CHARLES H. CRUSE
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Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 495-4455

BGE

November 12, 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 for the Review of the Calvert Cliffs Nuclear Power Plant, Units 1 & 2, Integrated Plant Assessment Report for the Auxiliary Feedwater System, and Errata

REFERENCES:

(a) Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated October 22, 1997, "Request for Review and Approval of System and Commodity Reports for License Renewal"

(b) Letter from Mr. D. L. Solorio (NRC) to Mr. C. H. Cruse (BGE), dated September 1, 1998, "Request for Additional Information for the Review of the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 & 2, Integrated Plant Assessment Reports for the Auxiliary Feedwater System"

(c) Letter from Mr. D. L. Solorio (NRC) to Mr. C. H. Cruse (BGE), dated September 24, 1998, "Renumbering of NRC Requests for Additional Information on Calvert Cliffs Nuclear Power Plant License Renewal Application Submitted by the Baltimore Gas and Electric Company"

Reference (a) forwarded four Baltimore Gas and Electric Company (BGE) system and commodity reports for license renewal. Reference (b) forwarded questions from NRC staff on one of those reports, the Integrate Plant Assessment Report for the Auxiliary Feedwater System. Reference (c) forwarded a numbering system for tracking BGE's response to all of the BGE License Renewal Application requests for additional information and the resolution of the responses. Attachment (1) provides our responses to the questions contained in Reference (b). The questions are renumbered in accordance with Reference (c). Attachment (2) provides errata to Section 5.1, Auxiliary Feedwater System, of the BGE License Renewal Application.

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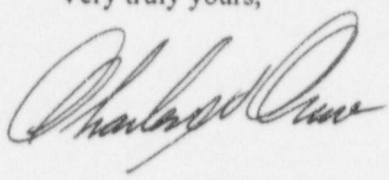
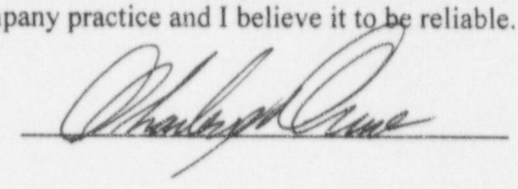
Should you have further questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,



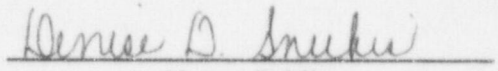
STATE OF MARYLAND :
: **TO WIT:**
COUNTY OF CALVERT :

I, Charles H. Cruse, being duly sworn, state that I am Vice President, Nuclear Energy Division, Baltimore Gas and Electric Company (BGE), and that I am duly authorized to execute and file this response on behalf of BGE. To the best of my knowledge and belief, the statements contained in this document are true and correct. To the extent that these statements are not based on my personal knowledge, they are based upon information provided by other BGE employees and/or consultants. Such information has been reviewed in accordance with company practice and I believe it to be reliable.



Subscribed and sworn before me, a Notary Public in and for the State of Maryland and County of Calvert, this 12th day of November, 1998.

WITNESS my Hand and Notarial Seal:



Notary Public

My Commission Expires:

2/1/2002

Date

CHC/KRE/dlm

Attachments: (1) Response to Request for Additional Information; Integrated Plant Assessment Report for the Auxiliary Feedwater System

(2) Errata to Section 5.1, Auxiliary Feedwater System; License Renewal Application

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

ATTACHMENT (1)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION;

INTEGRATED PLANT ASSESSMENT REPORT FOR THE

AUXILIARY FEEDWATER SYSTEM

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
November 12, 1998

NRC Question No. 5.1.4

The potential and plausible age-related degradation mechanisms (ARDMs) for the Auxiliary Feedwater (AFW) System are identified in Table 5.1-2 of Section 5.1 of Baltimore Gas and Electric Company's (BGE) License Renewal Application (LRA). However, components such as the AFW piping, pumps and valves are considered to have low susceptibility to fatigue. Provide a description of the evaluation and any specific criteria from which you concluded that fatigue is not a plausible aging effect for the AFW components. Inasmuch as corrosion and pitting have been identified as plausible aging effects for the AFW components, include in your response a discussion that effect of the degradation caused by corrosion and pitting on the structural integrity of the components and the basis for excluding fatigue as a plausible aging effect.

