BALTIMORE
GAS AND
ELECTRIC

1650 CALVERT CLIFFS PARKWAY • LUSBY, MARYLAND 20657-4702

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August 14, 1992

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
Electrical Distribution System Functional Inspection, Combined Inspection Report Nos. 50-317/92-80 and 50-318/92-80

REFERENCES: (a) Letter from Mr. M. W. Hodges (NRC) to Mr. G. C. Creel (BG&E), dated June 5, 1992, Electrical Distribution System Functional Inspection (EDSFI) of Calvert Cliffs Units 1 and 2, Combined Inspection Report Nos. 50-317/92-80 and 50-318/92-80

(b) Letter from Mr. G. C. Creel (BG&E) to NRC Document Control Desk, dated July 8, 1992, same subject

Gentlemen:

Reference (a) transmitted three Notices of Violation related to the Electrical Distribution System Functional Inspection (EDSFI) conducted at Calvert Cliffs from March 16, 1992, through April 30, 1992. As discussed in Reference (b), This letter forwards our response to the three violations. This letter is delayed beyond the intended date of submittal discussed in Reference (b) in order to incorporate changes necessary to ensure its clarity and accuracy. This delay has been discussed with Mr. Larry Nicholson of the Region I staff.

If, after consideration of the responses provided, the NRC wishes to discuss these issues further, we would be pleased to meet with members of your staff.

Very truly yours,

GCCreel

200065

Cert No P098603362

GCC/EPW/epw/dlm

Attachment

IE01
1/1

cc: D. A. Brune, Esquire
J. E. Silberg, Esquire
R. A. Capra, NRC
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REPLY TO A NOTICE OF VIOLATION
INSPECTION REPORT NOS. 50-317/92-80 AND 50-318/92-80

VIOLATION NO. ˜

Both examples in this cited violation are apparent violations of 10 CFR Part 50, Appendix B, Criterion XI (Test Control) which require that all testing be performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. Criterion XI also requires that the test results be documented and evaluated to assure that requirements have been satisfied. Each example is discussed separately below.

(A) I. **DESCRIPTION OF VIOLATION**

The first example concerns the degraded bus relay settings at Calvert Cliffs. As opposed to the loss of voltage relays which protect the 4 kV busses from a sudden loss of voltage and have a lower setpoint and a shorter time delay, the degraded bus relays protect the 4 kV busses from prolonged reduced voltage conditions which would impact the proper operation of safety-related equipment.

The degraded bus relays begin timing upon a reduced voltage on the 4 kV safety busses. The voltage level that initiates timing of the relay, called the "dropout" setting, is stipulated by Technical Specification (TS) 3.3.2.1 to be 3628 volts +/-25 volts. If voltage does not recover above the "reset" level within 8.4 seconds, the relay initiates a trip causing the 4 kV busses to divorce from their normal offsite supply, the Emergency Diesel Generators (EDGs) to start, and the loading of the EDGs with the 4 kV busses.

Although 4 kV bus voltage is the parameter of concern, the relays sense voltage on the low voltage side of a potential transformer and are set correspondingly. Thus a nominal dropout of 3628 volts on the bus corresponds to a relay setting of approximately 103.9 volts. This reflects the potential transformer voltage ratio (35:1) and the potential transformer (PT) error (-0.2% or a factor of 0.998). The PT error is constant for this transformer application and thus may be viewed as a correction factor rather than an error.

$$103.86 \times 35 \times 0.998 = 3628$$

The relay reset setting is determined by the relay deadband. The relay deadband is the difference between the dropout setting and the reset setting. Once the dropout setting is established the relay deadband is adjusted to yield the reset setting.

While the nominal dropout setting and the allowable time delay are specified in TS the reset setting is not. It must however, correspond to a 4 kV bus voltage lower than the worst case steady state voltage. Otherwise, a brief voltage transient could dip below the relay dropout setting, cause the relay to begin timing, and, with steady state voltage less than reset, the relay will initiate a trip because the reset setting is never reached. This relay trip will cause an unnecessary transient to the 4 kV busses and challenge to the EDGs.

During the EDSFI, the inspectors noted in STP results that a reset setting of 105.0 volts was recorded. This data was recorded for information only because the STP did not stipulate acceptance criteria for the reset setting.

