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Calvert Cliffs Nuclear Power Plant
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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 Feedwater System, and Errata

REFERENCES:

(a) Letter from Mr. D. L. Solorio (NRC) to Mr. C. H. Cruse (BGE), dated September 7, 1998, "Clarification Regarding Selected Feedwater and Diesel Fuel Oil Requests for Additional Information Resulting from May 6, 1998, Meeting with Baltimore Gas and Electric Company"

(b) Letter from Mr. D. L. Solorio (NRC) to Mr. C. H. Cruse (BGE), 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 seven clarified NRC requests for additional information for Baltimore Gas and Electric Company (BGE) Integrated Plant Assessment system reports for license renewal for the Feedwater System (five questions) and the Diesel Fuel Oil System (two questions). Reference (b) 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 five Feedwater System questions contained in Reference (a). The questions are renumbered in accordance with Reference (b). Attachment (2) provides errata to Section 5.9 of the BGE License Renewal Application, Feedwater System.

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

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

(2) Errata to Section 5.9, 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
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ATTACHMENT (1)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION;

INTEGRATED PLANT ASSESSMENT REPORT FOR THE FEEDWATER SYSTEM

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

NRC Question No. 5.9.1

[Nuclear Regulatory Commission] Bulletin 79-13 [*"Cracking in Feedwater System Piping"*] discusses stress assisted corrosion in pressurized water reactor Feedwater System (FWS), and Generic Safety Issue (GSI) 14, "PWR Pipe Cracks," discusses stress corrosion cracking specifically in Combustion Engineering plants' Feedwater Systems. Provide a justification for not including stress corrosion cracking as an applicable aging effect for the FWS *[in Baltimore Gas and Electric Company's (BGE's) License Renewal Application (LRA)]*.

BGE Response

Generic Safety Issue 14 is not included in Reference (1), Enclosure 2, "Safety Issues Requiring Review for License Renewal."

Generic Safety Issue 14 is concerned with pipe cracking in pressurized water reactor safety systems in a general sense. Stress corrosion cracking in Combustion Engineering plants' Feedwater Systems is not specifically discussed in NUREG-0933, "A Prioritization of Generic Safety Issues." It appears that stress corrosion cracking (SCC) is discussed as it applies to stainless steel materials and not to the carbon steel materials typically used in feedwater applications. NUREG-0933 resolved this issue and determined that the risk associated with GSI 14 is negligible for primary systems and low for other piping systems. The actions taken and conclusions reached as a result of GSI 14 would not be invalidated during the renewal term and do not require redress for this reason. NUREG-0933 directs the reader to NUREG-0691, "Investigation and Evaluation of Cracking Incidents in Piping in PWRs," for the results of the pressurized water reactor Pipe Crack Study Group investigation. The issue of feedwater line cracking is thoroughly examined and discussed in Section 2.3 of this document.

In Bulletin 79-13, Revision 2, the only Combustion Engineering plant where cracking of the feedwater piping was initially characterized as "stress assisted corrosion" was San Onofre Unit 1. Subsequent studies, which are the topic of NUREG-0691 Section 2.3, have characterized the mechanism as thermal fatigue assisted by corrosion, which is encompassed by the BGE definition of fatigue. Characterizing this mechanism as SCC would be incorrect. Stress corrosion cracking of carbon steels is known to occur in environments of concentrated nitrates or hydroxides (Metals Handbook, Volume 13, Corrosion). NUREG-0691 reports the primary cause of cracking to be thermal fatigue, in part because chemistry was found to be within acceptable limits. Thus, if the cracking experienced by San Onofre was indeed SCC and not the combined effects of fatigue and corrosion, then this would be a unique circumstance involving either a deviation in chemistry or a carbon steel material that was particularly susceptible to this mechanism. This does not apply to Calvert Cliffs. The issue was revisited again in NRC Information Notice 93-20, "Thermal Fatigue Cracking of Feedwater Piping to Steam Generators." This document reaffirms that the "main cause of crack growth appears to be fatigue induced by stresses from thermal stratification during cold, low-flow, feedwater injections."

Baltimore Gas and Electric Company considers SCC a potential age-related degradation mechanism for the FWS, but as discussed in BGE's previous responses to questions on this matter and the information presented above, it is not a plausible age-related degradation mechanism. (See response to NRC Question No. 2 in Reference 2 and responses to NRC Question Nos. 108, 111, and 113 in Reference 3.)

NRC Question No. 5.9.5

Clarify how the high level trip safety function is addressed in your application by identifying the components that have an intended function that supports a high level trip and identify where the aging management review is documented in the LRA.

BGE Response

Steam generator high level trips are not safety functions (i.e., they are not required to mitigate design basis events). Thus, there are no intended functions associated with a high level trip, and it is not addressed in the application. Section 5.9.1.1 (page 5.9-3) of the LRA contains a list of FWS intended functions; Section 5.9.1.2 (page 5.9-4) contains a cross-reference for FWS device types that are addressed as commodities in other sections of the LRA; and Section 5.9.1.3 (page 5.9-5) contains a list of FWS device types requiring aging management review that are addressed in Section 5.9.

