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ARTHUR E. LUNDVALL, JR.
VICE PRESIDENT
SUPPLY

July 26, 1982

U. S. Nuclear Regulatory Commission
Office Of Nuclear Reactor Regulation
Washington, D. C. 20555

ATTENTION: Mr. David H. Jaffe, Project Manager
Operating Reactors Branch #3
Division of Licensing

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Request for Additional Information

REFERENCES:
(a) Letter from A. E. Lundvall, Jr. to R. A. Clark dated June 17, 1982, Request for Amendment.
(b) Verbal conversation of July 8, 1982, regarding Main Steam Line Hydraulic Snubbers.
(c) LER Nos. 82-34 (U-1); 82-33 (U-2)

Gentlemen:

We are providing this correspondence in response to a verbal request made during a site visit on July 8, 1982. Enclosed as Attachment (1), is a description of the engineering analysis provided by Bechtel Corporation supporting recent modifications to our Unit 1 main steam piping system. Attachment (1) is additional information to Reference (a).

We would like to take the opportunity to describe the status of hydraulic snubbers associated with Units 1 & 2 main steam lines, auxiliary steam supply to auxiliary feedwater pumps, main feedwater piping, and the Unit 2 reactor coolant loop #22A drain line. For clarity, we will address these snubbers as three groups consisting of those snubbers associated with the Unit 1 main steam line and refered to in Reference (a); those snubbers associated with the Unit 1 and Unit 2 auxiliary steam supply to auxiliary feedwater pumps, main feedwater system, the Unit 2 Reactor Coolant loop #22A drain line, and referred to as additional snubbers identified during recent investigation by Bechtel; and those snubbers associated with the Unit 2 main steam line.

On June 17, 1982, we submitted a License Amendment, Reference (a), requesting the deletion of 4 Unit 1 main steam line snubbers and inclusion of 12 existing snubbers to our safety related snubber surveillance program. These snubbers had been unintentionally omitted from the safety related snubber surveillance program as a result of inadequate definition on the Q-List. Prior to startup of Unit 1, which had been in cold shutdown for refueling, we performed maintenance to rebuild and upgrade seals, tested in accordance

A001 Rec'd for Processing by D. Jaffe on 9/3/82 with surveillance test procedures and declared the 12 main steam line snubbers operational. During the testing phase 7 failed snubbers were identified. The failure mechanism was determined to be a loss of hydraulic oil in a reservoir serving the 7 snubbers.

Immediately following the discovery of the 12 snubbers associated with Unit 1 main steam line two actions were initiated; the Resident I&E Inspector was contacted and informed of the situation, and Bechtel was retained to perform an investigation of all safety related systems with the intent of identifying any additional snubbers of similar status as those associated with the Unit 1 main steam line.

It was our understanding, during discussions with the Resident I&E Inspector, that delayed testing of suspect Unit 2 main steam line snubbers until the next scheduled refueling outage constituted an appropriate level of action considering the inaccessibility of the Unit 2 snubbers during plant operation.

The results of the Bechtel investigation produced 15 additional snubbers associated with the Unit 1 and 2 auxiliary steam supply to the auxiliary feedwater pumps, main feedwater systems, and the Unit 2 reactor coolant drain line. We are in the process of submitting a request for amendment to include these snubbers in our safety-related surveillance program. On July 3, 1982, a visual inspection was completed on 14 of these snubbers which are accessible. On July 14, 1982, all 14 accessible snubbers had been upgraded to safety-related standards, testing was completed, and all were declared operational.

The last snubber was identified during the final stages of the investigation, and is located on the reactor coolant loop #22A drain line, downstream of two normally closed manual valves. An analysis was done on this section of piping assuming the snubber was inoperable. Piping stresses for the faulted conditions (SSE, dead weight, and pressure) are below Code allowables of 2.4 S_h. A review of all supports in this section of piping indicates the loads are not significantly increased to affect support performance, except for one anchor (not a snubber) located in the downstream piping. For this anchor, local deformation of some members may occur, but the anchor will remain intact to provide integrity of the safety-related piping. We conclude that operation assuming this snubber is inoperable is acceptable for the short term.

In parallel with the above events an attempt was made to identify the Unit 2 main steam line snubbers (similar to those associated with Unit 1) for which credit would be taken as a result of a seismic reanalysis effort presently being performed by Teledyne Corporation to upgrade the Unit 2 main steam line. This effort, of course, would assist us in the planning phase for testing and upgrading Unit 2 main steam line snubbers. As we pointed out during your site visit on July 8, 1982, this effort is still in progress.

Since discovery of the Unit 1 problem, we have been concerned about the status of Unit 2 main steam system snubber operability. A recent safety analysis performed by the Electric Engineering Department and assisted by Bechtel shows the seismic design of the Unit 2 main steam piping is adequate as presently configured assuming inoperable three way snubber supports. This analysis involved a review of the main steam piping from the containment penetration through the main steam isolation valve which ignore the function of the threeway snubber support in the main steam piping tunnel. The review considered the behavior of the system to evaluate the short term system operability assuming that the suspect snubbers did not function during a seismic event. The vibratory motions during an earthquake event would be limited by the large pipe whip restraints located at the east and west ends of the steam piping tunnel.