The inspectors developed two concerns which are the basis for this violation example. First, the inspectors were concerned that the STP did not contain acceptance criteria for the reset settings based on design documents. Second, the inspectors perceived that the reset setting of 105.0 volts they observed was too high in that it corresponded to a 4 kV bus voltage greater than the worst case (lowest) steady state voltage. This created the potential for a short transient as described above to unnecessarily load the 4 kV busses onto the EDGs while offsite power was still available. Thus a reset setting of 105.0 volts represented a potential challenge to safety systems. (See attached graph [1]) These two concerns are cited as an apparent violation of 10 CFR Part 50, Appendix B, Criterion XI (Test Control).

II. REASON FOR VIOLATION

Baltimore Gas and Electric Company (BG&E) does not agree that this example represents a violation of the referenced requirement. We believe some confusion exists regarding the requirements and acceptance limits for reset settings for the degraded grid relays.

The EDSFI inspection report states that Calculation E-90-31 determined the reset voltage to be 3668 volts. The report also indicates that this correlates to a reset setting of 104.8 volts. Therefore the report concludes that the recorded reset setting of 105.0 volts is unsatisfactory.

BG&E wishes to clarify these observations. First, the methodology used in the NRC inspection report to convert from reset setting to 4 kV bus voltage omits the use of PT error. This causes discrepancies between the NRC values and the values in use.

EDSFI inspection Report:	104.8 x 35 = 3668
	105.0 x 35 = 3675
BG&E Calculation	105.0 x 35 x 0.998 = 3668

By including PT error, it becomes clear that 105.0 volts corresponds to 3668 volts on the 4 kV bus. It is an acceptable setting for the relay reset.

Second, Calculation E-90-31 did not determine 3668 volts to be the reset point or "the worst case 4160 bus running voltage" as stated in the report. Rather, the calculated reset setting of 105.0 volts discussed above was equated to a 4 kV bus voltage of 3668 volts. That number was then used as an input to calculate the minimum acceptable switchyard voltage necessary to clear the maximum reset setting following an Engineered Safety Features actuation (limiting case transient) under worst case conditions. This switchyard voltage was found to be 479 kV and would result in a final steady state 4 kV bus voltage of 3668.5 volts. (See attached graph [1])

Operating Instruction (OI)-28 requires that switchyard voltage be maintained above 485 kV. This value includes 5 kV margin for the maximum possible concurrent grid transient and an additional 1 kV for conservatism.

In summary, Calculation E-90-31 was done expressly to determine the minimum initial switchyard voltage required to clear the maximum reset setting for the limiting case transient. Switchyard voltage is controlled above that value with conservatism and margin included. The observed reset setting of 105.0 volts is the maximum allowable reset setting.

Regarding the NRC concern that the STP did not contain the appropriate acceptance criteria, BG&E maintains that all applicable requirements have been met. Because the reset setting is not a setpoint stipulated in TS, it is not required to be tested under the STP Program. It is, however, controlled and tested by Functional Test Electrical (FTE) procedures using Relay Setting Sheets in accordance with the requirements of Criterion XI. This includes the fact that the acceptance criteria in the Relay Setting Sheets (no greater than 105.0 volts) is taken from design documentation (Calculation E-87-13).

BG&E does not believe that this example constitutes a violation of Appendix B Test Control requirements. Although the reset setting is not controlled by an STP, it is not required to be, and it is controlled by an appropriate test program. The as-found value of 105.0 volts was not inconsistent with design and as described above does not represent a potential challenge to safety systems. Therefore, BG&E requests that the NRC reconsider this example as a violation of Appendix B requirements.

(B) I. DESCRIPTION OF VIOLATION

The second example in this cited violation involves the documentation and evaluation of EDG test results.

Verification of the CCNPP emergency diesel generator (EDG) operating parameters is accomplished by surveillance testing. Attachment 10 to STP O-4 requires, in part, that the maximum frequency (Hz) obtained during sequencing of load steps be recorded based on data from the visicorder trace. The STP acceptance criterion for the maximum frequency recorded was 66 Hz.

