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BGE

November 19, 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 Reports for Structures and Electrical Commodities, and Errata

REFERENCES:

(a) Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated April 8, 1998, "Application for License Renewal"

(b) Letter from Mr. D. L. Solorio (NRC) to Mr. C. H. Cruse (BGE), September 7, 1998, "Request for Additional Information for the Review of the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 & 2, Integrated Plant Assessment Sections 3.3A. 3.3B, 3.3C, 3.3D, 3.3E, and 6.2"

(c) 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 the Baltimore Gas and Electric Company (BGE) License Renewal Application (LRA). Reference (b) forwarded questions from NRC staff on six sections of the BGE LRA. Those six sections were the five sections addressing the various site structures, and the section addressing electrical commodities. Reference (c) forwarded a numbering system for tracking BGE's response to all of the BGE LRA 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 Sections 3.3A, Primary Containment Structures, and 3.3D, Miscellaneous Tank and Valve Enclosures, of the BGE LRA.

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

Very truly yours,

Charles H. Cruse

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.

Charles H. Cruse

Subscribed and sworn before me, a Notary Public in and for the State of Maryland and County of Calvert, this 19 day of November, 1998.

WITNESS my Hand and Notarial Seal: Michelle D. Hall
Notary Public

My Commission Expires: February 1, 2002
Date

CHC/KRE/dlm

Attachments: (1) Response to Request for Additional Information; Integrated Plant Assessment Reports for the Structures and Electrical Commodities

(2) Errata to Sections 3.3A, Primary Containment Structures, and 3.3D, Miscellaneous Tank and Valve Enclosures; License Renewal Application

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ATTACHMENT (1)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION;

INTEGRATED PLANT ASSESSMENT REPORT FOR THE

STRUCTURES AND ELECTRICAL COMMODITIES

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
November 19, 1998

NRC Question No. 3.3.1

To facilitate the staff's review *[of Baltimore Gas and Electric Company's (BGE's) License Renewal Application (LRA)]*, BGE should provide a summary (in a tabular form) indicating which program (or programs) will cover safety-related (SR) tanks (including the field erected vertical tanks) and heat exchangers, and how these programs will be implemented.

BGE Response

The aging management reviews (AMRs) of tanks (including the field erected vertical tanks) and heat exchangers were typically performed in conjunction with each of their respective systems. Identification of which programs are credited for these components and a discussion of how they will be implemented is provided in the appropriate group discussions for each of those systems. Please refer to the sections of the BGE LRA listed in the following table for the information requested. Note that this list does not include components that comprise the device type accumulator, which are generally accumulators containing compressed air; however, they may also contain nitrogen or hydraulic fluid.

Device Type	BGE LRA Section	Group ID #
Tank	5.1	3 & 9
	5.2	2
	5.3	1 & 3
	5.5	2
	5.7	3 & 4
	5.8	1 & 4
	5.10	Systems 008, 013, 023, & 037
	5.12	1
	5.15	1, 2, 5, & 6
	5.17	1 & 3
Heat Exchanger	4.1	1, 2, 3, 4, 5, 6, & 7
	5.2	1, 2, & 4
	5.6	1 & 2
	5.10	System 029
	5.11A	1
	5.11B	2, 4, & 5
	5.11C	1
	5.12	1, 2, & 3
	5.13	1 & 2
	5.15	1 & 2
	5.16	4 & 5
	5.18	1

NRC Question No. 3.3.2

For concrete components of Category I structures, the significant age-related degradation mechanisms (ARDMs) are the following: settlement, freeze-thaw, leaching of calcium hydroxide, aggressive chemical attack, aggregate reaction, flowing water, and corrosion of embedded steel/rebar. The application addresses settlement as the applicable aging effect for concrete components of Category I structures only. Provide a brief summary (including basis and past operating experience, if any) to which these aging effects were either determined to be non-plausible or were not addressed, for the components described in Sections 3.3A, 3.3B, 3.3C, and 3.3D.

