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February 4, 1985

ARTHUR E. LUNDVALL, JR.
VICE PRESIDENT
SUPPLY

Director of Nuclear Reactor Regulation
Attention: Mr. J. R. Miller, Chief
Operating Reactors Branch #3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Calvert Cliffs Nuclear Power Plant
Units Nos. 1 & 2; Dockets Nos. 50-317 and 50-318
Containment Vent System

References: 1. BG&E letter from Mr. A. E. Lundvall, Jr. to Mr. J. R. Miller (NRC), dated December 22, 1983.

2. BG&E letter from Mr. A. E. Lundvall, Jr. to Mr. J. R. Miller (NRC), dated March 26, 1984.

Gentlemen:

In References 1 and 2 Baltimore Gas and Electric Company requested license amendments for Units 1 and 2 (respectively) which would permit the use of the existing containment hydrogen purge exhaust line as a containment venting system during normal operations. A venting capability is required during normal operations to maintain containment internal pressure below the limit established in the technical specifications. Fluctuations in containment internal pressure relative to atmospheric pressure are caused by sudden changes in local weather conditions or by changes in plant operating mode. A gradual increase in containment pressure will result from heat losses from the NSSS to the containment atmosphere, as well as the leakage of air and steam from various mechanical components such as seal and pneumatic valves.

On June 18, 1984, a telephone discussion was held with members of your staff involved in the review of our application. During this discussion, you indicated that our evaluation of the LOCA-while-venting accident should consider the impacts of a maximum hypothetical accident (TID-14844) source term as opposed to the LOCA source term applied in our analysis. You also expressed a concern with our conservative analytical assumption of a 60-second closure time for the containment vent line isolation valves, stating that such an assumption would result in a calculated dose in excess of Part 100 limits when used in conjunction with a maximum hypothetical accident source term. To resolve the staff's concerns we committed to repeating the LOCA-while-venting analysis utilizing the recommended higher source terms and a shorter, more realistic isolation valve closure time. In any event, we had indicated that a reanalysis would be necessary to reflect the planned removal of the two-inch flow restriction in the hydrogen purge exhaust line.

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The enclosure to this letter provides our reanalysis of the LOCA-while-venting accident scenario and is intended to replace the applicable portion of the evaluation of significant hazards considerations contained in References 1 and 2. The results of the analysis support our previous determination of no significant hazards considerations.

For your information, system modifications to support the containment vent mode of operation are now in progress but are not expected to be completed before July 31, 1985. As discussed above, these modifications include removal of the two-inch flow restriction in the hydrogen purge exhaust line to provide for a continuous 4-inch diameter venting pathway. Also included is the installation of a diverse isolation signal to the containment isolation valves. The source of this signal will be radiation detection instrumentation sensing airborne radiation inside containment. The signal is being installed non-safety grade as allowed by NUREG-0737, Item II.E.4.2.

In consideration of the above schedule for completion of required system modifications we request that you withhold issuance of the license amendment requested by References 1 and 2 until such time as the containment vent system is ready for service. In addition, you will note in the enclosed analysis that the 15-second response time credited for isolation valves MOV-6900 and 6901 is less than the technical specification value of 20 seconds (see T.S. Table 3.6-1). We plan to submit a request that the technical specification response time limit be reduced to 15 seconds to be consistent with our analysis.

If you should have any questions, please do not hesitate to contact us.

Very truly yours,

C. E. Lundvall Jr.

AEL/BSM/vf

Enclosure

cc: D. A. Brune, Esq.
G. F. Trowbridge, Esq.
Mr. D. H. Jaffe, NRC
Mr. T. Foley, NRC
Mr. J. C. Ventura, Bechtel

Enclosure

February 4, 1985

ANALYSIS OF OFFSITE DOSE CONSEQUENCES OF A LOSS OF COOLANT ACCIDENT WHILE VENTING CONTAINMENT

1. Introduction

The purpose of this analysis is to evaluate the performance of the containment isolation provisions of the proposed containment vent/hydrogen purge system. The system is assumed to be functioning in the containment vent mode with the plant operating at full power at the time a design basis large-break LOCA occurs concurrent with a loss-of-offsite power. Acceptance criteria applicable to this case are the offsite dose limits established by 10 CFR Part 100.

