

February 28, 2007

Mr. James A. Spina, Vice President  
Calvert Cliffs Nuclear Power Plant, Inc.  
Calvert Nuclear Power Plant  
1650 Calvert Cliffs Parkway  
Lusby, Maryland 20657-4702

SUBJECT: CALVERT CLIFFS NUCLEAR GENERATING STATION – NRC  
SUPPLEMENTAL INSPECTION REPORT 05000317/2007006 and  
05000318/2007006

Dear Mr. Spina:

On January 25, 2007, the U.S. Nuclear Regulatory Commission (NRC) completed a supplemental inspection at the Calvert Cliffs Nuclear Power Plant Units 1 and 2. The enclosed report documents the inspection results that were discussed on January 25, 2007, with you and other members of your staff.

The NRC performed this supplemental inspection to assess your evaluation of a low to moderate (White) safety significant finding related to an incorrect circuit breaker setting that would have impacted the ability of the Unit 1 "1A" emergency diesel generator to perform its intended safety function under certain design basis conditions. The supplemental inspection was conducted to determine if the root and contributing causes of the finding were understood, to assess the extent of condition review, and to determine if the corrective actions were sufficient to address causes and prevent recurrence. The inspection was conducted in accordance with Inspection Procedure 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," and examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspection included a review of your "Reply to a Notice of Violation," EA-06-198, dated November 27, 2006.

Based on the results of this inspection, we concluded that you have adequately completed a root cause analysis of the performance deficiency and have identified and implemented appropriate corrective actions. No findings of significance were identified. Given your acceptable performance in addressing the cause of the circuit breaker trip, the White finding associated with this issue will only be considered in assessing Unit 1 plant performance for a total of four quarters in accordance with the guidance in Inspection Manual Chapter (IMC) 0305, "Operating Reactor Assessment Program."

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at <http://www.nrc.gov/reading-rm/adams.html> (The Public Electronic Reading Room).

Sincerely,

**/RA/**

John F. Rogge, Chief  
Engineering Branch 3  
Division of Reactor Safety

Docket Nos. 50-317  
50-318

License Nos. DPR-53  
DPR-69

Enclosure: Inspection Report 05000317/2007006 and 05000318/2007006  
w/Attachment: Supplemental Information

cc w/encl:

M. J. Wallace, President, Constellation Generation  
J. M. Heffley, Senior Vice President and Chief Nuclear Officer  
President, Calvert County Board of Commissioners  
C. W. Fleming, Senior Counsel, Constellation Generation Group, LLC  
J. Gaines, Director, Licensing  
Director, Nuclear Regulatory Matters  
R. McLean, Manager, Nuclear Programs  
K. Burger, Esquire, Maryland People's Counsel  
P. Birnie, Esquire, Co-Director, Maryland Safe Energy Coalition  
R. Hickok, NRC Technical Training Center  
State of Maryland (2)

Distribution w/encl: **(via E-mail)**  
 S. Collins, RA  
 M. Dapas, DRA  
 J. Lamb, RI OEDO  
 J. Lubinski, NRR  
 D. Pickett, PM, NRR  
 M. David, PM, NRR (Backup)  
 B. McDermott, DRP  
 A. Burritt, DRP  
 S. Kennedy, DRP, SRI  
 C. Newgent - Resident OA  
 A. Blough, DRS  
 L. Scholl, DRS  
 J. Rogge, DRS  
 Region I Docket Room (with concurrences)  
[ROPReports@nrc.gov](mailto:ROPReports@nrc.gov) (All IRs)

**SUNSI Review Complete: \_\_\_JFR\_\_\_(Reviewer's Initials)**

DOCUMENT NAME: C:\FileNet\ML070610074.wpd

After declaring this document "An Official Agency Record" it **will** be released to the Public.