BGE Response

Baltimore Gas and Electric Company LRA Tables 3.3.A-3, 3.3B-3, 3.3C-3, and 3.3D-3 identify potential and plausible ARDMs for the Primary Containment Structure, Turbine Building Structure, Intake Structure, and Miscellaneous Tank and Valve Enclosures, respectively. A brief summary of the determination of the potential for and plausibility of ARDMs specified in the question is provided below. Detailed information concerning these determinations is available onsite. The summary descriptions are applicable to concrete components in the Auxiliary Building and Safety-Related Diesel Generator Building Structures as well (Section 3.3E of the LRA). Please note that the structure walkdowns noted in the discussions were completed for all subject structures with the exception of the Auxiliary Feedwater Valve Enclosure. The results of the walkdown inspections are expected to apply equally to that structure.

Freeze-thaw- Freeze-thaw is considered a potential ARDM for concrete structural components that are exposed to outdoor cold weather because the Calvert Cliffs Nuclear Power Plant (CCNPP) site is located in the geographic region subject to severe weather conditions according to American Society for Testing and Materials (ASTM)-C33, "Standard Specification for Concrete Aggregates." Freeze-thaw is not considered potential for concrete structural components below the frost line (depth of 20-22 inches) or for components located indoors.

The concrete components potentially subject to freeze-thaw were designed and constructed in accordance with American Concrete Institute (ACI)-318, "Building Code Requirements for Reinforced Concrete," and its relevant ACI standards and ASTM specifications, which provide the physical property requirements of aggregate and air entraining admixtures, chemical and physical requirements of air entraining cements, and proportioning of concrete containing entrained air to maximize the concrete resistance to freeze-thaw action. Walkdown inspections of the subject structures documented no evidence of damage from freeze-thaw, with the possible exception of the containment dome. This area has some exposed aggregate that may be due to freeze-thaw. However, even if the concrete was left unmanaged, it is not expected to result in any loss of function. The dome will be re-evaluated as part of the baseline inspection for ASME Section XI, Subsection IWL. Furthermore, NUREG-1557, "Summary of Technical Information and Agreements from Nuclear Management and Resources Council Industry Reports Addressing License Renewal," Table B9, states that freeze-thaw is a non-significant ARDM for structures that meet the basis requirements. The CCNPP structures meet the basis requirements. Therefore, freeze-thaw is not a plausible ARDM for concrete components exposed to outdoor cold weather.

Leaching of calcium hydroxide- Leaching of calcium hydroxide is considered a potential ARDM for concrete structural components that are subject to flowing liquid, ponding, or hydraulic pressure because water that contains small amounts of calcium ions (i.e., rain water or melting snow) can readily dissolve calcium compounds in concrete when it passes through cracks, inadequately prepared construction joints, or areas inadequately consolidated during construction. Leaching of calcium hydroxide is not considered potential for concrete structural components that are located indoors.

The concrete components potentially subject to leaching of calcium hydroxide were designed in accordance with ACI-318, and its relevant ACI standards, and ASTM specifications for low permeability and high compressive strength, which provide the best protection against leaching. Walkdown inspections of the subject structures documented only minor traces of leaching at some location on these structures. Based on the specific concrete characteristics, the CCNPP architect engineer and an independent contractor (also an architect engineer at other nuclear facilities) concluded that leaching of calcium hydroxide is not a plausible ARDM for Seismic Category I structures at CCNPP. Please also refer to the response to NRC Question 127 in Reference (1).