Upon review of the visicorder traces associated with STP O-4, conducted on EDG 11, the NRC team noted that the maximum frequency appears to be 66.2 Hz (based on timing of voltage peaks) at 0.23 seconds into step zero (0) of the loading sequence. However, the maximum recorded frequency in STP O-4 was 61 Hz, evidently incorrect. The inspection report indicated that BG&E: (i) failed to properly record the maximum frequency observed during EDG loading sequencing, and (ii) failed to properly evaluate the impact of frequency exceeding the maximum acceptable value during the STP. Section 4.2.2 of the inspection report concluded that these apparent problems constituted a violation of 10 CFR Part 50, Appendix B, Criterion XI (Test Control).

II. REASON FOR VIOLATION

BG&E disagrees that this example is a violation of NRC requirements. As detailed below, the frequency transient and subsequent recovery at step 0 of the surveillance test is not caused by a step load increase but rather is the result of normal engine start. As such, it is not subject to the frequency criteria described in the UFSAR and contained in the STP. Therefore its omission from the test frequency data is not incorrect and its inclusion is not necessary to properly evaluate the test results.

REPLY TO A NOTICE OF VIOLATION
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VIOLATION NO. 1

During the inspection, some disagreement existed over interpretation of the test criteria. BG&E wishes to clarify the basis for our position.

The NRC team apparently concluded that STP O-4 evaluated the maximum frequency observed during all EDG sequence steps -- including step zero. However, based on the UFSAR, BG&E believes that step zero is not considered a "load sequence step" for the purposes of evaluating transient frequency performance. As a result, the maximum frequency for steps 1 through 7 was recorded (61 Hz); the frequency for step zero (66.2 Hz) was not. Accordingly, the 66 Hz maximum frequency requirement only applied to steps 1 through 7.

UFSAR Section 8.4.1.2 states, "*During recovery from transients caused by step load increases or resulting from the disconnect of the largest single load, the speed of the diesel generator will not exceed nominal speed plus 75% of the difference between nominal speed (900 rpm and 115%) of nominal speed.*"

This indicates that the EDG speed is limited to 1001 rpm (900 + 0.75 x[1.15 x 900 - 900] = 1001.25 rpm), which corresponds to 66.7 Hz. Although maximum EDG frequency was less than 66.7 Hz in all steps, this requirement applies only to steps 1 through 7.

The transient during step 0 is a starting transient due to the acceleration and subsequent overshoot of the engine from rest to approximately 900 rpm in less than 10 seconds. This overshoot is normal and necessary to allow the governor to take control and establish 60 Hz frequency. Although a small amount of electrical loads are placed on the EDG at step 0, these loads represent less than 15% of the engine rating and have minimal impact on the transient when compared to the energy required to accelerate the engine from rest to rated speed in less than 10 seconds. In addition, observed frequency response during testing supports this explanation since frequency continues to increase for a short period after the output breaker closes rather than decrease due to the addition of loads. As such, this transient is not a transient caused by a load step increase and therefore the transient frequency criteria in the UFSAR does not apply.

Regarding the observation that BG&E failed to properly evaluate the impact of frequency exceeding the maximum allowable value during the STP, we deduce from the logic outlined above that the STP load step frequency criteria did not apply to step 0. The evaluation of test results therefore was consistent with the requirements and intent of the UFSAR. In addition, the 66 Hz STP requirement was a self-imposed value chosen for conservatism and convenience. As discussed above, the actual maximum allowed frequency in steps 1 through 7 is 66.7 Hz. It can be logically assumed, however, that the observed frequency of 66.2 Hz for step 0 is technically acceptable since this is below 66.7 Hz.

In summary, BG&E considers that the procedure was adequate and served its function. The results and acceptance criteria were properly documented and evaluated by test personnel and EDG performance regarding frequency meets all applicable requirements. BG&E believes that no violation exists and we request reconsideration of this example as a violation of 10 CFR Part 50, Appendix B, Criterion XI.

