September 8, 2006

EA-06-198

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

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT - NRC INSPECTION REPORT NOS. 05000317/2006012 AND 05000318/2006012; PRELIMINARY WHITE FINDING

Dear Mr. Spina:

On August 16, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Calvert Cliffs Nuclear Power Plant. The results of this inspection were discussed on August 16, 2006, with you and other members of your staff.

The inspection 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 inspectors reviewed selected procedures and records, observed activities and interviewed personnel. Specifically, this inspection focused on the "1A" Emergency Diesel Generator (EDG) at Calvert Cliffs Unit 1 and the activities performed by your staff in response to the unexpected trip of an associated circuit breaker during a spring 2006 refueling outage surveillance test.

This report documents one finding related to the "1A" EDG that appears to have low to moderate safety significance. As described in Section 2 of this report, a circuit breaker which normally supplies the EDG's support systems was found to have an incorrect trip setpoint. The low over-current trip setpoint would have impacted the capability of the "1A" EDG to perform its intended safety function during certain design basis events. The self-revealing finding involved inadequate design control during the establishment of the breaker's over-current trip setpoint. While this issue did present a potential safety concern, the plant was shutdown at the time of discovery and the requirements for onsite power systems were met. Actions were taken to establish the proper circuit breaker settings prior to the end of the refueling outage and no current safety concern exists.

This finding was assessed using the reactor safety Significance Determination Process (SDP) and was preliminarily determined to be White for Unit 1 (i.e., a finding with some increased importance to safety, which may require additional NRC inspection). The finding appears to have low to moderate safety significance because the "1A" EDG would not have been capable of performing its intended safety function under all conditions for which it was designed.

This finding is an apparent violation of NRC requirements specified in 10 CFR 50, Appendix B, Criterion III, "Design Control," and is being considered for escalated enforcement action in accordance with the NRC Enforcement Policy. The current policy is included on the NRC's website at http://www.nrc.gov; select **What We Do**, **Enforcement**, then **Enforcement Policy**.

We believe that we have sufficient information to make our final risk determination for the performance issue involving the incorrect circuit breaker trip setpoints. However, before the NRC makes a final decision on this matter, we are providing you an opportunity to: (1) present to the NRC your perspective on the facts and assumptions used by the NRC to arrive at the finding and its significance at a Regulatory Conference, or (2) submit your position on the finding to the NRC in writing. If you request a Regulatory Conference, it should be held within 30 days of receipt of this letter and we encourage you to submit supporting documentation at least one week prior to the conference in an effort to make the conference more efficient and effective. If a Regulatory Conference is held, it will be open for public observation and a press release will be issued to announce it. If you decide to provide a written response in lieu of the Regulatory Conference, the submission should be sent to the NRC within 30 days of the receipt of this letter.

Please contact Mr. Brian McDermott at (610) 337-5233 within 10 business days of the date of this letter to notify the NRC of your intentions. If we have not heard from you within 10 days, we will continue with our significance determination and enforcement decision, and you will be advised by separate correspondence of the results of our deliberations on this matter. Since the NRC has not made a final determination in this matter, no Notice of Violation is being issued for the inspection finding at this time. In addition, please be advised that the characterization of the apparent violation described in this letter may change as a result of further NRC review.

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 Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Brian E. Holian, Director
Division of Reactor Projects

Docket No. 50-317, 50-318
License No. DPR-53, DRP-69

Enclosure: Inspection Report 05000317/2006012 and 05000318/2006012
w/Attachments: A) Supplemental Information, B) Motor Control Center Loads

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
Director, Nuclear Regulatory Matters
R. McLean, Manager, Nuclear Programs
K. Burger, Esquire, Maryland People's Counsel
State of Maryland (2)

Criterion III, "Design Control," and is being considered for escalated enforcement action in accordance with the NRC Enforcement Policy. The current policy is included on the NRC's website at http://www.nrc.gov; select **What We Do**, **Enforcement**, then **Enforcement Policy**.

