July 9, 1985

Docket Nos. 50-317
and 50-318

DISTRIBUTION:
Docket File
NRC PDR
L PDR
ORB#3:Rdg
HThompson
OELD
EJordan
BGrimes
JPartlow
DJaffe
PMKreutzer
ACRS (10)
Gray File

Mr. A. E. Lundvall, Jr.
Vice President - Supply
Baltimore Gas & Electric Company
P. O. Box 1475
Baltimore, Maryland 21203

Dear Mr. Lundvall:

We are presently reviewing your responses to TMI Action Item II.D.1, "Performance Testing of Relief and Safety Valves." In the process of conducting our review, we have found it necessary to request additional information. Accordingly, within 60 days following receipt of this letter, please respond to the enclosed questions.

This request for information affects few than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

Edward J. Butcher, Acting Chief
Operating Reactors Branch #3
Division of Licensing

Enclosure:
As stated

cc: See next page

ORB#3:DL	ORB#3:DL	ORB#3:DL
PKreutzer	DJaffe:dd	EJButcher
7/9/85	7/9/85	7/9/85

Mr. A. E. Lundvall, Jr.
Baltimore Gas & Electric Company

Calvert Cliffs Nuclear Power Plant

Mr. William T. Bowen, President
Calvert County Board of
Commissioners
Prince Frederick, Maryland 20768

D. A. Brune, Esq.
General Counsel
Baltimore Gas and Electric Company
P. O. Box 1475
Baltimore, Maryland 21203

George F. Trowbridge, Esq.
Shaw, Pittman, Potts and Trowbridge
1800 M Street, NW
Washington, DC 20036

Mr. R. C. L. Olson, Principal Engineer
Nuclear Licensing Analysis Unit
Baltimore Gas and Electric Company
Room 922 - G&E Building
P. O. Box 1475
Baltimore, Maryland 21203

Mr. T. Foley
Resident Reactor Inspector
NRC Inspection and Enforcement
P. O. Box 437
Lusby, Maryland 20657

Mr. Leon B. Russell
Plant Superintendent
Calvert Cliffs Nuclear Power Plant
Maryland Routes 2 and 4
Lusby, Maryland 20657

Bechtel Power Corporation
ATTN: Mr. J. C. Ventur
Calvert Cliffs Project Engineer
15740 Shady Grove Road
Gaithersburg, Maryland 20877

Mr. R. M. Douglass, Manager
Quality Assurance Department
Baltimore Gas and Electric Company
Fort Smallwood Road Complex
P. O. Box 1475
Baltimore, Maryland 21203

Regional Administrator
USNRC, Region I
Office of Executive Director
for Operations
631 Park Avenue
King of Prussia, Pennyslvania 19406

Mr. Charles B. Brinkman
Manager - Nuclear Operations
Combustion Engineering, Inc.
7910 Woodmont Avenue
Bethesda, Maryland 20814

Mr. J. A. Tiernan, Manager
Nuclear Power Department
Calvert Cliffs Nuclear Power Plant
Maryland Routes 2 and 4
Lusby, Maryland 20657

Mr. R. E. Denton, General Supervisor
Training and Technical Services
Calvert Cliffs Nuclear Power Plant
Maryland Routes 2 and 4
Lusby, Maryland 20657

Combustion Engineering, Inc.
ATTN: Mr. R. R. Mills, Manager
Engineering Services
P. O. Box 500
Windsor, Connecticut 06095

Department of Natural Resources
Energy Administration, Power Plant
Siting Program
ATTN: Mr. T. Magette
Tawes State Office Building
Annapolis, Maryland 21204

REQUEST FOR ADDITIONAL INFORMATION

TMI ACTION NUREG-0737 (II.D.1)

FOR

CALVERT CLIFFS, UNITS 1 AND 2

DOCKET NO.: 50-317 AND 50-318

JUNE 1985

SAFETY EVALUATION QUESTIONS TMI ACTION NUREG-0737 II.D.1
FOR CALVERT CLIFFS 1 AND 2

Question's related to selection of transients and inlet fluid conditions:

1. In the FSAR, the PORVs were assumed not to open during the loss of AC event. The C-E valve inlet fluid conditions report, however, indicates that both the safety valves and PORVs are expected to open for this event. Since both valves can be expected to open during the loss of AC event, provide assurance that this situation is considered in the thermal hydraulic analysis so that loads on the system are maximized. Also, assure that the PORV operability evaluations requested in Question 4 consider this event.