VIOLATION NO. 1

III. CORRECTIVE STEPS TAKEN AND RESULTS ACHIEVED

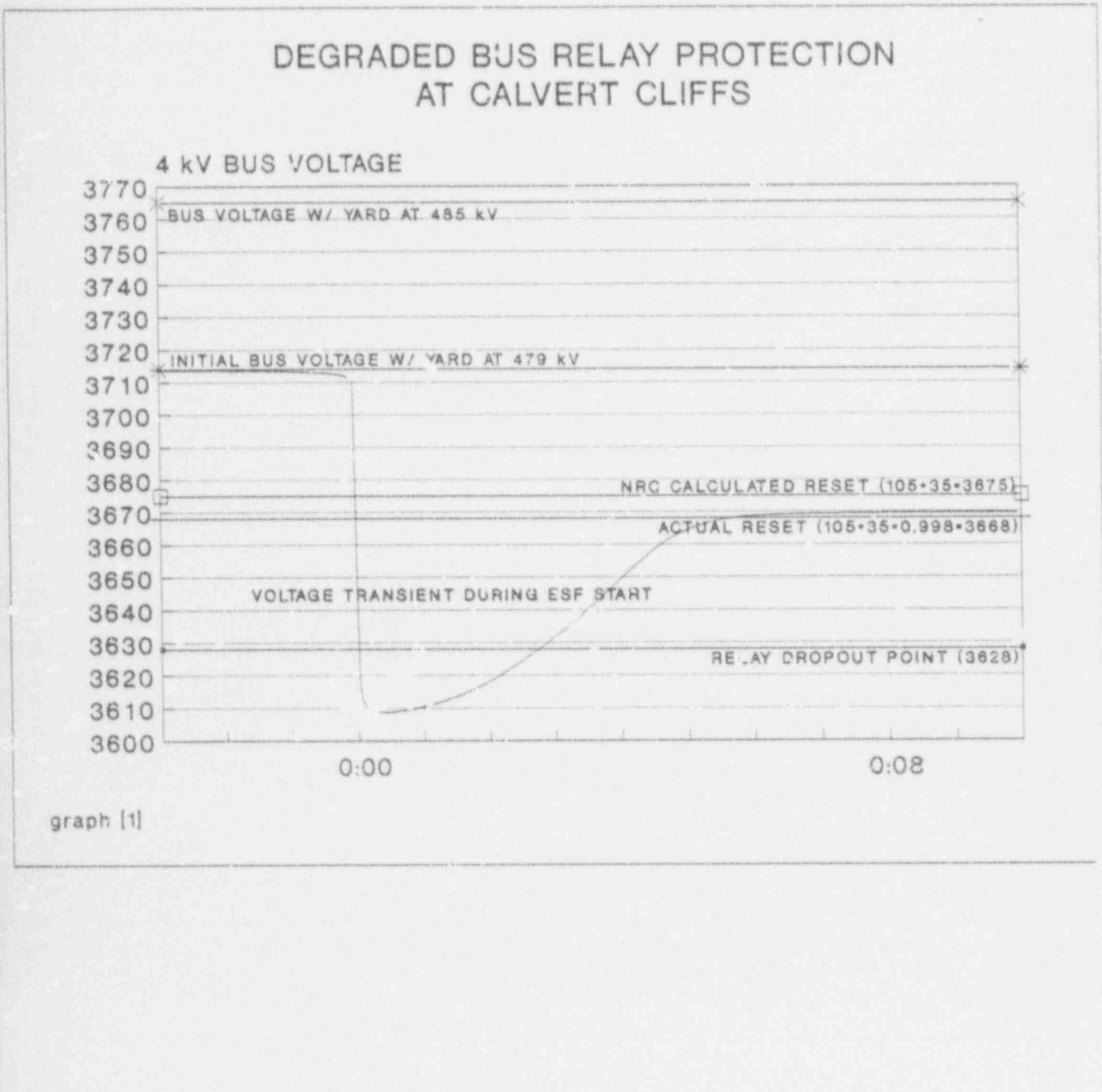
No corrective action is necessary.

IV. CORRECTIVE ACTIONS WHICH WILL BE TAKEN TO AVOID FURTHER VIOLATIONS

No corrective action is necessary.

V. DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED

Full compliance with NRC requirements has been maintained.


DEGRADED BUS RELAY PROTECTION
AT CALVERT CLIFFS
4 kV BUS VOLTAGE
3770
3760
3750
3740
3730
3720
3710
3700
3690
3680
3670
3660
3650
3640
3630
3620
3610
3600
BUS VOLTAGE W/ YARD AT 485 kV
INITIAL BUS VOLTAGE W/ YARD AT 479 kV
NRC CALCULATED RESET (105•35•3675)
ACTUAL RESET (105•35•0.998•3668)
VOLTAGE TRANSIENT DURING ESF START
RELAY DROPOUT POINT (3628)
0:00
0:08
graph [1]

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VIOLATION NO. 2

I. DESCRIPTION OF VIOLATION

Baltimore Gas and Electric Company Technical Specification (TS), Section 6.8.1, states that written procedures shall be established and implemented covering the applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2.