BGE Response

There is no steam piping within the scope of license renewal for the AFW System. Steam is delivered to the control valve via the Main Steam System. Baltimore Gas and Electric Company LRA Section 5.12, Main Steam, addresses this steam supply piping. Exhaust steam piping from the AFW turbines to the roof exhausts is not within the scope of license renewal.

Fatigue is not plausible for the control valve, steam turbine, and governor valve, which have an internal environment of steam, for the following reasons:

1. The subject components are in a piping system that is designed per American National Standards Institute B31.1. The piping system design analysis includes an implicit fatigue design basis. A detailed fatigue analysis is typically only developed for Class 1 components, unless special concerns exist. Special concerns may include the presence of thermal stratification or other conditions the original design did not consider. Baltimore Gas and Electric Company has not identified any special concerns for these components.
2. The manufacturer has indicated that 2,204 individual thermal cycles are available before exceeding theoretical thermal fatigue life. The number of thermal cycles for these components over a 60-year period is conservatively estimated to be 1,480 cycles.

Fatigue is not plausible for AFW components in the liquid flowpath between Condensate Storage Tank No. 12 and the steam generators based on the following reasons:

1. The majority of the system in the liquid flowpath between Condensate Storage Tank No. 12 and the steam generators has an operating temperature of 100°F or less. The portion of piping adjacent to the steam generator nozzles experiences higher temperatures and is normally stagnant. This results in a gradual temperature gradient between the steam generators' nozzles and the upstream AFW piping. The pipe is 4-inch schedule 80 with a wall thickness of 0.337 inches, which will not subject the pipe to significant thermal gradient stresses on heatup or cooldown. System testing that adds 40-100°F condensate storage tank water through these lines occurs relatively infrequently.
2. Additionally, components in the AFW liquid flowpath between Condensate Storage Tank No. 12 and the steam generators were evaluated in an AFW System fatigue analysis. This analysis determined that the most fatigue-limiting components in this flowpath were the check valves immediately upstream of the steam generators. These check valves are not shown on the Figure 5.1-1 Simplified Diagram, but they are shown in Calvert Cliffs Nuclear Power Plant (CCNPP) Updated Final Safety Analysis, Revision 22, Figures 10-13 and 10-14

(CKV-129 and -130). The fatigue analysis calculated cumulative usage factor (CUF) for these check valves as 0.041. The CUF is based on 400 cycles of AFW initiation for each steam generator. The temperature differential was conservatively assumed to be 532°F on the steam generator side of the check valve, with 32°F AFW water injection. The analysis demonstrates that the CUF for these check valves, the piping between these check valves and the steam generators, and all other upstream components will be far below 1.0 for 60 years.

Therefore, fatigue is not plausible for this system.

Table 5.1-2 identifies the groups in which an ARDM/device type combination are evaluated. Other parts of Section 5.1 of the BGE LRA contain discussions regarding the effects of plausible ARDMs, and the methods used to manage plausible ARDM effects for crevice corrosion, erosion corrosion, galvanic corrosion, general corrosion, microbiologically-induced corrosion, and pitting. Please refer to these discussions for the requested information.

NRC Question No. 5.1.5

The pumps and piping in the AFW were judged to have low susceptibility to dynamic loadings. However, based on operating experience, it is likely that the AFW System will be subject to dynamic loads during transient operation and abnormal events such as water hammer. Provide a summary of the evaluations from which you concluded that damage due to dynamic loading is not an aging concern for the critical components in the AFW System during the proposed period of extended operation.