2. The C-E valve inlet fluid conditions report states that the PORVs are used for cold overpressure protection. The submittal does not mention whether or not cold overpressurization transients were considered in the piping analysis. For the water-solid plant condition, a PORV actuation would result in a water flow transient that may produce more severe loading on the piping system than a high pressure steam transient. Explain whether the piping system was analyzed for PORV actuations for cold overpressurization transients.

3. The Combustion Engineering Report on operability of PORVs in CE plants indicated that the limiting inlet fluid conditions during low temperature pressurization transients are a water discharge event. The CE Inlet Fluid Conditions Report stated that the pressurizer water solid condition and resulting PORV liquid discharge case was chosen for the cold overpressurization event since it gave the most severe pressurization transients. The report further states that a steam bubble can also exist in the pressurizer during low temperature operation whereby the PORV could lift on steam. No low pressure steam tests were performed by EPRI on the Dresser PORV. Provide verification that the PORVs in Calvert Cliffs Units 1 and 2 will operate satisfactorily on low pressure steam.

Questions related to valve operability:

4. The submittal provided a comparison between the calculated bending moment on the safety valve discharge flange and the moment applied during the tests for the Unit 1 and 2 safety valves. This comparison is intended to verify that the moment applied during the tests was greater than the calculated moment. The bending moments recorded during these tests, however, were those that occurred just before valve opening and just after valve closing. Also, the moments were based on load cell readings located at the second elbow downstream of the valve, which could be influenced by the horizontal piping further downstream. Thus, the bending moments recorded during the tests do not appear to be representative of the moments caused by discharge loads that occur while the valve is open. Provide further assurance that bending moments on the safety valve flanges caused by thermal expansion of the pressurizer and piping and by the discharge loads will not impair valve operability.

5. The submittal references an abnormal occurrence at Davis-Besse during which a Velan motor operated block valve operated successfully, the EPRI-Marshall Block Valve Test Data Report, and information received from the manufacturer regarding the operability of the Calvert Cliffs PORV block valves. However, the submittal is very general in nature, and does not contain any specific data upon which to make an evaluation. Provide additional information discussing how the EPRI test data and the Davis-Besse abnormal occurrence was extrapolated (or interpolated) to assure the operability of the Calvert Cliffs block valves.

6. The EPRI Test Condition Justification Report recommends that a comparison between the expected total pressure drop for the in-plant safety valve/inlet piping combination and that for the tested safety valve/inlet piping combination be made as part of evaluating whether stable valve operation can be expected. The EPRI Safety and Relief Valve Test Program Guide for Application of Valve Test Program Results to Plant-Specific Evaluations states that the total pressure drop is

comprised of a flow pressure drop plus an acoustic pressure drop, and provides equations for calculating the total pressure drop for the in-plant valve and inlet piping configuration. The Calvert Cliffs Operability Reports [CEN-248(B), Rev. 1 and 2] state that the acoustic wave amplitude is the important parameter to be considered in application of test results to plant specific evaluations. Provide a justification for neglecting all the flow losses (inlet, friction and velocity head).

The Calvert Cliffs Safety Stability Evaluation [Appendix C-1 of CEN-248(B)] provides an acceptable qualification for "PIPES" by comparing computed versus actual test data. However, the total pressure drops computed for the plant specific valve/piping combinations (ΔP_{static} for Unit 1 = 279 psid, ΔP_{static} for Unit 2 = 329 psid) are equal to or greater than the total test pressure drop (258 psid measured and 277 psid computed) for the test valve, which implies that the Unit 2 safety valve may not operate stably. Provide additional information to assure that the Calvert Cliffs Unit 2 safety valve will operate stably.

7. NUREG-0737, Item II.D.1 requires that the plant-specific PORV control circuitry be qualified for design-basis transients and accidents. Please provide information which demonstrates that this requirement has been fulfilled.