Aggressive chemical attack on concrete and corrosion of embedded steel/rebar- The two ARDMs 'aggressive chemical attack on concrete' and 'corrosion of embedded steel/rebar' are discussed together because of the similarities in the AMRs. Both ARDMs are considered potential for concrete structural components that may contain an aggressive environment, which might attack the concrete or embedded steel/rebar, under the following three environments:

- The fluid-retaining walls and slabs of the Intake Structure, which are constantly exposed to a saltwater environment that is considered aggressive;
- The concrete structural components exposed to groundwater, because the groundwater could potentially contain chlorides and/or sulfates that approach or exceed the threshold limits; and
- The concrete surrounding the spent fuel pool, which could be exposed to concentrated deposits of boric acid residue resulting from collection and/or evaporation of leakage in the leak chases. The fluid-retaining walls and slabs behind the liner incorporate a series of monitoring trenches and leak channels to allow detection of any leakage of the borated water in the spent fuel pool that may occur.

Aggressive chemical attack on concrete and corrosion of embedded steel/rebar are not considered potential ARDMs for other concrete structural components at CCNPP because of the lack of an aggressive environment. There is a substantial inventory of borated water inside the Containment Structure and the Auxiliary Building, which is considered an aggressive chemical. However, the borated water is primarily in SR systems, so undetected leakage for an extended period of time would not occur. There is no other significant inventory of aggressive chemicals inside the CCNPP structures.

There is no heavy industry near the CCNPP site that could release aggressive chemicals to the atmosphere. Due to the proximity to the Chesapeake Bay, the above-grade portion of the exterior walls of some structures may be exposed to an environment containing chloride ions. However, the natural environment created by the Bay is not sufficient to promote aggressive conditions on the exterior surface of the above-grade portions of the structures.

NUREG-1557, Table B9, states that these ARDMs are non-significant for above-grade portions of structures that meet the basis requirements. Those concrete structural components at CCNPP for which BGE determined these ARDMs are not potential meet the basis requirements. Furthermore, walkdown inspections of the subject structures documented the lack of cracking, staining, or spalling that would be indicative of these ARDMs.

Aggressive chemical attack on concrete and corrosion of embedded steel/rebar are considered plausible for the fluid-retaining walls and slabs of the Intake Structure because they are exposed to saltwater that may contain chemicals that might attack the concrete and steel. A discussion of the aging management programs for these components is discussed in Group 2 of Section 3.3C of the LRA.

Aggressive chemical attack on concrete and corrosion of embedded steel/rebar are considered not plausible for the walls and foundations of structures exposed to groundwater because groundwater chemistry was not considered aggressive during plant construction, and there is no conclusive evidence that confirms that the groundwater chemistry has become aggressive since then. During construction, analysis of groundwater at the CCNPP site indicated neutral pH with concentrations of aggressive chemical species well below the levels that can lead to these ARDMs. Furthermore, the concrete used at CCNPP was designed to the relevant ACI codes and ASTM specifications for a concrete structure of low permeability. Sufficient concrete cover and reinforcement distribution (to minimize crack development) were also specified in accordance with ACI-318 Code. These attributes provide good protection against chemical attack and corrosion of embedded steel/rebar. Therefore, aggressive chemical attack on concrete and corrosion of embedded steel/rebar are not plausible ARDMs for the walls and foundations of structures exposed to groundwater.

Aggressive chemical attack on concrete and corrosion of embedded steel/rebar are considered not plausible for the fluid retaining walls and slabs behind the spent fuel pool liner because of the quality of the concrete used for construction and the chemical composition of the refueling pool water. As discussed above, the concrete used at CCNPP was designed to assure low permeability and minimize the likelihood of concrete cracking that would allow water penetration. These attributes provide good protection against these ARDMs. Additionally, analysis has demonstrated that the effects of boric acid leakage at the concentration present in the spent fuel pool are negligible for concrete or embedded steel/rebar.

Aggregate reaction- Aggregate reaction is not considered to be a potential ARDM for concrete structural components because the reactivity of aggregates used in CCNPP concrete structures was adequately considered in the original design. The CCNPP concrete design specification specifies that no aggregate shall be used in concrete until tested for acceptability and verification of the mix by Bechtel. Acceptability of aggregate and source for potential reactivity (chemical) was based on ASTM-C-289. The concrete was also subject to petrographic analysis in accordance with ASTM Designation C-295, "Petrographic Examination of Aggregates for Concrete," which showed that the aggregate was non-reactive. Furthermore, the aggregates used at CCNPP came from sites in Charles County, Maryland, which is not in the geographic regions known to yield aggregates suspected of or known to cause aggregate reaction.