Regulatory Guide 1.33, Revision 2, Appendix A, paragraphs 8.a and b, state that procedures appropriate to the circumstances should be provided to ensure that instruments and controls are properly controlled and calibrated to maintain accuracy and specific surveillance test procedures written to cover these activities.

During the EDSFI, the inspectors noted that surveillance procedures such as STP O-4 for the Emergency Diesel Generator and STP M-522-2 for degraded bus protection did not include instrument inaccuracies and calibration errors for instruments such as voltage relays, voltmeter, wattmeter, ammeter, visicorder frequency meter, current transformer and potential transformer to ensure that the EDG and the degraded bus protective relays operated within the design values. This was perceived by the inspectors to be an apparent violation of the Regulatory Guide 1.33 requirements committed to in TS 6.8.1.

II. REASON FOR THE VIOLATION

BG&E has reviewed the cited violation and believes that no violation of NRC requirements exists. As stated in Technical Specification 6.8.1, BG&E is committed to the requirements set forth in Regulatory Guide (RG) 1.33, Revision 2. The Notice of Violation (NOV) indicates that this RG requires that surveillance procedures, to be adequately implemented, must include instrument accuracies and calibration errors. However, after a detailed review of paragraphs 8.a and b of this RG, BG&E has concluded that no such requirement exists.

Regulatory Guide 1.33, Revision 2, Paragraphs 8.a and b are as follows:

"a. *Procedures of a type appropriate to the circumstances should be provided to ensure that tools, gauges, instruments, controls, and other measuring and testing devices are properly controlled, calibrated, and adjusted at specified periods to maintain accuracy. Specific examples of such equipment to be calibrated and tested are readout instruments, interlock permissive and prohibit circuits, alarm devices, sensors, signal conditioners, controls, protective circuits, and laboratory equipment.*"

"b. *Specific procedures for surveillance tests, inspections, and calibrations should be written (implementing procedures are required for each surveillance test, inspection, or calibration listed in the technical specifications). ...*"

BG&E complies with the requirements contained in each paragraph of Regulatory Guide 1.33 cited above. At CCNPP: (i) procedures exist to properly control, calibrate and adjust tools, gauges, instruments, controls, and other measuring equipment to maintain accuracy, and (ii) procedures exist for surveillance tests, inspections and calibrations. BG&E does not interpret the above requirements to mean that surveillance procedures must include instrument accuracies and calibration tolerances in all cases to ensure that equipment operates within design values.

VIOLATION NO. 2

In addition, based on an industry survey conducted at the time of the inspection and further discussions with other utilities, we have found that our procedures are consistent with general industry practice regarding instrument inaccuracies and calibration tolerance.

In light of the discussion outlined above, BG&E requests that the NRC reconsider its position on this issue or address it as a generic industry concern.

III. CORRECTIVE STEPS TAKEN AND RESULTS ACHIEVED

No corrective action is necessary.

IV. CORRECTIVE ACTIONS WHICH WILL BE TAKEN TO AVOID FURTHER VIOLATIONS

No corrective action is necessary.

V. DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED

Full compliance with NRC requirements has been maintained.

REPLY TO A NOTICE OF VIOLATION
INSPECTION REPORT NOS. 50-317/92-80 AND 50-318/92-80

VIOLATION NO. 3

The two examples in this citation are apparent violations of 10 CFR Part 50, Appendix B, Criterion III (Design Control) and the corresponding Baltimore Gas and Electric Company (BG&E) Quality Assurance Policy. These documents require that design methods provide for verifying or checking the adequacy of design.

BG&E has reviewed the cited violation and concurs that, in the first example, a failure to properly check the adequacy of design occurred as the result of a failure to follow established procedures. Regarding the second example, however, we contend that a violation of regulatory requirements did not occur. Each example is discussed separately below.