To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	RI/DRS		RI/DRP		RI/DRS		
NAME	LScholl/LLS		BMcDermott/BMD		JRogge/JFR		
DATE	02/27/07		02/28/07		02/27/07		

OFFICIAL RECORD COPY

U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos. 50-317, 50-318

License Nos. DPR-53, DPR-69

Report Nos. 05000317/2007006 and 05000318/2007006

Licensee: Constellation Generation Group, LLC

Facility: Calvert Cliffs Nuclear Power Plant, Units 1 and 2

Location: 1650 Calvert Cliffs Parkway  
Lusby, Maryland 20657-4702

Dates: January 23 - 25, 2007

Inspector: Larry Scholl, Senior Reactor Inspector, DRS

Approved by: John F. Rogge, Chief  
Engineering Branch 3  
Division of Reactor Safety

## SUMMARY OF FINDINGS

IR 05000317/2007006, 05000318/2007006; 01/23/2007 - 01/25/2007; Calvert Cliffs Nuclear Power Plant, Units 1 and 2; Supplemental Inspection; IP 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area."

The inspection was conducted by a regional inspector. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

### **Cornerstone: Mitigating Systems**

The NRC performed this supplemental inspection, in accordance with Inspection Procedure 95001, to assess the licensee's evaluation associated with the incorrect overcurrent trip set point for the supply circuit breaker to Unit 1 1MCC123. This performance issue was previously characterized as having low to moderate risk significance (White) in NRC Inspection Reports 05000317/2006012 and 05000318/2006012.

Constellation's evaluation of the issue included performing a formal root cause analysis to identify the root and contributing causes associated with the improper circuit breaker trip set point and to identify corrective actions to address these causes.

Based on the results of this inspection, the inspector concluded that Constellation completed a thorough evaluation of the performance deficiencies associated with this finding and implemented appropriate corrective actions to address the related causes. Given Constellation's acceptable performance in addressing the improper circuit breaker trip set point, the White finding associated with this issue will only be considered in assessing Unit 1 plant performance for a total of four quarters in accordance with the guidance in IMC 0305, "Operating Reactor Assessment Program."

## REPORT DETAILS

### 01 INSPECTION SCOPE

The U.S. Nuclear Regulatory Commission (NRC) performed this supplemental inspection to assess Constellation's evaluation of the root and contributing causes for the trip of the feeder circuit breaker for safety-related motor control center 1MCC123 on March 24, 2006. This motor control center (MCC) supplies 480 volt power to the "1A" emergency diesel generator support equipment which include radiator cooling fans and building ventilation fans. The circuit breaker trip was due to inadequate design controls that resulted in an improper short-time overcurrent trip set point combined with the normal drift of the trip unit set point. As a result, the EDG would not have been able to perform its safety function following a loss of offsite power (LOOP) under certain conditions. The "0C" EDG was similarly affected, but to a lesser degree since the amount of trip set point drift was found to be less than that of the "1A" EDG.

This performance issue was previously characterized as a finding with low to moderate safety significance (White) in NRC inspection report numbers 05000317/2006012 and 05000318/2006012 and is related to the mitigating systems cornerstone in the reactor safety strategic performance area. The inspector performed a walk-down of the affected EDGs, interviewed selected Constellation staff, and reviewed documents pertaining to the root cause evaluation and corrective actions for the event. The inspector also reviewed the corrective actions to ensure the actions addressed both the root and contributing causes for the identified performance deficiencies. The inspection also included a review of the adequacy of Constellation's "Reply to a Notice of Violation," EA-06-198, dated November 27, 2006, and Licensee Event Report 2006-001, "1A Emergency Diesel Generator Feeder Breaker Tripped Due to Low Design Set Point," Revision 1.

### 02 EVALUATION OF INSPECTION REQUIREMENTS

#### 02.01 Problem Identification

- a. Determination of who identified the issue and under what conditions.

The circuit breaker trip was a self-revealing finding identified during the performance of an EDG surveillance test on March 24, 2006. During surveillance and test procedure (STP) O-004A-1, "Unit 1 A-Train ESF Test," a loss-of-offsite-power is simulated, the EDG starts and powers the both the 4 kV bus loads and 1MCC123. Due to the low set point and the effects of the trip unit (Amptector) drift, the inrush current when the MCC energized exceeded the short-time overcurrent set point, tripping the feeder breaker.

- b. Determination of how long the issue existed and prior opportunities for identification.

