoint remained above the value required to prevent tripping the breaker with a single ventilation fan running until after Unit 1 was shutdown in February 2006. However, the expected in-rush for two fans starting is greater than the as-left setting for the amptector. Therefore, for periods where DG room temperature was high enough to have the second fan running (i.e., room temperature greater than 85 degrees F), the 1A DG MCC would have tripped.

Although the 1A DG would start and load and run without its vital MCC powered, it would eventually overheat because the radiator fans would not be running. Therefore, for periods when the 1A DG room temperature resulted in at least two ventilation fans running, the 1A DG was considered inoperable. In determining reportability on any event or condition that affects a system, it is necessary to consider other existing plant conditions. Therefore, a review of maintenance activities affecting the safety function of systems described in 50.73(a)(2)(v) was performed.

The emergency diesel generators are designed to provide a dependable onsite power source capable of starting and supplying the essential loads necessary to safely shut down the plant and maintain it in a safe shutdown condition under all design bases conditions. Two emergency diesel

generators are provided for each unit, the 1A and the 1B DG are provided on Unit 1. As stated earlier, the subject condition is applicable to only one of the four safety-related diesel generators, the 1A DG. During the period of vulnerability at least two cases were identified affecting the 1B DG. Specifically, on August 11, 2005 and again on August 12, 2005, when Chesapeake Bay water temperature exceeded 80 degrees F, the 1B DG was out-of-service for approximately 12 hours on each occurrence while service water heat exchangers were removed from service for scheduled cleaning. On August 11 and 12, 2005 with the 1B DG out-of-service and with the 1A DG inoperable due to diesel room temperature greater than 85 degrees F, the Unit 1 emergency on-site power source system was not capable of performing its design safety function. Therefore, this event is reportable pursuant to the reportable requirements specified in 10 CFR 50.73(a)(2)(v)(D).

The amptector setpoint drifted to a value less than the total inrush with one ventilation fan running after Unit 1 was shutdown and in a Mode where the Technical Specifications were not applicable. During periods of Technical Specifications applicability to Unit 1 for this condition, the total inrush required at least two ventilation fans running (i.e., room temperature greater than 85 degrees F) to exceed the amptector setting. Based on a review of available temperature data, it was determined that the condition did not exist for a period longer than the allowed completion time of any applicable Unit 1 Technical Specification. Therefore, this event is not reportable under this criterion for Unit 1.

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."

The Technical Specifications require one DG from the other unit to be capable of supplying power to the Control Room Emergency Ventilation System (CREVS) and the Control Room Emergency Temperature System (CRETS). The 1A DG provides this Technical Specification function for Unit 2. As stated previously, the amptector setpoint drifted below the value required with one ventilation fan running after Unit 1 was shutdown for the scheduled refueling outage. At that time, the 1A DG was not required for Unit 1 Technical Specification operability. However, Unit 2 remained in the applicable Modes for the CREVS and CRETS, so the 1A DG was still required for Unit 2 Technical Specification operability.

Based on linear drift, it was determined that the amptector setpoint drifted to a value below the calculated inrush amperage (2243A) for one fan running approximately 31 days prior to the event. Therefore from February 21, 2006 until the event date, March 24, 2006 the 1A DG was not capable of supplying power to the CREVS and CRETS. The condition existed for a time longer than the completion time allowed by the Technical Specifications, therefore this event is reportable pursuant to the reporting requirements specified in 10 CFR 50.73(a)(2)(i)(B).

This event is reportable in accordance with the following:

> 10 CFR 50.73(a)(2)(ii)(B); "Any event or condition that resulted in the nuclear power plant being in an unanalyzed condition that significantly degraded plant safety."

Because this event could prevent the fulfillment of the safety function of a system required to mitigate the consequences of an accident, it is also reportable per 10 CFR 50.73(a)(2)(ii)(B) as a condition that resulted in the nuclear power plant being in an unanalyzed condition that significantly degraded plant safety.

There were no actual nuclear safety consequences incurred from this event. For periods when the 1B DG was out of service and when 1A DG building temperature required at least two ventilation fans, Unit 1 was more susceptible to a Station Blackout (SBO) event. The SBO diesel generator is designed to provide a power source capable of starting and supplying the essential loads necessary to safely shutdown one unit and maintain it in a safe shutdown condition during a SBO event. The CCNPP SBO DG is a SACM diesel generator, similar in design to the 1A. However, the 0C DG had margin up to the point where three ventilation fans were required and therefore remained capable of performing its design function until ambient temperature in the SBO DG room reached 95 degrees F. This condition existed for short periods during the time of vulnerability. This event has relatively low risk significance based on recoverability of the diesel generators.

IV. CORRECTIVE ACTIONS

A. Engineering was issued to increase the short-time setting from 2400A to 3600A which provides adequate design margin.

B. The 1A DG was tested satisfactorily with the new 3600A setting while all four ventilation fans were running.

C. Schedule and conduct training for engineering personnel regarding adequacy of post-modification test procedures.

D. Evaluate need for training engineering personnel regarding owner acceptance review expectations and consider adding this event to engineer qualification card as applicable.

E. Engineering evaluated the short-time/instantaneous setting on the other safety-related diesel generators (Fairbanks Morse) to ensure the subject event could not occur.

F. Notify Appendix B vendor to ensure this issue is included in their corrective action program.

G. Operating Experience issued to the industry regarding this event.

V. ADDITIONAL INFORMATION

A. Component Identification

	IEEE 803	IEEE 805
Feeder Breaker 52-1703	BKR	W120

B. Previous Occurrences

A review of Calvert Cliffs' events over the past several years was performed. No previous occurrences were identified.