(A) I. DESCRIPTION OF VIOLATION

The first example concerns the apparent failure to verify or check the adequacy of assumptions utilized in design calculations. Five assumptions are identified to illustrate the violation. These are: (i) conductor temperature of 75^{O}C, (ii) motor starting capabilities at 75% of nameplate rating for 460V load center loads and 4 kV loads and 70% of nameplate rating for MCC loads, (iii) computer modeling without considering all power cables, (iv) starting and running values of motor torque are the same, and (v) 460V running voltages were less than the required 90% of rated nameplate rating.

II. REASON FOR THE VIOLATION

The violation cites that BG&E used these assumptions without adequate verification or checking. BG&E agrees that two of the noted assumptions represent errors in inputs to calculation, namely starting and running values of motor torque are the same, and 460V running voltages were less than the required 90% of rated nameplate rating. However, we contend that the remaining assumptions are valid. They are categorized under unresolved item #2 (92-80-06), Reference (b) and in our view are not illustrative of the cited violation. We request they be withdrawn as examples. BG&E requests consideration of the following:

Conductor temperature of 75^{O}C

BG&E calculation E-90-24 develops cable impedances for use in load flow calculations. The cable impedances are based on a conductor operating temperature of 75^{O}C. This assumption was based on the average conductor temperature for the postulated scenarios of all cables in the load flows not exceeding 75^{O}C. The approach of basing cable impedances with all cables operating at 75^{O}C is considered conservative by BG&E.

Use of 90^{O}C, when the cable rating is 90^{O}C, as the average conductor operating temperature will yield more conservative results, but not more accurate ones. The value of 90^{O}C is the maximum continuous operating temperature of the cable without sustaining damage for 90^{O}C rated cables. Typical continuous cable temperature ratings are 60^{O}C, 75^{O}C, and 90^{O}C. Power cables generally have overload and emergency temperature ratings as well as continuous temperature ratings. For example, a 90^{O}C rated cable will typically have a one hour overload rating of 135^{O}C and an emergency rating (fault conditions) of 250^{O}C. There is no industry requirement to use one conductor temperature versus another when performing load flow calculations. IEEE 141-1986, Section 3.11.1, indicates use of a conductor temperature of 75°C for average loading and 90°C for maximum loading.

Subsequent to the EDSFI, BG&E developed new load flows at the anticipated cable operating temperatures and compared the results to the existing loads flows based on an average conductor operating temperature of 75°C (reference our letter of July 8, 1992). The existing load flows based on an average conductor temperature of 75°C yielded more conservative results.

Calculation E-90-24 postulated an average conductor operating temperature for use in determining cable impedances to be used in load flow calculations that is in accordance with industry guidance and yields conservative results. This assumption was reviewed and verified as adequate as part of the calculation review and approval process in accordance with BG&E Quality Assurance Program requirements. BG&E concludes that the verification and review were adequate and not in violation of regulatory requirements.

Motor starting capabilities of 75% of name plate rating for 460 volts load center loads and 4 kV loads and 70% of nameplate rating for MCC loads

BG&E calculations E-90-28 and E-90-41 develop the minimum voltage requirements at 480V load centers and MCCs respectively. Motor loads supplied directly from load centers are assumed to have the capability to start with 75% of rated nameplate voltage at their terminals. MCC supplied motor loads are assumed to have the capability to start with 70% of rated nameplate voltage at their terminals.

In BG&E's view: (i) A/E documentation attached to calculation E-90-28 verifies that safety related motors supplied directly from the load centers will start with 75% of motor rated voltage at their terminals and (ii) calculation E-90-41 develops an adequate basis to provide reasonable assurance that MCC supplied motor loads have the capability to start with 70% of rated nameplate voltage at their terminals.

Computer modeling without considering all power cables

The computer model used to develop the load flow calculation E-90-[illegible] has a limit on the number of nodes allowed for use in the calculation. As a result of the software limitation, BG&E could not include all the motor power cables in the model. The approach taken by BG&E was to identify the worst case condition with regard to motor loads. This was considered to be the longest cable runs to a number of motors. It was recognized at the time of the review of the calculation by the design review engineer, that the terminal voltage of all safety related motors was not modeled. However, given the limitations of the software, the approach taken was considered adequate.