NRC Question No. 5.9.18

Describe the features of the wet and dry lay-up process that ensures that the resulting conditions do not result in aging concerns. Consider in your response that secondary chemistry controls are not in place during wet and dry lay up and the potential effects on aging management.

BGE Response

The standard lay-up practices used at Calvert Cliffs are not credited with managing the effects of aging. Page 5.9-8 of the application acknowledges that oxygen levels and water chemistry during plant outages may be outside of what is normally considered acceptable during operation. Corrosion may take place during lay-up; hence, corrosion mechanisms are plausible. For a discussion of credited aging management programs please refer to the Group 1 Aging Management Program(s) discussion on page 5.9-9 of the application.

NRC Question No. 5.9.19

The NRC staff recognizes that BGE acknowledged that corrosion is an applicable aging mechanism for carbon steel fasteners due to the exposure of these fasteners to the internal environment of borated systems. Discuss the potential for carbon steel fasteners being exposed to the internal environment of other plant systems such as the FWS. Based on the potential for exposure to the FWS internal environment, provide a bases for concluding that any applicable carbon steel and/or low alloy steel bolting within the scope of the FWS aging management review will not experience aging.

BGE Response

Fluid leakage from a system is not a normal condition to which bolting is assumed to be continually subjected. Calvert Cliffs' systems, in particular high energy systems such as the FWS, are maintained leak tight. Any leaks that develop are repaired as soon as practical and are not permitted to remain for extended periods without justification. Any minor leakage that might occur does not pose a corrosion problem for the bolting. In the unlikely event that a leak develops that is large enough to maintain the bolting in a wetted condition, some limited corrosion may take place before the leak is discovered and repaired. Since the leak would not be permitted to exist unabated for long and because the FWS process fluid is chemistry-controlled water, the resultant corrosion would occur to such a small degree that the intended function of the bolting would remain unaffected. Thus, by the

definition provided in BGE LRA Section 2.0, corrosion is not a plausible aging mechanism for the FWS fasteners within the scope of license renewal.

This differs from the conclusions reached for systems containing boric acid. Industry experience indicates that significant corrosion problems may develop from even small leaks of borated water over short periods of time. Similar conclusions are also reached for the Saltwater System (LRA Section 5.16) since the process fluid is raw, brackish water from the Chesapeake Bay that is particularly corrosive to carbon and low alloy steels.

NRC Question No. 5.9.35

Discuss the significance of dropping below the minimum wall thickness criteria for the FWS with respect to the effectiveness of your aging management program. Provide a summary description of FWS-specific operating experience relating to occurrences of dropping below the minimum wall thickness criteria and a summary description of any corrective actions taken in response to these occurrences.

BGE Response

No occurrences of dropping below minimum wall thickness requirements have been identified in FWS components within the scope of license renewal since the inception of the CCNPP Erosion Corrosion Monitoring Program.

Pertinent operating experience of erosion corrosion degradation of FWS components and the associated corrective actions are described on LRA pages 5.9-20 and 5.9-21 of the BGE LRA. The description on page 5.9-21 (second paragraph) states that a replacement of check valves in 1988 was due to valve wall thickness being less than minimum wall requirements. In actuality, these two Unit 2 steam generator check valves (2CKVFW-130 and 133) were replaced because they were discovered to have material washout below the valve seats. These valves are within the scope of license renewal. Subsequent to that event, three other system check valves (main feedwater pump discharge check valves), which are not within the scope of license renewal, were replaced due to minimum wall concerns.

References

1. Letter from Mr. C. I. Grimes (NRC) to Mr. D. J. Waters (NEI), dated January 29, 1998, "Generic Safety Issues Related to License Renewal," Enclosure 2, "Safety Issues Requiring Review for License Renewal"

2. Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated July 30, 1998, Responses to Requests for Additional Information for the Review of the Calvert Cliffs Nuclear Power Plant, Units 1 & 2, Integrated Plant Assessment Reports for the Feedwater System and Diesel Fuel Oil System

3. 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

ATTACHMENT (2)

ERRATA TO SECTION 5.9, FEEDWATER SYSTEM;

LICENSE RENEWAL APPLICATION

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

ATTACHMENT (2)

ERRATA TO SECTION 5.9; FEEDWATER SYSTEM; LICENSE RENEWAL APPLICATION

The following changes apply to Section 5.9 of the BGE LRA:

- On page 5.9-4, in the second bullet from the bottom, the last line should read, in part, "Feedwater System" vice "Compressed Air System."
- On page 5.9-10, the fifth paragraph (second paragraph under "Discovery:," should be replaced by the following, which is very similar, but more clear:

  "All components will be included within a new plant program to accomplish the needed inspections. The hand valves, check valves, MOVs, temperature elements, and piping will be included in the new plant program to accomplish the needed inspections of general corrosion, crevice corrosion, and pitting. This program is considered an Age-Related Degradation Inspection(ARDI) Program as defined in the CCNPP IPA Methodology presented in Section 2.0 of the BGE LRA."
- On page 5.9-24, in Table 5.9-3, in the line item for "ARDI Program," "Group 3" should read "Group 1," and the last line should read "temperature element thermowells (part of Group 3)."