2. Radioactive Source Term

The radioactive source term was conservatively calculated assuming total failure of the core simultaneous with lead rod clad rupture. The time of lead rod clad rupture is 10.2 seconds after initiation of the LOCA (FSAR Table 14.17-21). The core radioisotope inventory was derived in accordance with TID-14844 based on a power level of 2754 Mwt (102% power), as follows (FSAR Section 14.24.2):

100 percent of the noble gases
50 percent of the iodine
1 percent of all other fission products

Half of the iodine is assumed to deposit on surfaces inside the containment. This leaves 25 percent of the original core iodine inventory available for release.

The assumption of total core failure concurrent with the lead rod clad rupture is highly conservative. Licensing grade analyses (based on a census of fuel pin power level) demonstrate that even under worst-case bounding conditions, considerably less than one-half of the core would be susceptible to failure within the first 25 seconds of the accident. Since fuel failure in this context means clad rupture, the radioactivity initially released to the containment would be limited to the fuel pin gap inventory.

Thermal-Hydraulic Data

A 2.0 ft^2 hot leg break was assumed because it yields the highest peak containment pressure. The containment pressure profile is illustrated in FSAR Figure 14.20-18.

Mixing of the Containment Atmosphere

At 10 seconds following LOCA initiation, it is assumed that the radioactive source term is available for release through the containment vent line and is completely mixed with the containment atmosphere (initial RCS blowdown is nearly complete). This assumption implies instantaneous transport of the source term to the vent line inlet upon rupture of the lead rod.

Isolation Valve Closure Time

The total time required for closure of the vent line isolation valves (MOV-6900 and 6901) is less than 25 seconds after initiation of a LOCA. Closure time is composed of the following elements:

SIAS delay	2.4 seconds
D/G loading time	10 seconds
valve stroke time	10 seconds
margin	2.6 seconds

The stroke time of both isolation valves have been verified by testing. If offsite power is not lost, overall closure time would be less than 15 seconds.

Vent Line Data

To determine the discharge rate, the vent line was conservatively modelled as a four-inch orifice between two infinite volumes. This approach resulted in a maximum volumetric flow rate which was then used to calculate the quantity of containment atmosphere released to the environment during the time period of interest (between T = 10 seconds and T = 25 seconds). Actual flow rates would be lower by a factor of 2 due to frictional resistance in the vent line (elbows, valves, etc.), and other flow resistances imposed by the moisture separator and the safety-grade penetration room ventilation system HEPA filter and charcoal absorber. In addition, the throttling effect of the closing isolation valves would further reduce the calculated discharge rate by a factor of about 2, due to the fact that the time-averaged "orifice" diameter would be halved by the action of the valves.

Dose Calculation

The penetration room ventilation system charcoal absorber (2-inch bed depth) is credited with an iodine removal efficiency of 95 percent. The remaining radioactivity is released via the main plant vent and is assumed to be transported to the exclusion area boundary without credit for decay or depletion. Atmospheric relative concentrations are taken from FSAR Figure 2.3-3. The resulting 0-2 hour time interval dose is 93.6 Rem thyroid and 2.27 Rem whole body, roughly equivalent to the 0-2 hour dose attributable to the containment leakage pathway (FSAR Section 14.24.3). Thus, the total LOCA dose (0-2 hour) is 188 Rem thyroid and 4.5 Rem whole body. These doses are within the limits established by 10 CFR Part 100.

Summary of Results

Operation of the containment vent system at the time of a loss-of-coolant accident will not result in offsite doses in excess of the applicable limits. The action of the vent system isolation valves (actuated upon high containment pressure, low pressurizer pressure, or high containment radiation) in conjunction with the penetration room ventilation system filtration train, will minimize the amount of radioactivity released to the environment.

The analysis shows that a maximum of about 3000 cubic feet of containment atmosphere would be released from containment during the 25 seconds required for isolation. Because of the conservatisms identified in the analysis, this value exceeds the actual volume that would discharged from the containment by at least a factor of 4 and would result in a containment pressure drop of less than one psi. This pressure drop will have no adverse affect on ECCS operation and current FSAR LOCA results.