BG&E concurs that the originator and the design review engineer of the calculation did not consider the effects of increased currents resulting from decreased motor terminal voltages. BG&E plans to develop new load flow studies as part of a master calculation concept to model the Calvert Cliffs

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> Nuclear Power Plant electrical auxiliary system. The master calculation will employ the CYME software. The new load flow calculations will model the safety related electrical system including the power cables to the associated motors.

In the view of BG&E, calculations E-90-24, E-90-28, E-90-31, and E-90-41 received an adequate review and verification. Each of these calculations were independently reviewed in accordance with BG&E procedure DESP-6, Paragraph 6.1, C. of DESP-6, in part, requires that:

> "The reviewer shall verify the accuracy of the calculation using either critical review of the calculation including reasonableness of input, assumptions and results; alternate calculations; or qualification testing of design. ... The reviewer shall document the calculation review, including any specific comments, using the Calculation Review Record (Attachment D). ... "

Each of these calculations contained an executed Calculation Review Record and the calculation cover sheet was signed in the appropriate place by the design review engineer. BG&E's review of these calculations subsequent to the inspection supports the validity of the original assumptions and has been discussed in our letter dated July 8, 1992. We therefore request that NRC reconsiders these illustrations as examples of the cited violation.

With regard to the balance of the assumptions: starting and running values of motor torque are the same, and 460V running voltages were less than the required 90% of rated nameplate rating; both of these assumptions are contained in calculation E-92-16. An adequate review of this calculation was not performed by BG&E. Sufficient documentation supporting the assumptions contained within this calculation were not provided. The reason for the inadequate review is personnel error and not sufficiently following established BG&E procedures.

Starting and running values of motor torque are the same

Generally it is a conservative assumption to consider starting torque equal to running torque, where the value of running torque is greater than starting torque. The BG&E reviewer knew Charging Pump 13 was a positive displacement pump but did not realize that the pump motor had a gear box. The assumption that starting torque equaled running torque with a motor with a gear box was, therefore, non-conservative.

460V running voltages were less than the required 90% of rated nameplate rating

The reviewer assessed the reasonableness of this assumption after a number of discussions with the external responsible design organization that developed the calculation. Although this assumption appears to be a reasonable conclusion of NEMA-MG1 (i.e., that a service factor of 1.15 increases the current rating of the motor winding by 15%), the reviewer did not require that sufficient documentation be developed in the form of references or development of equations as a proof to support the methodology employed.

The two assumptions in Calculation E-92-16 discussed above did result in erroneous inputs to calculations. However, they were not caused by a lack of means to verify or check the adequacy of design. Rather they resulted from a failure to properly follow procedures: the first case involved the failure to verify the reasonableness of input and assumptions; the second case involved the failure to document the justification for assumptions.

Nonetheless, as part of our design basis recompilation program, most of the original plant electrical calculations have been redone in much greater detail. However, given the content of the original calculations and plant design which serve as the starting point for our effort, all of the information required to make a calculation may not be available and assumptions must be made. These assumptions are clearly identified and supported by the best information available at the time of the calculation. As the design basis process progresses and additional information is discovered, these assumptions will be refined or eliminated.

(B) I. **DESCRIPTION OF VIOLATION**

The second example regards the translation of design requirements into test acceptance criteria and the apparent failure to include instrument uncertainties into these criteria.

Criterion III states that, "*The design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, ... or by the performance of a suitable testing program. ... Design control measures shall be applied to items such as the following: ... delineation of acceptance criteria for inspections and tests.*" Specifically, the Notice of Violation states that, "the design documents E-90-31 and E-87-13 for degraded bus protection and E-88-15 and E-90-39 for diesel generator loading calculation were not verified or checked properly to ensure that test criteria are developed correctly with instrument inaccuracies, tolerances and errors. Furthermore, the licensee's 'master calibration data sheets' record the various meter tolerances. This has not been factored into any engineering calculations including the above."

II. **REASON FOR VIOLATION**

BG&E has reviewed the cited violation and the requirements of 10 CFR Part 50 Appendix B, Criterion III, and we contend that no violation exists.

Criterion III addresses tests in two contexts. First, in specifying the acceptable means of verifying the adequacy of design, performance of a suitable testing program is one alternative listed. The design of diesel generator loading and degraded bus protection cited in the violation do not fit into this category, as the method used for verifying their design adequacy was performance of design reviews, another of Criterion III's listed alternatives.

