CHARLES H. CRUSE
Vice President
Nuclear Energy

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 495-4455

BGE

September 22, 1998

U. S. Nuclear Regulatory Commission
Washington, DC 20555

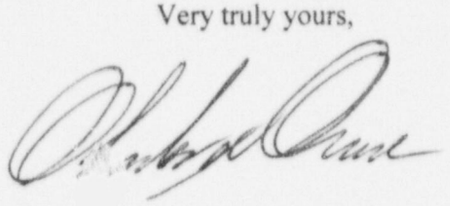
ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Response to Request for Additional Information; Summary Report on the Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors (TAC Nos. M69435 & M69436)

REFERENCE: (a) Letter from Mr. A. W. Dromerick (NRC) to Mr. C. H. Cruse (BGE), dated March 2, 1998, "Request for Additional Information (RAI) Regarding the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2, Summary Report on the Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, dated June 28, 1996 (TAC Nos. M69435 and M69436)"

Attachment (1), based on generic responses developed by the Seismic Qualification Utility Group, provides our response to Reference (a). Should you have additional questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,



A025

CHC/JMO/dlm

Attachment: (1) Response to Request for Additional Information; Summary Report on the Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors

cc: R. S. Fleishman, Esquire
J. E. Silberg, Esquire
S. S. Bajwa, NRC
A. W. Dromerick, NRC
H. J. Miller, NRC
Resident Inspector, NRC
R. I. McLean, DNR
J. H. Walter, PSC

ATTACHMENT (1)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION;

SUMMARY REPORT ON THE VERIFICATION OF SEISMIC ADEQUACY OF

MECHANICAL AND ELECTRICAL EQUIPMENT IN OPERATING REACTORS

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
September 22, 1998

NRC Request (a):

Describe what reviews were performed to determine if any local operator actions required to safely shutdown the reactor (i.e., implement the safe shutdown equipment list [SSEL]) could be affected by potentially adverse environmental conditions (such as loss of lighting, excessive heat or humidity, or in-plant barriers) resulting from the seismic event. Describe how staffing was evaluated and describe the reviews which were conducted to ensure operators had adequate time and resources to respond to such events.

BGE Response:

As described in Generic Implementation Procedure, Revision 2 (GIP-2), Part II, Section 3.2.5, the only potential events that must be considered in the Unresolved Safety Issue (USI) A-46 program are a safe shutdown earthquake (SSE) and loss of offsite power (LOOP). The plant operating procedures used to shut down the reactor following a LOOP have previously been validated for local operator actions as one of the Calvert Cliffs Nuclear Power Plant (CCNPP) Updated Final Safety Analysis Report Chapter 14 accident scenarios. This includes potentially adverse environmental conditions such as loss of lighting and excessive heat and humidity. Note that the USI A-46 accident scenario (SSE + LOOP) explicitly excludes loss-of-coolant accidents and high energy line breaks. Therefore, the heat and humidity conditions in the plant are postulated to be equivalent to those in a Updated Final Safety Analysis Report Chapter 14 LOOP scenario.

The potential for failure of plant structures and equipment is not considered credible at eastern U.S. earthquake levels. Earthquake experience has shown that typical industrial structures are able to withstand earthquakes larger than the SSEs for eastern U.S. nuclear plants without collapse or failure. The potential for local failure of architectural features (such as suspended ceilings in the control room) and the potential for adverse seismic spatial interactions in the vicinity of safe shutdown equipment, where local operator actions may be required, was explicitly evaluated as required in GIP-2, Part II, Section 4.5, and Appendix D. For example, this review included a check that the masonry walls near safe shutdown equipment are seismically adequate based on the results of the NRC Inspection and Enforcement Bulletin 80-11 program.

The systems and equipment selected for the USI A-46 program seismic review at CCNPP are those for which Normal, Abnormal, and Emergency Operating Procedures are available to bring the plant from a normal operating mode to a hot standby (Mode 3) condition. As required by GIP-2, Part II, Sections 3.2.8 and 3.7, the SSEL was reviewed by CCNPP Operations personnel to confirm that it is compatible with these plant procedures. Since these plant procedures had already been validated to ensure that adequate time and resources are available for operators to respond to a LOOP incident, it was not necessary to revalidate these procedures for the USI A-46 program.

NRC Request (b):

As part of the licensee's review, were any control room structures which could impact the operator's ability to respond to the seismic event identified? Such items might include but are not limited to: main control room ceiling tiles, non-bolted cabinets, and non-restrained pieces of equipment (i.e., computer keyboards, monitors, stands, printers, etc.). Describe how each of these potential sources of interactions has been evaluated and describe the schedule for implementation of the final resolutions.

BGE Response:

Control Room structures that could impact the operator's ability to respond to an SSE include the suspended ceiling, transitory equipment, and various cabinets located in and around the room. These items were evaluated as part of CCNPP's USI A-46 review. Prior to and following the conduct of the Seismic Verification Project at CCNPP, various actions were taken to mitigate the impact of these items.

The method used for evaluating these potential sources of seismic spatial interaction is described in GIP-2, Part II, Section 4.5, and Appendix D. After performing this review, we concluded that all Control Room structures passed the GIP screening criteria except for the following outliers:

- Suspended ceiling;
- Rack for self-contained breathing gear; and
- Hat and coat rack.

The above listed items/outliers have subsequently been either strengthened and made collapse-proof, as in the case for the suspended ceiling, or relocated in order to eliminate the potential for becoming an interference. Existing plant procedures govern the use of transitory equipment in the Control Room. Transitory equipment items are required to be secured, while in use, to preclude adverse seismic interactions.