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Sincerely,

Brian E. Holian, Director
Division of Reactor Projects

Docket No. 50-317, 50-318
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Enclosure: Inspection Report 05000317/2006012 and 05000318/2006012
w/Attachments: A) Supplemental Information, B) Motor Control Center Loads

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos.	50-317, 50-318
License Nos.	DPR-53, DPR-69
Report Nos.	05000317/2006012 and 05000318/2006012
Licensee:	Constellation Generation Group, LLC
Facility:	Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Location:	Lusby, MD
Dates:	July 10, 2006 through August 16, 2006
Inspectors:	John B. Giessner, Senior Resident Inspector (acting, DRP) Christopher G. Cahill, Senior Reactor Analyst (DRS) Leonard S. Chueng, Senior Inspector (DRS) Marlone Davis, Resident Inspector (DRP)
Approved by:	Brian J. McDermott, Chief Projects Branch 1 Division of Reactor Projects

Enclosure

TABLE OF CONTENTS

SUMMARY OF FINDINGS

IR 05000317/2006012 and 05000318/2006012; 07/10/2006 - 08/16/2006; Calvert Cliffs Nuclear Power Plant, Unit 1; Event Followup.

The report documents an event follow-up inspection focused on the “1A” Emergency Diesel Generator (EDG) at Calvert Cliffs Unit 1 and the followup activities performed by your staff in response to the trip of an associated circuit breaker during a spring 2006 refueling outage surveillance test. The inspection was conducted by regional and resident inspectors. One apparent violation (AV) with potential low to moderate safety significance was identified (Preliminary White). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, “Significance Determination Process” (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. 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.

NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- **Preliminary White:** An apparent violation of 10 CFR 50, Appendix B, Criterion III (Design Control) was identified involving the failure to ensure an adequate trip setpoint for the electrical circuit breaker that supplies the “1A” EDG support systems. An SDP Phase 3 risk analysis determined that the failure to account for possible combinations of “1A” EDG support equipment operation in the short-time over-current trip setpoint for the supply breaker to 1MCC123 was preliminarily of low to moderate safety significance. Specifically, the short-time over-current trip setpoint was set too low and it did not account for the in-rush current associated with the possible combinations of equipment that could start and operate to support the “1A” EDG following a loss of offsite power (LOOP). This low setpoint, combined with normal setpoint drift, resulted in substantial periods where the “1A” EDG would not have been able to perform its safety function, because the support system supply circuit breaker would have tripped open inappropriately. Calvert Cliffs took immediate action to correct the breaker setpoint and evaluate other potential deficiencies of a similar nature. This issue was entered into the corrective action program at Calvert Cliffs for resolution.

  The finding was more than minor because it affected the Mitigating Systems Cornerstone objective to ensure the availability and reliability of systems (i.e., emergency AC power) that respond to initiating events to prevent undesirable consequences, and its related attribute for design control. The "0C" Station Blackout Diesel Generator (a non-safety related, but risk-important power source) and the breaker for its support systems were similarly affected by the performance deficiency. SDP Phase 1, Phase 2, and Phase 3 assessments were used to evaluate the risk significance of this finding. The Phase 1 screening required performance of a Phase 2 evaluation because the finding represented a loss of safety function of a single train, for greater than its allowed outage time. The Technical Specification (TS) allowed outage time is 14 days for a single EDG. To assess the full significance both the Phase 2 and Phase 3 analyzes assumed a 5407 hour exposure for the “1A” EDG being unable to perform its safety function and an additional 6.7 hours where both the "1A" EDG and the "0C" DG would not have been able to perform their required functions (the "0C" EDG had less instrument drift). The Region I senior reactor analyst (SRA) conducted a Phase 3 Risk Assessment, to refine the Phase 2 analysis and to incorporate external events and recovery credit. The Phase 3 analysis for internal and external initiating events, using the above assumptions and licensee risk information, determined a ΔCDF of approximately 1 in 150,000 years of operation (mid E-6 per year range) for both internal and external events, with no associated increase in large early release frequency (LERF). The risk of the "1A" EDG exposure time dominated the analysis by several orders of magnitude over the risk of the concurrent "1A" EDG and "0C" DG exposure time. A large fire in the turbine building, which causes a loss of offsite power, was the dominating initiating event.