BGE Response

Components and structures are designed to accommodate loads that are expected in service. Expected service loading amplitudes/frequencies do not perpetuate dynamic loading. Component design, operating procedures, and system testing procedures prevent vibrational loadings that could cause degradation. The system is normally maintained at relatively steady water pressure and temperature. The system is operated infrequently, such as during plant heatup, cooldown, and steam generator filling. It is tested on a quarterly and shutdown basis. Operating Instructions require venting of the system prior to operation if steam binding (due to leaking steam generator check valve) is suspected, thereby preventing significant water hammer loads. Water hammer is not considered to be a normal or routine event for the AFW System and is not a source of long-term age-related degradation of its components. Refer also to the RAI responses transmitted to the NRC In Reference (1), Items 116 and 117. Furthermore, an analysis of the susceptibility of the CCNPP AFW System to water hammer was conducted by the NRC and documented in the Safety Evaluation Report attached to Reference (2). The conclusion was that a damaging water hammer would be very unlikely to occur in the AFW System. The conclusion was substantiated by plant operating experience prior to the evaluation. Therefore, lack of dynamic loadings make this ARDM not plausible.

NRC Question No. 5.1.6

Provide a description of the evaluation and any specific criteria from which you concluded that erosion/corrosion is not a plausible aging effect for the components of the AFW System.

BGE Response

Process fluid temperature and infrequent operation minimize erosion corrosion in the AFW System. The system is exposed to cold water (< 100°F) when taking suction from the condensate storage tank. When in standby mode, temperatures will be at inside ambient conditions (< 160°F). The piping adjacent to the steam generators is exposed to warmer temperatures, but the fluid is normally stagnant. Based on industry experience, erosion corrosion is not significant for cold water systems. The system is infrequently operated and only for short periods of time. Total cumulative operating time is typically less than 110 hours per year. These two factors lead to the conclusion that erosion corrosion is not a plausible aging mechanism for the AFW System. Erosion corrosion is considered plausible for the turbines, governors, and turbine throttle/stop valves that are exposed to a steam environment when the system is operated. Aging management of these components is addressed in Group 5.

NRC Question No. 5.1.7

Identify differences between the Diesel Fuel Oil System and AFW System buried pipe inspection programs. If there are any differences, provide a description and justification for each of the differences.

BGE Response

There is only one buried pipe inspection program. It is credited for the Diesel Fuel Oil System and the AFW System. The LRA was not clear in that it indicated a "Diesel Fuel Oil Buried Pipe Inspection Program" and an "AFW Buried Pipe Inspection Program."

NRC Question No. 5.1.8

Are there any parts of the systems, structures and components that are inaccessible for inspection? If so, describe what aging management program will be relied upon to maintain the integrity of the inaccessible areas. If the aging management program for the inaccessible areas is an evaluation of the acceptability of inaccessible areas based on conditions found in surrounding accessible areas, please provide information to show that conditions would exist in accessible areas that would indicate the presence of, or result in degradation to such inaccessible areas. If different aging effects or aging management techniques are needed for the inaccessible areas, please provide a summary to address the following elements for the inaccessible areas: (a) Preventive actions that will mitigate or prevent aging degradation; (b) Parameters monitored or inspected relative to degradation of specific structure and component intended functions; (c) Detection of aging effects before loss of structure and component intended functions; (d) Monitoring, trending, inspection, testing frequency, and sample size to ensure timely detection of aging effects and corrective actions; (e) Acceptance criteria to ensure structure and component intended functions; and (f) Operating experience that provides objective evidence to demonstrate that the effects of aging will be adequately managed.

BGE Response

Baltimore Gas and Electric Company can access all AFW components if required. For example, for portions of AFW pump suction underground piping, it may be necessary to excavate or use remote inspection techniques.