NRC Request (c):

Describe what reviews were performed to determine if any local operator actions were required to reposition "bad actor relays." For any such activities describe how adverse environmental conditions (such as loss of lighting, excessive heat or humidity, or in-plant barriers) resulting from the seismic event were analyzed and dispositioned. Describe how staffing was evaluated and describe the reviews which were conducted to ensure operators had adequate time and resources to respond to such events.

BGE Response:

The term "bad actor relays" is a colloquial expression that refers to the list of relays in Appendix E of Electric Power Research Institute (EPRI) Report NP-7148. These relays have low seismic ruggedness or demonstrated sensitivity to high frequency vibration. The term used in EPRI NP-7148 characterizes these relays as "low ruggedness" relays.

During the conduct of the Seismic Verification Project at CCNPP, there were no "bad actor" or "low ruggedness" relays found that are associated with equipment on the SSEL. Therefore, no new operator actions are required to reset any relays to restore systems to allow the plant to be brought to a

safe shutdown condition. The results of the CCNPP USI A-46 Relay Evaluation were previously submitted for NRC review as Attachment 2 to Reference 2.

NRC Request (d):

Describe which of the operator actions associated with resetting SSEL equipment affected by postulated relay chatter are considered to be routine and consistent with the skill of the craft. If not considered skill of the craft, what training and operational aids were developed to ensure the operators will perform the actions required to reset affected equipment?

BGE Response:

During the conduct of the Seismic Verification Project at CCNPP, there were no "bad actor" or "low ruggedness" relays found which are associated with equipment on the SSEL. Therefore, no new operator actions are required to reset any relays to restore systems to allow the plant to be brought to a safe shutdown condition.

The CCNPP USI A-46 Relay Evaluation submitted as an attachment to Reference 2 described the screening out of several relay groups based upon using operator action. Those areas that might potentially require operator action, but are also considered to be routine and consistent with the skill of the craft, are as follows:

- Resetting battery charger breakers within two hours;
- Running fire pumps to provide make-up cooling water within several hours; and
- Restarting a charging pump.

In each of the above cases, operator action, if necessary, would not be needed for at least a few hours, if at all. It would not be expected to impose a significant additional burden on the operators.

NRC Request (e):

Assume the alarms associated with "bad actor relays" are expected to annunciate during the seismic event. Do the operators have to respond to those annunciators and review the annunciator response procedures associated with them for the potential action? How would those additional actions impact the operators ability to implement Normal, Abnormal and Emergency Operating Procedures required to place the reactor in a safe shutdown condition?

BGE Response:

As discussed in our response to Question (c) above, the term "bad actor relays" is a colloquial expression that does not properly categorize these type of relays. As defined in the relay review procedure, EPRI Report NP-7148, these relays are called "low ruggedness" relays.

As described in EPRI Report NP-7148, Section 3.5.3, following an earthquake that causes the turbine to trip and the reactor to scram, 50 to 100 or more alarms are expected to annunciate. In addition to this large number of alarms, there may be several earthquake-induced, spurious alarms resulting from such events as water sloshing in tanks, oil sloshing in transformers, actuation of vibration protective instrumentation on rotating equipment, and contact chatter of relays. When the avalanche of alarms occurs, the operator will clearly be aware that the plant has tripped. Plant procedures and operator

training require that operators respond to the turbine trip and reactor scram by confirming the scram and trip and checking important levels, temperatures, pressures, flows, and electrical switching resulting from associated power transfers. These confirmatory checks will take more than a minute to go through during which time the operators will be busy making these checks and not responding to specific alarms. The earthquake motion is assumed to last less than a minute and the causes of the spurious alarms will have gone away during this period while the operators are responding to the plant trip.

The NRC staff and Seismic Qualification Utility Group representatives discussed this topic in detail, including discussions held at a meeting on August 3, 1988, where this was a primary topic of discussion. The results of that evaluation and review are summarized in EPRI NP-7148, Section 3.5.3, where the following conclusion is reached:

> "Accordingly, there appear to be no reasonable bases or evidence which would suggest that spurious alarms resulting from an earthquake may lead to abnormal operator responses. Therefore, special operating procedures or relay evaluation actions to address potential spurious alarms are not considered warranted and relays affecting alarms need not be seismically adequate."

The NRC staff accepted the relay functionality review procedure summarized in GIP-2 and described in detail in EPRI NP-7148 (including the above conclusion) in Supplemental Safety Evaluation Report No. 2 on GIP-2. Therefore, we do not consider it necessary to perform any additional reviews of the effect spurious alarms caused by "low ruggedness" relays or other causes as a result of a seismic event.

NRC Request (f):

To the extent that Normal, Abnormal, and Emergency Operating Procedures were modified to provide plant staff with additional guidance on mitigating the USI A-46 Seismic Event, describe what training was required and provided to the licensed operators, non-licensed operators, and other staff required to respond to such events.

BGE Response:

As a result of the USI A-46 Seismic and Relay Evaluations conducted at CCNPP, it was concluded that there was no need to modify any Normal, Abnormal, or Emergency Operating Procedures. It was concluded that no new operator actions are required to reset any relays or to restore any system to allow the plant to be brought to a safe shutdown condition.

References

1. Letter from Mr. A. W. Dromerick (NRC) to Mr. C. H. Cruse (BGE), dated March 2, 1998, "Request for Additional Information (RAI) Regarding the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2, Summary Report on the Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Dated June 28, 1996 (TAC Nos. M69435 and M69436)"
2. Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, June 28, 1996, "Summary Report for Resolution of USI A-46 (TAC Nos. M69435, M69436)"