REPORT DETAILS

1.0 Description of Events

On March 24, 2006, Operations personnel secured the “1A” Emergency Diesel Generator (“1A” EDG) at Calvert Cliffs Unit 1 during a refueling outage surveillance test, based on the unexpected trip of an associated circuit breaker. Surveillance test procedure (STP) O-004A-1, “Unit 1 A-Train ESF Test,” simulates a loss of the 4 kV safety bus and initiates a fast start of the EDG. During the performance of the STP, plant operators initially observed that the “1A” EDG started and picked up the 4 kV bus loads as expected. However, Operations subsequently noted that the 480 V feeder breaker for Motor Control Center (MCC) 123 was tripped. This MCC supplies essential EDG support systems such as radiator cooling fans, room ventilation cooling fans, and other loads. Approximately twenty minutes after the EDG start, Operations aborted the STP and secured the “1A” EDG to prevent the engine from overheating due to the loss of the cooling fans and room ventilation.

During the evaluation of this event, Calvert Cliffs determined that the 480 V feeder breaker for MCC 123 tripped when the MCC was initially energized during loading of the EDG. The feeder breaker tripped because the MCC 123 loads that immediately energized exceeded the breaker's short-time over-current trip setpoint. The licensee subsequently determined that the over-current trip setpoint was set too low due to a design error that occurred when the EDG was installed in 1996.

Background

The safety related 1A EDG and the non-safety related “0C” Station Blackout Diesel Generator at Calvert Cliffs are French designed five megawatt dual diesel generators (i.e., one diesel at each end with the generator in the middle). Each EDG is housed in its own building, with a 125 V battery room and battery chargers. The “1A” EDG is cooled by six radiator fans and the building is cooled by a series of four ventilation fans. The room ventilation fans start based on the diesel generator room temperature. One building ventilation fan starts when the EDG starts, the other three fans start sequentially based on the diesel generator room temperature. The ventilation system also includes various heaters for temperature control during the winter months.

The “0C” EDG (station blackout diesel) is a non-safety related, manual-start EDG that is capable of being aligned to any one of the safety-related 4kV busses for either Unit 1 or Unit 2 at Calvert Cliffs. The “0C” EDG has a heating, ventilating and conditioning (HVAC) design similar to the “1A” EDG. The “0C” EDG is important to plant risk and its support system supply breaker setting was impacted, similar to the “1A” EDG. As part of the corrective actions for the issue discussed in this report, the licensee determined that the Amptector setting for “0C” EDG MCC supply breaker was also set too low. The NRC's significance determination for the finding discussed in this report takes into consideration the impact of the incorrect breaker settings for the “1A” EDG and “0C” EDG.

2.0 Equipment Failures and Causes

Incorrect Setting of 1MCC123 Supply Breaker Over-current Trip Device

a. Inspection Scope

The inspectors, as part of event follow-up, reviewed the events surrounding the breaker trip and the existing design of the "1A" EDG breakers and trip scheme. This review included the related Updated Final Safety Analysis Report (UFSAR) sections and TSs, diagrams, various design electrical analyses, discussion with site personnel, summaries of testing results and various condition reports (CRs) related to the issue. The inspectors reviewed the design modification which installed the "1A" EDG and the testing performed. In addition, the team reviewed the calculations and evaluations done to assess the impact (probabilistic risk assessment) and past operability related to the breaker tripping. This included a review of calculations, cause analysis, operator actions and the overall thoroughness of the extent of condition. The extent of condition review included the "0C" EDG, the diesel generator with similar design. The inspectors also reviewed Constellation's immediate corrective action to address the issue, which included the changes to the over-current setting to verify they were adequately set to prevent inadvertent tripping, and to verify adequate breaker and bus protection. The inspection included a review of CRs to ensure the scope of the licencee's review was adequate.

b. Findings

Introduction: An apparent violation of 10 CFR 50, Appendix B, Criterion III (Design Control) involving the licensee's failure to ensure an adequate trip setpoint for the electrical circuit breaker that supplies the "1A" EDG support systems was identified. A SDP Phase 3 risk analysis determined that the failure to account for possible combinations of "1A" EDG support equipment operation in the short-time over-current trip setpoint for the supply breaker to 1MCC123 was preliminarily of low to moderate safety significance.

