December 19, 1997

Mr. Charles H. Cruse
Vice President - Nuclear Energy
Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON THE RESOLUTION OF UNRESOLVED SAFETY ISSUE A-46, CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 (TAC NOS. M69435 AND M69436)

By letter dated June 28, 1996, the Baltimore Gas and Electric Company (the licensee) forwarded the plant-specific summary report in response to the Unresolved Safety Issue (USI) A-46 program at the Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (CCNPP). The NRC has reviewed the summary report and determined that additional information is needed to complete the review of the licensee's USI A-46 program. The information required is addressed in the enclosure.

The staff requests that the additional information be provided within 90 days of receipt of this letter.

If you have any questions regarding this letter, please contact me at (301) 415-3473.

Sincerely,

Original Signed by:

Alexander W. Dromerick, Project Manager
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-317
and 50-318

Enclosure: Request for Additional Information

cc w/encl: See next page

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NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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Mr. Charles H. Cruse
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Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 and 2

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REQUEST FOR ADDITIONAL INFORMATION

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2

UNRESOLVED SAFETY ISSUE A-46

Reference: Letter (and enclosures) from Baltimore Gas and Electric Company to USNRC, "Summary Report for Resolution of USI A-46," June 28, 1996

1. In Section 5.1.1 of Attachment 1 to your letter, the following effective grades are indicated:

Containments	Elev. 10'
Intake structure	Elev. 3'
All other buildings	Elev. 45'

In generating the "realistic median centered" in-structure response spectra in Appendix H to Attachment 1 for outliers resolution, you used NUREG/CR-0098, 84 percentile non-exceedance spectral shape and the realistic damping values recommended therein. You used 10% frequency peak shifting and indicated that the free field motion at the base mat elevation may be less than 60% of the ground level free field motion. The damping values mentioned are (1) 5% equipment damping in Section 1.1, (2) 7% structural damping for both steels and concrete elements in Section 2.0, and (3) the best estimate, lower and upper bounds of effective soil hysteretic damping of 0.08, 0.10 and 0.06 in Section 3.0 of Appendix H.

On the basis of the information summarized above, we request the following additional information:

a) Since the NUREG/CR-0098 spectrum does not reflect the soil amplification at your site, what is the basis for using these spectra at the ground level for deconvolution to the foundation level of each structure? By doing this deconvolution, you are inappropriately reducing the spectra for the response analysis. This is contrary to the method described in your submittal of September 18, 1992, which was reviewed and accepted for use in resolving the A-46 issues. Provide the basis for your revised approach which deviates from your previous commitment.

b) Is there any ground motion generated at the foundation level through deconvolution less than 60% of that at the ground level? Provide your justification if such a condition exists.

c) In all the figures provided, 5% damping is indicated. Where is the 7% damping used?

d) The last sentence of Section 4 of Appendix H states, "For the Reactor Building the fundamental SSI mode frequency is shifted to the left, outside of the frequency range of maximum earthquake power resulting in the structural response being considerably reduced." The in-structure spectra with such shift are shown in Figures A1.12 and

Enclosure

A1.13 in Appendix H. The staff believes that a single time history has been used. In accordance with SRP Section 3.7.1. I.1.b. Option 1, if Single Time History is used, it is required to satisfy a target power spectral density in addition to the design response spectra enveloping requirement. Indicate if this requirement is met. If so, provide the documentation.

2. In your reference letter, you stated that Baltimore Gas and Electric (BGE) committed to implement the Generic Implementation Procedure, Revision 2 (GIP-2). You also stated that no significant or programmatic deviation from the GIP-2 guidance were made during the USI A-46 resolution process. Provide the worst-case items which deviate from the GIP-2 guideline but were considered to be insignificant for Calvert Cliffs and also provide the bases for categorizing them as such.

3. Referring to Tables 5.2-1 and 5.2-2 of the attachment, "Intent but Not Letter Caveat Summary," for Units 1 and 2 respectively, each of the items listed in the table involve some degree of judgment or estimation by licensee personnel in concluding that the intent of applicable caveats were met. Provide the technical bases for the judgment or estimation that were used to determine the seismic adequacy for certain items (e.g., 1MS3986, 1C67, 1N0411, 0PC5429, 1CV517) listed in the tables, but not identified below. Also, provide the following additional information:

   a. For valve 2MOV509, the top of the valve operator touches pipe insulation on the same piping, and the bleed-off line touches support framing. You indicated that there is no impact concern because the valve and piping will move together, and the piping has a nearby restraint. Provide additional information to demonstrate that the valve and the piping, and the bleed-off line and the support frame would not respond out of phase to one another and impact each other during an earthquake.

   b. Valves 1MOV501, 1MOV514, 1MOV504, 2CV517, etc. are independently supported from the connected piping. Provide an example calculation in support of your judgment to demonstrate that the specific piping and valve support configuration would not cause an overstressed condition.

   c. Valves 1PCV4510, 1PCV4520, etc., are mounted on piping less than 1" in diameter. Provide the analysis, in accordance with the GIP-2, to ensure that the structural integrity of the valves and the connected piping is satisfied.