Constellation's evaluation determined that the improper overcurrent trip set point was established as the result of a design error when the "1A" and "0C" were installed by a plant modification in 1996. Prior opportunities for identification would have been during

the modification design development and design reviews and/or during post-modification testing. However, neither the design reviews or the post-modification test were sufficiently rigorous to identify the deficiency. Both the design agent and CCNPP design acceptance reviews failed to identify the problem. The post-modification test was not conducted in a manner that ensured the breaker would be subjected to the maximum possible level of inrush current during the MCC energization. For example, the number of building ventilation fans that start simultaneously is dependent on the building temperature at the time of the EDG start following a LOOP. At low temperatures one will start and the number of additional starts increases as room temperature increases. All four fans would start simultaneously at a design room temperature of 105°F.

The problem was not identified during previous surveillance tests because, due to ambient temperature conditions, only one building ventilation started during those tests. Additionally, and at the time of those tests, the amount of Amptector set point was not sufficient to cause a trip at the reduced current levels associated with a single fan start.

- c. Determination of the plant-specific risk consequences and compliance concerns associated with the issue.

Constellation's Root Cause Analysis Report, Rev. 1, estimated that the MCC feeder breaker would have tripped approximately 70% of the times the EDG would have started between March 24, 2005, and March 24, 2006, resulting in an increase in core damage frequency (CDF) of approximately 5E-6. The NRC's risk evaluation reached similar conclusions.

## 02.02 Root Cause and Extent of Condition Evaluation

- a. Evaluation of methods used to identify root cause and contributing causes.

To evaluate this issue, Constellation used a modified Kepner-Tregoe Problem Analysis for the equipment-related analysis. They used Problem Analysis, Why Staircase, and Cause-Effect Analysis for the human performance-related analysis. The inspector determined that Constellation used appropriate methods to identify the root and contributing causes.

- b. Level of detail of the root cause evaluation.

The inspector determined that the level of detail of the root cause analysis was sufficient for the issue. In addition to addressing the cause of the incorrect short-time overcurrent trip set point, Constellation performed a review of Amptector calibration data for numerous circuit breakers to ensure there was not a programmatic issue with the set point drift.

- c. Consideration of prior occurrences of the problem and knowledge of prior operating experience.

Constellation's evaluation included a consideration of previous internal and external operating experience that may be applicable to this issue. A number of internal and external events were reviewed; however, none of the issues would have afforded an opportunity to prevent this event.

- d. Consideration of potential common causes and extent of condition of the problem.

The inspector found that Constellation's evaluation properly addressed extent of condition for both the equipment issues and the human performance issues. After identification of the set point issue with the MCC for the "1A" EDG, the same problem was identified with the "0C" EDG which is of similar design and was installed at the same time as the "1A" EDG. Although the condition was not expected to affect the originally installed Fairbanks Morse EDGs, their associated MCC feeder breaker overcurrent trip set points were reviewed and found to be satisfactory. The extent-of-condition review was then expanded to include a determination of available margin for the 4160 volt and 480 volt safety-related bus feeder overcurrent trip set points. All bus feeder breaker set points were found to be acceptable.

#### 02.03 Corrective Actions

- a. Appropriateness of corrective actions.

Constellation took immediate corrective actions to increase the set points of MCC feeder circuit breaker 1BKR52-1703 and 0BKR52-0703 short-time overcurrent trip from 2400 amps to 3600 amps. Additional actions were subsequently taken to provide training to site engineers in the areas of owner acceptance review expectations regarding vendor design bases assumption verification and the use and preparation of Engineering Test Procedures for post-modification testing. The inspector concluded that the corrective actions were appropriate.

- b. Prioritization of corrective actions.

The inspector reviewed the prioritization of corrective actions and verified that all required actions had been completed within an appropriate time. Associated engineering documents had also been updated at the time of the inspection.

- c. Establishment of schedule for implementing and completing the corrective actions.

Constellation's evaluation provided dates for completion of corrective actions. The inspector reviewed the status of corrective actions and found that all required actions had been completed. One action which remains incomplete is to increase the overcurrent trip time delay setting. This action is considered to be an additional enhancement and will be

implemented during the next scheduled performance of the trip point test. The inspector reviewed this issue and concluded that increasing trip unit current level set point would be sufficient to prevent recurrence, without increasing the time delay.