8. Calvert Cliffs 1 and 2 utilize Dresser 31533VX-30-1 PORV valves. The model number indicates that the valve contains the older obsolete internals. Most plants using this valve have upgraded their valves to the type 2 internals. The EPRI tests were conducted with the type 2 internals. The EPRI PWR Safety and Relief Valve justification report indicates that as of August 1981 the licensee had not purchased the parts necessary to upgrade their valves to the type 2 internals. The manufacturer indicated that all plants using this valve are expected to make the modification. Provide verification that the modification has been made for the Calvert Cliffs valves or, if the modification has not been made, provide justification that tests are applicable and adequately demonstrate acceptable performance of the plant valves.

9. Dresser Industries transmitted a letter in March 1976 to Metropolitan Edison Co. warning that the PORV block valve should be kept closed when the reactor coolant system pressure is below 1000 psig to avoid damaging the PORV (Model 3153VX-30-1) disk and seat by steam cutting. The EPRI program data indicates that the Dresser PORV was successfully tested on water at pressures in the 500-900 psig range. Steam testing at lower pressures was not performed. The recommendation made by Dresser that the PORV be isolated at pressures lower than 1000 psi would seem to preclude the use of the PORV for low temperature overpressure protection of the reactor vessel. Provide additional information concerning the Dresser recommendation as it applies to Calvert Cliffs 1 and 2. Explain whether the Dresser recommendation or a modification it will be followed, or a modification to the PORV will be performed to prevent damage to the disk and seat, or provide additional test detail performed since March 1976 that demonstrates such precautions are unnecessary.

Questions related to thermal hydraulic analysis:

10. The submittal states that a thermal hydraulic analysis of the safety/relief valve piping system has been conducted using RELAP5/MOD1, but does not present details of the analysis. To allow for a complete evaluation of the analysis and the results, provide a discussion on the thermal hydraulic analysis that contains at least the following information:

    (a) Identification of important parameters used in the RELAP5/MOD1 analysis and rationale for their selection. These include time step, valve flow area, peak pressure and pressurization rate, node spacing, choked flow junctions, valve opening time, the fluid conditions at valve opening.

    (b) The submittal states that the safety valves were modeled as valve components in RELAP5, which act as orifices that open at a set rate. It does not, however, report the flow rates passing through the valves in the analysis. For the safety valves, the ASME Code requires derating of the safety valves to 90% of actual flow capacity. The safety valve flows should thus be based on a flow of at least 111% of the valve flow rating, unless another flow rate can be justified. Explain how derating of the safety valves was handled and describe methods used to establish flow rates for the safety valves and PORVs in the analysis.

    (c) A discussion of the sequence of opening of the safety valves that was used to produce worst case loading conditions.

    (d) A sketch of the thermal hydraulic model showing the size and number of fluid control volumes.

    Provide a copy of the contractor's piping thermal-hydraulic analysis report.

11. The submittal does not discuss whether multiple safety valve or PORV actuations were considered in the thermal hydraulic analysis. A multiple valve actuation condition will generally impose larger fluid loads on the piping system than a single valve actuation. Thus, explain whether multiple actuations were considered and in what sequence the valves were assumed to open.

Questions related to the structural analysis:

12. The ME-101 finite element program was used to perform the structural analysis. In this program the response to fluid transient loading was calculated using the modal superposition solution method. Since a modal superposition solution includes response from a limited set of natural frequencies of the structure, this technique must be employed with caution to obtain the total structural response. Explain whether the ME-101 program has been benchmarked for fluid transient problems similar to that of the pressure/relief valve system in which the modal superposition method was exercised and provide evidence that the program generated an accurate solution.

13. The submittal states that the pipe stresses were evaluated according to the USAS B31.7, 1969 Code but does not identify all the load combinations performed or the specific stress limits used for each combination. It does claim that a relief valve actuation coincident with the Operating Basis Earthquake is the limiting load case. Provide description of the load combinations performed in the analysis for the upstream and downstream piping, and specify corresponding stress limits used for both the piping and supports.

14. The submittal states that the stresses in the piping for Units 1 and 2 meet the ASME B31.7 1969 Code allowables. Provide a comparison between the calculated piping stresses and the Code allowables for various load combinations to verify this conclusion.

15. The submittal states that modification to 10 piping supports in Unit 1 and 12 supports in Unit 2 are planned to assure that the loading on these supports is acceptable. Provide a comparison between the calculated stresses and the allowable stresses for the unchanged supports and the modified supports to verify that the support system will be adequate.