4. Referring to Tables 5.3-1 and 5.3-2, "Equipment Outlier Description and Resolution Summary," for Units 1 and 2 respectively, we find the analysis method employed for resolution of each of the items listed in the table to be unclear. Provide a more detailed description of the analysis employed for resolution of a representative sample outliers and the basis for the judgment used. Also, provide the following additional information:

   a. Valves 1CV5210, 1CV5150, 1CV5152, 1CV5212, 1CV5153, 1CV5155, etc. were identified to be outliers because their valve bodies were manufactured of cast iron. Provide an analysis to demonstrate that these valves will not be overstressed.

   b. Panel 1PY5427A was identified to be an outlier because the natural frequency is within the range where the required response spectra are greater that 1.5 times the bounding spectrum. You proposed that this outlier be resolved by plant modification that eliminates the need for the component. Provide an explanation as to how the panel function is no longer needed.

c. There are items (e.g., Switches 1PS5431, 1PS5432, 1PS5433, 1PS5434, etc.) for which both the outlier description and the outlier resolution address the same Rule-of-the-box number. Please explain in detail using any of the switches as an example.

5. In Section 6 of Attachment 1 to your letter, outlier items for tanks and heat exchangers are identified and listed in Table 6.1. All of the outliers were resolved by additional or further analysis except for the condensate storage tanks and refueling storage tanks. For these tanks, the calculated seismic overturning moment was 8161 kip-ft which exceeds the overturning capacity of 6292 kip-ft. A dynamic analysis accounting for soil-structure interaction was performed by Stevens & Associates using its developed computer code, SUPER SASSI/PC. The results showed overturning moments in the magnitude of 5395 kip-ft and 6009 kip-ft for shear wave velocities of 760 fps and 1600 fps, respectively. However, it is our understanding that the staff has not previously reviewed and approved the SUPER SASSI/PC code. Provide the validation documents which should contain sufficient information for the staff's review, especially in the areas of application at Calvert Cliffs for resolution of the USI A-46 issues. Also, provide for each type of outlier a sample calculation to show how the outlier was resolved.

6. In reference to Section 6.2 of the attachment, "Summary of Outliers" for Tanks and Heat Exchangers, you indicate that an expansion anchor capacity reduction factor (CRF) of 0.75 rather than 0.5 for unknown bolt type anchors was used in accordance with Revision 3 of the GIP (GIP-3), dated July 31, 1995. On the basis of its Supplemental Safety Report No. 3 (SSER No. 3) dated December 4, 1997, on the review of the updated GIP-3 dated May 16, 1997, the staff did not accept this CRF. Therefore, the staff request that you re-evaluate equipment types for which the unknown expansion anchor CRF of 0.75 was used in evaluating their seismic adequacy. The evaluation should be in compliance with SSER No. 3 and the updated GIP-3. Also, provide the results for the staff's review.

7. The NRC staff has concerns about the way the USI A-46 cable trays and conduit raceways issue was being disposed of by some USI A-46 licensees. The staff issued requests for additional information (RAIs) to several licensees on this issue. SQUG responded instead of the licensees because SQUG considered the RAIs to be generic in nature. The staff issued a subsequent RAI to SQUG as a follow up to their response. However, the staff found that the correspondence with SQUG did not achieve the intended results, in that it did not address the identified technical concerns of the staff. Therefore, we are stating our concerns in the following discusion.

The GIP procedure recommended performing what is called "a limited analytic evaluation" for selected cable and conduit raceway supports. The procedure further recommended that when a certain cable tray system can be judged to be ductile and if the vertical load capacity of the anchorage can be established by a load check using three times the dead weight, no further evaluation is needed to demonstrate lateral resistance to vibration from earthquakes. The staff has concerns with the manner in which these simplified GIP criteria were implemented at your plant.

