50-317

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

October 20, 1995

Mr. Robert E. Denton
Vice President - Nuclear Energy
Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: EVALUATION OF ISOLATION PROVISIONS FOR SERVICE WATER SYSTEMS, CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT 1 (TAC NO. M87189) AND UNIT 2 (TAC NO. M87190)

Dear Mr. Denton:

Baltimore Gas and Electric Company (BGE) submitted a Licensee Event Report (LER) 89-23, Revision 2, on December 14, 1990. The LER detailed a potential vulnerability to the loss of the safety-related (SR) portion of the service water system (SRW) during a Safe Shutdown Earthquake (SSE) and provided a proposed resolution. By letter dated July 7, 1993, BGE indicated that the initial proposed resolution, a provision for automatic isolation of the nonsafety-related (NSR) portion of the system during a seismic event, described in the LER was not practical and provided an alternative solution. The alternative was based on the result of BGE staff plant walkdowns and engineering judgment. BGE stated that the turbine building and the NSR piping housed therein is rugged enough to withstand an SSE and, therefore, would satisfy the appropriate licensing basis criteria for the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2.

By letter dated November 3, 1993, the NRC staff transmitted a request for additional information (RAI) on the issue. The staff requested that BGE provide an analytical basis, in lieu of plant walkdowns, for concluding that the NSR portion of the SRW system piping is seismically adequate. BGE subsequently responded by letter dated September 6, 1994, indicating that the lacking of seismic analyses for the NSR portion of the SRW system would pose no significant risk to the public and would not justify the large expenditure required for an extensive seismic analysis. As an alternative, BGE proposed that the SRW system seismic issue be evaluated within the scope of the Individual Plant Examination of External Events (IPEEE) Program for Calvert Cliffs, where all of the concerns relating to the SRW system seismic issue will be addressed.

Based on the information provided, the NRC staff determined that BGE's proposal of including the SRW system seismic issue in its IPEEE Program for final resolution to be acceptable provided that BGE provide the additional information requested in it's RAI dated June 13, 1995.

BGE responded to the RAI by letter dated August 11, 1995. BGE was unable to provide assurance that the natural frequencies of the NSR SRW piping system would fall outside the resonance of the Calvert Cliffs seismic design input motion which would eliminate the possibility of a potentially unfavorable amplified response. BGE indicated, based on past earthquake experiences, that the inertia effects from seismic events would not cause failure in welded steel piping for earthquakes up to 0.9g peak ground acceleration (PGA). This PGA value is well beyond the SSE design basis level for the Calvert Cliffs site. While the NRC staff agrees this is likely, it will determine if seismic inertia effects need to be reconsidered based on the IPEEE Program's final resolution for this issue.

BGE further stated that the more credible failure mode that could cause loss of pressure boundary in the SRW system would be due to excessive differential anchor movement, with the primary effects on small branch lines. In order to improve the seismic capability of the system, BGE has already completed several physical modifications. The piping in question is generally of welded steel construction. There are some bolted flange joints and some of the small branch lines for small relief valves have threaded joints near the relief valve portion of the vent line. The NSR SRW system piping is typically supported in a flexible manner by rods, spring cans, rigid supports under valves at valve stations, slides on trapeze and rigid supports, and occasional rigid restraints. Based on the engineering judgment of the BGE walkdown team, it was determined that the following configurations were susceptible as sources of potential break locations:

1. Branch lines with threaded connections to main pipe or equipment - Considering adverse spatial interactions and seismic inertial motion, this condition, if existing, was identified as a potential cause for leakage due to the inherent weakness of a threaded connection in bending.

2. Branch lines with restraints - Imposed forces and moments due to differential seismic anchor movement between a restrained branch line and its header could result in failure at the welded joint between the branch line and the main pipe.

3. Branch lines with the potential to impact or become hard bound - This includes any branch line which might be susceptible to impact with a structural member or other interference due to movement of the main pipe with a resulting failure at the welded joint between the branch line and the main pipe.

Based on the configurations identified above, five potential break locations were identified; one was due to a combination of configuration Nos. 1 and 2, one was due to configuration No. 2, and three were due to configuration No. 3. Physical modifications for these five potential break locations have been completed. The NRC staff found BGE's basis for identifying the potential

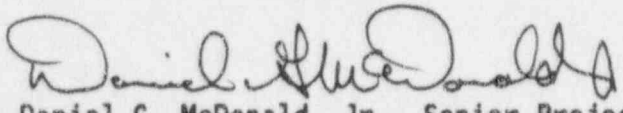
break locations, due to differential anchor movements, to be acceptable. However, this may also be reconsidered based on the final resolution for this issue.

BGE also indicated that the turbine building was originally designed to the requirements for a Seismic Class II structure, including wind load and seismic load. The building is an integrated steel structure, with metal siding, supported on reinforced concrete foundations. In addition, all of the structural steel columns, beams, and roof trusses of the building have been designed as independent members and in accordance with American Institute of Steel Construction, Inc. Specifications. Based on its assessment, BGE determined that facilities which were built to the requirements of basic construction codes have the ability to survive seismically-induced loadings and stresses well in excess of the original allowances. Although a quantitative evaluation of the seismic capability of the turbine building has not been performed, it is unlikely that catastrophic failure of the turbine building would occur. This, as well as the other items identified above, may be reconsidered pending the final resolution of this issue.

Based on the above, the NRC staff has concluded that BGE's proposal of including the SRW system seismic issue in its IPEEE program for final resolution to be acceptable. As noted in the above, the NRC staff may reevaluate portions of this issue when the final resolution is determined upon completion of the IPEEE Program.

This completes all actions related to the above referenced TAC numbers.

Sincerely,



Daniel G. McDonald, Jr., Senior Project Manager
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Original signed by:

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