- d. Establishment of quantitative or qualitative measures of success for determining the effectiveness of the corrective actions to prevent recurrence.

The inspector found that Constellation's root cause report contains appropriate actions to assess the effectiveness of corrective actions. The actions include verification there are no additional breaker trips, no condition reports related to vendor modifications that are caused by improper review of assumptions, and no conditions reports result that are related to inadequate Engineering Test Procedure scopes.

### 03 **MANAGEMENT MEETINGS**

#### Exit Meeting Summary

The results of this inspection were discussed with Mr. James Spina and other members of the Calvert Cliffs staff at the conclusion of this inspection on January 25, 2007. Following the exit meeting, a Regulatory Performance Meeting was conducted, by conference call, in accordance with Inspection Manual Chapter 0305, "Operating Reactor Assessment Program," and focused on the performance deficiencies associated with this issue and corrective actions to prevent recurrence. No proprietary information was discussed.

## ATTACHMENT

### SUPPLEMENTAL INFORMATION

#### KEY POINTS OF CONTACT

##### NRC Personnel

S. Kennedy, Senior Resident Inspector, Calvert Cliffs  
M. Davis, Resident Inspector, Calvert Cliffs  
J. Rogge, Chief, Engineering Branch 3, DRS  
B. McDermott, Chief, Projects Branch 1, DRP

##### Licensee Personnel

S. Loeper, System Manager  
J. Mark, Design Engineer  
A. Simpson, Senior Engineer, Regulatory Matters  
M. Simpson, Principal Engineer, Plant Engineering Section

#### ITEMS OPENED, CLOSED, AND DISCUSSED

##### Closed

05000317/2006012-01	VIO	Failure to Adequately Control the Design of the "1A" EDG Feeder Breaker for Essential EDG Support Systems
05000317, 318/2006001-01	LER	1A Emergency Diesel Generator Feeder Breaker Tripped Due to Low Design Set Point

#### DOCUMENTS REVIEWED

##### Calculations

D-E-94-001, Rev. 7, Relay Settings and Coordination

##### Drawings

61-085-C, Sheet 104, Schematic Diagram Diesel Generator 1A Control Room Duct Heater DH-2  
61-027-E, Rev. 2, Single Line Diagram - Diesel Generator 1A 480V MCC 123 (SR)

##### Issue Reports

IR4-007-179 IR4-022-461 IRE-015-760 IRE-019-732\* IRE-019-735\*

\* Indicates issue reports initiated during this inspection.

Maintenance Orders

1200601513  
1200601442

Miscellaneous

CCNPP Protective Relay Setting Sheet - Breaker 52-0703, Revs. 4, 5, 6, 7  
CCNPP Protective Relay Setting Sheet - Breaker 52-1703, Revs. 5, 6, 7  
ES 200600156-000, Revs. 0000 and 0001, Evaluate the Short-Time Overcurrent Setting for  
52-1703 (1A EDG) and 52-0703 (0C EDG) Feeder Breakers (Includes Current Magnitude  
and Time Delay)  
Category I Root Cause Analysis - 1A Diesel Amptector Set Point, Rev. 1  
ETS-06-C-009, dated December 5, 2006 Post Modification Testing Lesson Learned - Training  
Lesson Plan  
ENG-ECU-06-003, dated November 2, 2006, MCC-123 Breaker Setting 1A EDG Event -  
Training Lesson Plan  
TS 3.8.1, AC Sources-Operating  
TS 3.8.1, Bases  
UFSAR Table 8-7, Load Sequencing

**LIST OF ACRONYMS**

CDF	Core Damage Frequency
DRS	Division of Reactor Safety
EDG	Emergency Diesel Generator
ESF	Engineered Safeguards Feature
IMC	Inspection Manual Chapter
IR	Inspection Report
LOOP	Loss of Offsite Power
MCC	Motor Control Center
NRC	Nuclear Regulatory Commission
STP	Surveillance and Test Procedure
SUNSI	Sensitive Unclassified Non-Safeguards Information