The analysis was performed by displacing the pipe equivalent to the hot gap between pipe and whip restraint down stream of the main steam isolation valves (at the west end of the tunnel). The model included the piping between containment penetration and the whip restraint. Each gap was considered separately for the analysis. Stress intensification factors were accounted for in the stress values. By inspection, the vertical motion of the pipe was not quantified as the whip restraint at the east end of the tunnel limits motion thereby minimizing system stresses. Certain simplifying assumptions were made; e.g. the study was a static analysis of main steam piping and dynamic amplification was not considered. The highest calculated stress was significantly below allowables. Considering the assumptions made and substantial margin that exist in calculated stress values, we conclude that the piping system is adequately supported to meet all postulated conditions and that operability of the main steam isolation valves is not affected.

In conclusion, by inspection of the Unit 1 main steam line snubbers the failure mechanism was found to be a lack of hydraulic oil as a result of inadequate surveillance. Due to similarity of application between Unit 1 and Unit 2 main steam line snubbers it is reasonable to assume that the Unit 2 snubbers should not exhibit any higher frequency of failures as compared to that characterized by Unit 1.

As you are aware, personnel safety considerations have limited us during normal operations from performing a visual inspection on the Unit 2 snubbers. We do, however, have accessibility to remote reservoirs associated with at least 6 of the 12 snubbers of concern. We have reason to believe that these remote reservoirs are common reservoirs serving the majority of snubbers comprising those which make up the seismic threeway snubber supports. We have initiated, on an interim bases, an increased inspection program to verify adequate oil levels in the accessible reservoirs.

From a qualitative assessment, considering the remote probability of seismic activity, the inherent flexibility of the piping system and considering measures we have initiated to ensure continued operability of accessible reservoirs, we are confident that the operability of the main steam line is not degraded to the extent that the public health and safety is compromised by continued operation of Unit 2.

We are taking corrective measures to ensure that a similar event, such as the events described in this letter and References (a) and (c) are not repeated. These measures are described in Reference (c).

Very truly yours,

A. E. Lundvall Jr.

Vice President - Supply

AEL/LOW/gla

STATE OF MARYLAND :
: **TO WIT:**
CITY OF BALTIMORE :

Arthur E. Lundvall, Jr., being duly sworn states that he is Vice President of the Baltimore Gas and Electric Company, a corporation of the State of Maryland; that he provides the foregoing response for the purposes therein set forth; that the statements made are true and correct to the best of his knowledge, information, and belief; and that he was authorized to provide the response on behalf of said Corporation.

WITNESS my Hand and Notarial Seal: Ruth H. Grese
Notary Public

My Commission Expires: July 1, 1986

cc: J. A. Biddison, Esquire
G. F. Trowbridge, Esquire
R. E. Architzel, NRC

ATTACHMENT (1)

SCOPE OF STUDY

An analysis was performed to review the Unit #1 main steam piping system to evaluate the effects of the turbine stop valve closure. The operational history of the Unit #1 turbine building piping had demonstrated some motion both during steady state and valve closure transients. Also maintenance inspection during outages had shown distress in the containment supports. This review was performed to establish the margins in the system and to identify areas where strengthening or maintenance were warranted. For completeness of the study the major normal operating loads, dead weight and thermal plus the seismic loads, essentially within the category I portion, were re-evaluated.

FLUID ANALYSIS

The forcing function generated is due to the main turbine stop valve closure. The forces can be attributed to rapid deceleration of the fluid in the main steam line following closure of the stop valves. Hence, in order to develop the forcing function, we must first evaluate the fluid conditions following a valve closure.

RELAP5/MOD1 (Version 2.1)

The fluid conditions are evaluated using the computer code RELAP5/MOD1. Basically, this code evaluated fluid conditons at discrete time intervals by making use of conservation of mass, energy, and momentum. Also, the system being modeled is broken into several components (volumes) which are joined by junctions. This allows the code to evaluate fluid properties as a function of space (i.e., changes of properties due to fluid flow frictional effects as the fluid traverses from one point to the next) as well as time.

PIPE SYSTEM STRESS ANALYSIS

Piping analysis was performed using the ME-101 program. ME-101 is a finite element computer program which performs linear elastic analysis of piping systems using standard beam theory techniques.

MATH MODEL

The piping system was broken into two stress problems:

1. Piping inside containment - This included the piping from the steam generator nozzle to containment penetration.

2. Piping outside containment - This included all the piping from containment penetrations to turbine nozzle including dump line.

The seismic model included the piping from the exterior of the containment building through the auxiliary building steam room through the steam tunnel and a segment into the turbine building.

ATTACHMENT I

ANALYSIS

The following analyses were performed:

Weight Analysis	A static analysis was performed for the system under the action of the weight of pipe, contents and insulation.
Thermal Analysis	A thermal analysis was performed using normal operating temperature of the steam.
Steam Hammer Analysis	A dynamic analysis was performed using the forcing function generated by computer code RELAP5/MOD1.
OBE & DBE Analysis	A dynamic analysis, using envelop response spectra method, was used for OBE. The DBE loads were ratioed from OBE loads. For piping outside the containment building a portion of turbine building piping was included in the analysis to consider the effect of that portion of pipe on the seismic snubber at "K" Line. This overlap technique is as described in NUREG-51357 "Dynamic Analysis of Piping Using Structural Overlap Method".
Seismic Anchor Movements	An analysis was performed using the relative displacements input caused by the OBE & DBE motions of the independent category I structures.

All supports were evaluated using the new generated loads.

SUMMARY OF STUDY

The conclusions of this study revealed a very high margin exists in the pressure boundary, the pressure piping for all examined load cases. However, the transient loads created by the valve closure developed significant loads on the support system. A program has been developed to systematically upgrade these supports, stiffen supports or add additional supports. In addition some snubbers were deleted.