The inspectors verified that the condition of the short-time over-current trip setpoint would not have been identifiable during normal monthly EDG surveillance testing. When the "1A" EDG is started for surveillance testing one room cooling fan and other loads are already normally running and the other fans would start based on room temperature alone (they would not simultaneously start as they do following a loss-of-offsite power).

Description: The "1A" EDG was manually secured during testing when it was determined that the circuit breaker that feeds 1MCC123 had tripped. Since the EDG would not be able to perform its design functions with its support loads de-energized, the licensee promptly declared the EDG inoperable and started an investigation. The cause for the loss of 1MCC123 was due to the feeder breaker short-time over-current exceeding its trip setpoint, resulting in a trip of the feeder breaker. Attachment B of this report has a detailed description of the MCC loads and their design ratings.

The original short-time over-current of the Amptector (trip device) for the supply breaker was set at 2400 amps. The setpoint was based on providing coordination with the upstream breaker; and the starting of the single largest motor, and the MCC supplying all other loads, as documented in Calculation D-E-94-001, dated August 26,1994. The combined current from the assumed loading was increased by a factor of two to account for the direct-current (DC) off-set current and the large uncertainty of the breaker tripping setpoint (i.e., including calibration tolerance, setpoint drift and the inherent inaccuracy of the Amptector). However, the setpoint did not account for all the loads that can simultaneously start after an undervoltage event. The setpoint was inadequate because once the "1A" EDG started and 1MCC123 energized, more than one motor can start instantly. At the design room temperature of 105°F, all four room ventilation fans would start simultaneously. Fifteen motors and other breaker loads could start simultaneously, resulting in a combined in-rush current of more than 2600 amps. In addition, with the tripping setpoint uncertainty, setpoint drift of up to 10%, and DC off-set current, the in-rush current could be much higher than the original setpoint. During an extent of condition review, Constellation determined that the "0C" EDG also had an inadequate short-time over-current setpoint for its equivalent breaker and that the breaker would trip open prematurely under certain conditions.

The inspectors determined that Calvert Cliffs did not verify and check the adequacy of the short-time over-current setting of 1MCC123 Amptector for the simultaneous starting of all loads that would be expected under design basis conditions. Instead, Constellation used a design standard which only included the largest single load starting with other loads already running. This standard was not appropriate for the 1MCC 123 supply breaker setting. This issue was most likely not identified in previous surveillance tests because the setpoint had not drifted as low and because the testing was conducted during the months when the normal ambient temperature was too low to require additional ventilation fans to start.

The licensee, prior to plant startup on Unit 1, reset the 1MCC123 breaker trip to 3600 amps to address the issue. The Amptector setpoints are calibrated once every two years. The calibration procedure allowed the technicians a +/- 2% as-left setpoint tolerance and the allowable as-found setpoint deviation can be +/- 10%. The inspectors have reviewed the new short-time over-current setting and have found it acceptable. The licensee also corrected the setpoint of the equivalent breaker which supplies the support systems for the "0C" EDG.

<u>Analysis</u>: The performance deficiency involved the failure to provide adequate design control, as required by 10 CFR 50 Appendix B, Criteria III, for the "1A" EDG support system supply circuit breaker short-time over-current trip setpoint. The setpoint was too low, it did not account for the in-rush current associated with the possible combinations of equipment that could start and operate to support the "1A" EDG following a LOOP. This low setpoint and normal setpoint drift resulted in substantial periods where the "1A" EDG would not have been able to perform its safety function, because the support system supply circuit breaker would have tripped open inappropriately.