The final sentence of Criterion III specifies that "design control measures shall be applied to items such as . . . delineation of criteria for inspections and tests." BG&E does accomplish application of design control measures to specify test acceptance criteria through its test procedure control process. Design engineering input is obtained in developing equipment tests, and changes to test procedures are reviewed by the Responsible Design Organization under the criteria of 10 CFR 50.59. No instances were identified where design control measures were not applied.

The substance of the alleged violation, then, is that the inspectors disagreed with the specific design values used in BG&E's tests. Their contention is that tests must accommodate the full range of conservatisms used in the design assumptions and must in addition provide further margin to compensate for the instrument accuracy used in the test. BG&E disagrees with this contention.

In considering whether to apply instrument accuracy to electrical test acceptance criteria, BG&E has considered the existing regulatory guidance. No regulatory guidance specific to the treatment of instrument accuracies is cited in the Notice of Violation, and we are aware of none which relates to the issues cited in the violation.

Regulatory guidance regarding instrument uncertainties does exist for Limiting Safety System Settings (LSSS) as defined in 10 CFR 50.36(c)(1)(ii)(A). This is appropriate considering the elevated safety significance of these parameters and the degree of precision associated with this instrumentation. In these instances, instrument inaccuracy can be a substantial portion of the total design uncertainty, and it is prudent to consider it. The LSSSs for Calvert Cliffs are contained in Technical Specification Table 2.2-1. This table does not include electrical system parameters and specifically does not include the parameters associated with the systems and components cited in the violation.

Our approach in using nominal values as test setpoints is prudent for the types of major electrical equipment discussed in this violation. Large electrical equipment such as breakers, motors, and diesel generators are built with considerable margin to allow for the inherent deviation in bus conductivity, dimensional tolerances, spring tension, etc. The degree of precision is substantially less than that of the LSSS-related equipment. Industry experience with electrical equipment supports this, as observed moderate beyond-specification occurrences have not caused equipment failure and detailed calculations, when feasible, have shown substantial conservatisms.

We acknowledge that the design margins of our EDG capacity and degraded grid voltage protection do not afford the degree of conservatism typical of our design. We have committed substantial efforts to modifying plant equipment to improve these margins. As described in Reference (b), we are committed to installing two new 5000 kW Class 1E EDGs to complement our existing onsite capability. In addition, pursuant to the future addition of an additional 500 kV connection to the site, we are evaluating the addition of voltage regulating equipment which will improve our protection against potential degraded grid voltage conditions. We believe these efforts will effectively improve the safety of the systems addressed in this alleged violation. Those actions, not revised design standards for equipment test setpoints, are the correct focus of the technical concern.

In summary, BG&E finds no specific regulatory guidance which supports the purported requirement to include instrument tolerance in the testing of EDG loading or degraded grid voltage protection. We believe our existing practice is adequately controlled and technically prudent. We have verified that our approach is consistent with industry practice. We consider that imposition of the interpretation of Criterion III contained in this alleged violation would constitute a new regulatory requirement on BG&E and other utilities. Finally, we believe that the physical modifications already planned substantially improve the design margins which caused this issue to be raised.

III. CORRECTIVE STEPS TAKEN AND RESULTS ACHIEVED

A. Corrective actions to resolve the assumptions contained within E-92-16 as well as other questions raised by the inspection team concerning this calculation are contained within the BG&E response to the four issues requiring expedited review and resolution, dated July 8, 1992. These actions include enhancements to the offsite supply improving the reliability of the preferred supply to the safety related system, a number of new studies and analyses, and performance of tests on MCC contactor coils to verify their withstand capabilities. Calculation E-92-16 will be reassessed and corrected appropriately.

In addition, new analyses are being developed employing a Master Calculation concept using CYME software. The new analyses will include new load flow calculations which will model the safety related electrical system including the power cables to the associated motors.

B. No corrective action is necessary.

IV. CORRECTIVE ACTIONS WHICH WILL BE TAKEN TO AVOID FURTHER VIOLATIONS

A. Training will be provided to the appropriate BG&E organizations regarding the responsibilities of a design originator and a design review engineer and the lessons learned from this issue.

B. No corrective action is necessary.

V. DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED

A. Training of appropriate BG&E organizations will be complete October 15, 1992.

B. Full compliance with NRC requirements has been maintained.