References

1. Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated February 14, 1997, Response to Request for Additional Information; Baltimore Gas and Electric Company's Integrated Plant Assessment Systems and Commodity Reports
2. Letter from Mr. R. W. Reid (NRC) to Mr. A. E. Lundvall, Jr. (BGE), dated March 10, 1980, Transmittal of License Amendment Nos. 42 and 25

ATTACHMENT (2)

ERRATA TO SECTION 5.1, AUXILIARY FEEDWATER SYSTEM;

LICENSE RENEWAL APPLICATION

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
November 12, 1998

ATTACHMENT (2)

ERRATA TO SECTION 5.1, AUXILIARY FEEDWATER SYSTEM; LICENSE RENEWAL APPLICATION

The program credited for aging management of corrosion of the governor valves in the Auxiliary Feedwater System has been changed from the Age-Related Degradation Inspection (ARDI) Program to the Preventive Maintenance Program. Currently a periodic overhaul is performed on these valves that will provide for ongoing aging management versus the one-time inspection of the ARDI Program. The Repetitive Tasks that cause the overhaul to be performed on the turbine also cause the governor to be overhauled. The specific maintenance procedures that direct performance of these overhauls, called TURB-01 and VALVE-28, will be modified slightly to ensure the specific subcomponents and age-related degradation mechanisms are addressed as follows:

- TURB-01: Inspections will be added for erosion and corrosion of the following subcomponents; bypass elbow, turbine casing, gland casing, shaft, jet plug, and lube oil coolers.
- VALVE-28: Inspections for "damage or wear" of the valve body, stem, and bonnet will be changed to inspections for "damage, wear, erosion, and corrosion."

Therefore, in Section 5.1 of the Baltimore Gas and Electric Company License Renewal Application:

- On page 5.1-26, add the words "and governor" following the words "The turbine" in the last complete sentence on the page.
- On page 5.1-27, delete the words "governor valve and" from the 1st line on the page.
- Add the following paragraph following the second full paragraph on page 5.1-27:

  "The existing Preventive Maintenance Program includes tasks that also require a periodic overhaul of the AFW pump governor valves. In accordance with CCNPP Technical Procedure VALVE-28, "Auxiliary Feedwater Pump Turbine Governor Valve Overhaul," the governor is removed from the piping system, disassembled, and then cleaned and inspected for damage or wear. Measurements are taken to assure critical tolerances are within acceptance criteria. Specific subcomponents are inspected for wear, erosion, pitting, and/or surface cracking. Unsatisfactory inspection results are recorded and evaluated. Corrective actions are initiated in accordance with the CCNPP Corrective Actions Program, if necessary. [References 28 and 39] Other than the governor valve stem failures reported on page 5.1-2, no other degradation, such as cracks or corrosion on pressure-retaining components, have been observed."
- On page 5.1-27, add the words "and governor" following the words "pump turbine" in the last sentence under the PM Program discussion.
- On page 5.1-27, delete the words "governor valve and" from the second line in the last paragraph on the page.
- On page 5.1-28, add the words "and governor" following the words "existing turbine" in the fifth bullet.
- On page 5.1-28, add the sentence "The procedures implementing the overhauls will be modified to specify specific components and ARDMs" to the fifth bullet.
- On page 5.1-28, delete the words "governor valves and" from the sixth bullet.
- On page 5.1-40, for the CCNPP Preventive Maintenance Program, change the word "Existing" to "Modified" in the first column, add the phrase "and procedure VALVE-28, 'Auxiliary Feedwater Pump Turbine Governor Valve Overhaul'" to the paragraph in the "Program" column, and add the words "and governor valves" to the end of the sentence in the "Credited As" column.

- On page 5.1-40, for the ARDI Program delete the words "governor valves and" from the fourth bullet.
- On page 5.1-42, add Reference "39. Calvert Cliffs Technical Procedure VALVE-28, 'Auxiliary Feedwater Pump Turbine Governor Valve Overhaul,' Revision 0, June 15, 1993."