The inspectors determined, by reviewing licensee data concerning setpoint drift and outside air temperatures that the "1A" EDG would not have been able to perform its safety function for an exposure period of approximately 5407 hours over the last year of reactor operation. The setpoint drift contributed approximately 5046 hours when outside air temperature was below 85 °F (one room cooling fan start) and the low setpoint contributed approximately 361 hours when outside air temperature was at or above 85

°F(more than one room cooling fan start). The finding was more than minor because it is associated with the Mitigating Systems Cornerstone attribute of design control and affected the cornerstone objective to ensure the availability and reliability of systems (i.e., emergency AC power) that respond to initiating events to prevent undesirable consequences.

The “0C” EDG (station blackout diesel) support system supply circuit breaker short-time over-current trip was similarly affected by this performance deficiency, however, the as-found setting was not as low as that found on the “1A” EDG. The inspectors verified licensee data that indicated that the “0C” EDG would not have been able to perform its required function when outside air temperature was at or above 95 °F (more than two room cooling fans start). It was estimated that this exposure period was 6.7 hours.

To assess the full significance of the performance deficiency, both Phase 2 and Phase 3 analyses were based on the 5400 hour exposure for the “1A” EDG being unable to perform its safety function and additional 6.7 hours where both the “1A” EDG and the “0C” EDG would not have been able to perform their required functions.

The finding was evaluated in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations," using Phase 1, Phase 2, and Phase 3 SDP analyses. The Phase 1 screening required performance of a Phase 2 evaluation because the finding represented a loss of safety function of a single train, for greater than its allowed outage time. The TS allowed outage time is 14 days for a single EDG. A Licensee Event Report (LER) was written on this issue.

The internal events Phase 2 analysis, conducted using the Risk-informed Inspection Notebook for Calvert Cliffs Nuclear Power Plant Units 1 and 2, revision 2, dated September 30, 2005 and with IMC 0609, Appendix H, Containment Integrity SDP, determined that the finding could have substantial safety significance based on ΔCDF with no associated change in LERF.

The Region I SRA conducted a Phase 3 Risk Assessment, to refine the Phase 2 analysis and to incorporate external events and recovery credit. The analysis used an updated Calvert Cliffs SPAR model, Rev 3 plus, dated October 28, 2005. Since the finding only affected the “1A” EDG and the “0C” DG, the emergency power system common cause factors were adjusted to more accurately reflect the physical differences between the site EDGs. Additionally, the shutdown risk was evaluated and considered to be small compared to the operational risk.

The final assessment results indicate that the finding had low to moderate safety significance and was determined to be WHITE for Unit 1 based on ΔCDF of approximately 1 in 150,000 years of operation (mid E-6 per year range) for both internal and external events, with no associated increase in LERF. The Phase 3 internal events analysis resulted in an increase in ΔCDF of in the low E-6 range for the 5407-hour exposure period. The dominant internal event core damage sequence was a station blackout with a successful reactor shutdown along with a failure to recover the EDGs and restore offsite power in four hours. A LOOP was the second dominant internal event sequence with a successful reactor shutdown and the EDGs powering a safety bus with auxiliary feedwater (AFW) and failure of once through cooling. The SRA determined, based on information from the licensee, that the dominate external event was a large turbine building fire which causes a LOOP and challenges AFW and failure of once through cooling. The contribution in ΔCDF from external events was in the mid E-6 range. The SRA reviewed the licensee's risk assessment which included at-power internal and external events, shutdown and LERF. Using similar assumptions to those used in the Phase 3 analysis, the licensee estimated the ΔCDF to be similarly in the mid-E-6 range. The risk of the "1A" EDG exposure time dominated the analysis by several orders of magnitude over the risk of the concurrent "1A" EDG and "0C" EDG exposure period.

Old Design Issue Considerations: As defined in NRC Inspection Manual Chapter (IMC) 0305, issued date 06/22/06, an old design issue is an inspection finding involving a past design-related problem in the engineering calculations or analysis, associated operating procedure or installation of plant equipment that does not reflect a performance deficiency associated with existing licensee programs, policy, or procedures. As discussed in IMC 0305 Section 06.06.a, some old design issues may not be considered in the assessment program.