The GIP procedure eliminates horizontal force evaluations by invoking ductility. However, some so-called non-ductile cable tray support systems would eventually become ductile by inelastic deformation, buckling or failure of the non-ductile cable tray supports and members. This procedure is a basic departure from conventional methods of engineering evaluation and the GIP does not provide an adequate basis for dealing with those cable trays that are initially judged to be non-ductile but are eventually called ductile by postulating failure of the lateral supports. If this procedure was followed for eliminating cable trays from further assessment at your plant, then all the cable trays could conceivably be screened out from the A-46 evaluation. We request that you provide the following information to enable our assessment and safety evaluation of cable trays at your plant.

a. Define ductility in engineering terms as used at Calvert Cliffs for the USI A-46 evaluation. Clarify how this definition is applied to actual system configurations at Calvert Cliffs plant consistently for the purpose of analytical evaluation.

b. Provide the total number of raceways that were selected for worst-case analytical calculations and were classified as ductile in your A-46 evaluation and for which you did not perform a horizontal load evaluation. Indicate the approximate percentage of such raceways as compared with the population selected for analytical review. Discuss how the ductility concept is used in your walkdown procedures.

c. Describe the typical configurations of your ductile raceways (dimension, member size, supports, etc.)

d. Justify the position that ductile raceways need not to be evaluated for horizontal load. When a reference is provided, state the page number and paragraph. The reference should be self contained, and not refer to another reference.

e. In the evaluation of the cable trays and raceways, if the ductility of the attachments is assumed in one horizontal direction, does it necessarily follow that the same system is ductile in the perpendicular direction? If yes, provide the basis of this conclusion. If it is not ductile in the perpendicular direction, how was the seismic adequacy of the attachments evaluated?

f. Discuss any raceways and cable trays including supports in your plant that are outside of the experience data. Explain what criteria are used for establishing their safety adequacy and specify your plan for resolution of outliers that did not meet the acceptance criteria. Provide examples of the configurations of such raceways and cable trays including supports. Also, indicate the percentage of cable trays and raceways outside the experience data in relation to the population of raceways and cable trays examined during the walkdowns of the safe shutdown path. Discuss how will they be evaluated and disposed.

g. Submit the evaluation and analysis results for four of the representative sample raceways (one single non-ductile, one single ductile, one multiple non-ductile, and one multiple ductile raceway), including the configurations (dimension, member size, supports, etc.).

8. In Section 8 of the attachment, you stated that there are 35 unresolved outliers and the schedule for resolving them is provided in Section 5.3 of the enclosure to your letter.

However, there is no resolution schedule provided in Section 5.3. On page 2 of your letter, you indicated that you plan to resolve all outliers by July 1998. Explain the safety implications for not resolving these outliers, in accordance with Item 17 in Section 9.1 of the GIP-2. You are also requested to elaborate on your decision to defer the resolution of identified outliers and your evaluation in support of the conclusion that the operability of affected plant equipment will not be affected by your decision.

9. In Appendix G of the attachment, the third-party audit report and responses indicates that the instrument and control panel (1NB130) is attached to a block and was not judged to be acceptable by BGE. Clarify why this equipment is listed as line no. 6053 in the Calvert Cliffs Unit 1 Safe Shutdown Equipment List (SSEL) but not documented in the Screening Verification Data Sheet (SVDS) in Appendix D. Also, provide the status and resolution regarding the seismic adequacy of this control panel.

10. Referring to the in-structure response spectra provided in your 120-day-response to the NRC's request in Supplement No. 1 to Generic Letter 87-02, dated May 22, 1992, provide the following information.

    a. Identify structure(s) which have in-structure response spectra (5% critical damping) for elevations within 40-feet above the effective grade, which are higher in amplitude than 1.5 times the SQUG Bounding Spectrum.

    b. With respect to the comparison of equipment seismic capacity and seismic demand, indicate which method in Table 4-1 of GIP-2 was used to evaluate the seismic adequacy for equipment installed on the corresponding floors in the structure(s) identified in Item (a) above. If you have elected to use method A in Table 4-1 of the GIP-2, provide a technical justification for not using the in-structure response spectra provided in your 120-day-response. It appears that some A-46 licensees are making an incorrect comparison between their plant's safe shutdown earthquake (SSE) ground motion response spectrum and the SQUG Bounding Spectrum. The SSE ground motion response spectrum for most nuclear power plants is defined at the plant foundation level. The SQUG Bounding Spectrum is defined at the free field ground surface. For plants located at deep soil or rock sites, there may not be a significant difference between the ground motion amplitudes at the foundation level and those at the ground surface. However, for sites where a structure is founded on shallow soil, the amplification of the ground motion from the foundation level to the ground surface may be significant.

    c. For the structure(s) identified in Item (a) above, provide the in-structure response spectra designated according to the height above the effective grade. If the in-structure response spectra identified in the 120-day-response to Supplement No. 1 to Generic Letter 87-02 were not used, provide the response spectra that were actually used to verify the seismic adequacy of equipment within the structures identified in Item (a) above. Also, provide a comparison of these spectra to 1.5 times the Bounding Spectrum.