This issue was "self-revealed" during the performance of a two-year surveillance test which is associated with an existing licensee program. Section 06.06.a.1 states, in part, that the NRC may refrain from considering safety significant inspection findings in the assessment program for a design-related finding in engineering calculations or analysis, associated operating procedure or installation of plant equipment that meets all four criteria listed in IMC 0305, Section 06.06.a.1, Treatment of Old Design Issues in the Assessment Process. The first criterion states that the finding was licensee-identified as a result of a voluntary initiative such as a design basis reconstitution. This section further states that for the purpose of this manual chapter, self-revealing issues are not considered to be licensee-identified. In this case, the design issue (incorrect short-time over-current setting of 1MCC123 Amptector) was identified as the result of a self-revealing event and the licensee had a previous opportunity to identify the issue during the EDG installation. Therefore, this design-related finding will not be treated as an old design issue.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods or by the performance of a suitable testing program. Contrary to the above, in 1996, Calvert Cliffs did not verify or check the adequacy of the short-time over-current setting of the 1MCC123 Amptector when the "1A" EDG was installed. This issue was entered into the corrective action program at Calvert Cliffs (IRE-013-237) for resolution. Corrective actions included changes to the over-current trip setting **(AV 50-317/20060012-01, Failure to Adequately Control the Design of the "1A" EDG Feeder Breaker for Essential EDG Support Systems)**.

4OA6 Meetings, Including Exits

Exit Meeting

On August 16, 2006, the inspectors presented the inspection results to yourself and other members of your staff, who acknowledged the findings. The inspectors asked Constellation whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENTS: SUPPLEMENTAL INFORMATION
MOTOR CONTROL CENTER LOADS

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

<u>Licensee</u>

J. Spina	Site Vice President
J. Pollock	Plant General Manager
P. Furio	Licencing Supervisor
J. Mills	System Engineering General Supervisor
M. Simpson	Supervisor, Electrical and Controls System Engineering
A. Julka	Director Fleet PRA
J. Stone	Principal Engineer
A. Simpson	Sr. Licensing Engineer
L. Larragoite	Director Fleet Licensing
M. Flaherty	Manager - Engineering
S. Loeper	EDG system manager
R. Stark	Design Engineer
J. Boggs	Design Engineer
A. Julka	Director, PRA
J. Wynn	System Engineer

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

<u>Opened</u>

05000317/2006012-01	AV	Failure to Adequately Control the Design of the Setpoints for “1A” EDG Feeder Breaker for Essential EDG Support Systems (Section 2)

<u>Closed</u>

None

<u>Discussed</u>

None

LIST OF DOCUMENTS REVIEWED

Procedures and Documents

STP O-004A-1, Unit 1A Train Engineered Safety Features Test, Revision 25
FTE-29, Acceptance Test and Calibration of Amptectors, Revision 8
York 507-40053, Direct Digital Control System for “0C”-AHU-1 & “0C”-AHU-2

Calculations and Studies

Calculation D-E-94-001, Bechtel Design Calculation for SACM Diesel Project, Revision 7
Calvert Cliffs Nuclear Power Plant Risk Evaluation for the 1A DG MCC Feeder Breaker Trip on 3/24/2006 and 7/25/2006
ES 200400160, Equivalency Evaluation for New Westector Trip Devices in Place of Westinghouse Amptectors, Revision 0
ES 200600156, Engineering Evaluation for Breaker Short Time Over-current Settings 52-1703 (of MCC 123) and 52-0703 (MCC 023)

Condition Reports/Evaluations

IRE-013-237, 1MCC123 Feeder Breaker tripped, 3/27/2006
Action Item Tracking (AIT) IR200600072, Apparent Cause for 1MCC123 Feeder Breaker Tripping, Revision 1

Drawings

61001SH0001, Electrical Main Single Line Diagram
61-027-E, Diesel Generator Project Single Line Diagram, Diesel Generator “1A”, SH1, Rev. 2
61-085-C, Diesel Generator Project Schematic Diagram, “1A” Emergency DG HVAC System Preheat Duct Heater DH-4, Sh 106, Revision 2
62429SH0001, HVAC System P & ID, Diesel Generator Building 1, Revision 5
60-626-B, Logic Diagram, DG Building 2, Switchgear Room Air Handling Unit “0C”-AHU-2, SH004, Revision 1
60-626-B, Logic Diagram, DG Room Exhaust Fans “0C”-F-1 Thru OC-F-4, Sh 48, Revision 1
61085SH0077, Schematic Diagram Diesel Generator 1A Building Supply Fan F-10, Revision 5

Work Orders (WO)

WO 0200402727, Inspect 52-0703 (MCC 023 Feed) Per FTE-077
WO 1200403460, Inspect 52-1703 (MCC 123 Feed) Per FTE-077
WO 0200002152, Inspect 52-0703 (MCC 023 Feed) Per FTE-077 and Calibrate the Amptector per FTE 29
WO 1200601442, Replace Amptector 52-1703 and Calibrate the Amptector per FTE 29

LIST OF ACRONYMS

ADAMS	Agency Document Access and Management System
AFW	Auxiliary Feed Water
AIT	Action Item Tracking
AV	Apparent Violation
CR	Condition Report
DC	Direct Current
DS	Diesel Generator
EDG	Emergency Diesel Generator
HVAC	Heating, ventilating and air-conditioning
IMC	Inspection Manual Chapter
LER	Licensee Event Report
LERF	Large Early Release Frequency
LOOP	Loss of Offsite Power
MCC	Motor Control Center
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records System
SDP	Significance Determination Process
SRA	Senior Reactor Analyst
STP	Surveillance Test Procedure
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
WO	Work Order

MOTOR CONTROL CENTER (MCC) LOADS

1MCC123 supplies power to all essential 480 VAC components for the operation of the 1A EDG at Calvert Cliffs Unit 1. The MCC is fed from the 4.16kV safety-related bus 11 that is powered from the 1A EDG output or the offsite power supply. A step down transformer reduces the voltage to 480 VAC and supplies the power to 1MCC123 and another MCC (MCC124). The loads connected to the 480 VAC 1MCC123 are as follows:

a. Six radiator fans (40 HP with an estimated inrush current of 247.5 amps each)
b. Two ventilation fans (F10 &F12, 40 HP with an estimated inrush current of 283 amps each)
c. Two fuel oil feed pump motors (P11 and P12, 5 HP with an estimated inrush current of 12.76 amps each
d. One battery room exhaust fan (F8, 1.5 HP with an estimated inrush current of 20.37 amps)
e. One battery charger (estimated inrush current of 6.17 amps)
f. One distribution panel (1P23 with estimated inrush current of 1.44 amps)
g. Four room ventilation fans (F1, F2, F3, and F4, 20 HP with an estimated inrush current of 148.1 amps each)
h. One intake duct heater (DH-4, 70 KW with steady state current of 79 amps)
i. One battery room unit heater with fan (estimated inrush current of 21 amps)
j. Two pre-lube pumps (not expected to be running during EDG operation)

The operation of the above components is such that when the "1A" EDG starts and energizes the 4.16kV Safety Bus 17, it in turn energizes the 480 VAC 1MCC123, items "a through f" and at least one fan of item "g" starts immediately (regardless of the diesel room temperature). The other three fans of item "g" will start, sequentially, when the room temperature exceeds 85°F, 95°F, and 105°F. If the diesel room temperature is above 105°F when the 1MCC123 is energized then all four room fans listed in item "g" will start simultaneously. Item "i" is set at 78°F to maintain the battery room at or above the temperature setting.

Item "h" is controlled through two silicon controlled rectifiers (SCRs), which responds to a thermister (a resistance temperature sensor) in the outdoor air inlet duct, and is set at 40°F. It is controlled with a control band of 10°F that is fully heated at 35°F and has no heat at 45°F. However, the current design will always energize the heater initially (for about 2 seconds) when power is restored to the bus. This heater design led to an overall increase in the in-rush current the breaker will experience when power is restored to the bus.

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