Walkdown inspections of the subject structures documented no evidence of map cracking, which is an indicator or aggregate reaction. NUREG-1557, Table B9, states that reactions with aggregates is a non-significant ARDM for structures that meet the basis requirements. The CCNPP structures meet the basis requirements.

Flowing water- Baltimore Gas and Electric Company considers the effects of flowing water in two ARDMs; leaching of calcium hydroxide and abrasion and cavitation. Leaching of calcium hydroxide is discussed above. Abrasion and cavitation is not considered to be a potential ARDM for concrete structural components, with the exception of the Intake Structure, because no other CCNPP concrete structure is exposed to continuously flowing water. NUREG-1557 states that this is a non-significant ARDM for Class I structures other than the Intake Structure. Abrasion and cavitation is considered to be a potential ARDM for the fluid-retaining walls and slabs inside the Intake Structure because the concrete surfaces are exposed to flowing water. The flow velocity at the intake of a single circulating water pump was calculated to be approximately 12 feet per second. This velocity is well below the threshold where abrasion and cavitation would become a concern. The components subject to this degradation mechanism have been periodically cleaned and inspected as part of the preventive maintenance program. No significant age-related degradation of the concrete has been identified to date.

NRC Question No. 3.3.3

Have the results of prior inspections (1994 and earlier) indicated any particular trend in the incidence of coating degradation or corrosion of steel?

BGE Response

Baltimore Gas and Electric Company is unaware of any trends associated with the incidence of coating degradation or the corrosion of steel.

NRC Question No. 3.3.4

One of the generic structural functions considered under the component level scoping process is to "Provide flood protection barrier (internal flooding events)." Is protection from external flood events an intended function? If so, clearly identify the structures associated with implementing the intended function and describe the corresponding aging management programs.

BGE Response

Protection from external flood events is an intended function only for the Intake Structure. It is a "subfunction" of "provide shelter/protection to SR equipment" as discussed in the response to Question 172 of Reference (1). Other structures within the scope of license renewal are at 45', well above the flood elevation 16.2'.

The Intake Structure houses the saltwater pumps, which we need for normal operations and for safe shutdown. As described in Calvert Cliffs Updated Final Safety Analysis Report (UFSAR) Section 5.6.2.2, the roof elevation is 28.5 feet. This assures that wave runup on top of the hurricane surge will not overtop the structure. The adverse slope at the top of the wall turns waves back, so there will be no water from waves on top of the roof. Updated Final Safety Analysis Report Sections 2.8.3.5 and 2.8.3.6 discuss the model tests that demonstrated "that there will be no overtopping of the intake structure."

The front and side walls protect the saltwater pump motors from flooding. The only penetrations are some small piping sleeves and conduits, and the watertight door at the north end. Two expansion joints divide the structure into thirds. Waterstops limit the water leakage through the joints.

Beams high in the intake structure support the saltwater pump motors, above the hurricane surge elevation. Long shafts connect the motors to the saltwater pumps, which are at elevation (-)7'-10". Since the motors are well above water level, small leaks in the wall would not threaten the safety of the motors.

The structural components associated with implementing this intended function are listed in Table 3.3C-2. The plausible ARDMs and associated component types are in Table 3.3C-3. The credited inspection program for the structural components subject to these ARDMs is Calvert Cliffs Administrative Procedure MN-1-319, "Structure and System Walkdowns."

NRC Question No. 3.3.5

A heavy waterproofing membrane is provided at exterior walls and base slab. Rubber water stops are also provided at all construction joints up to grade elevation. Explain whether the waterproofing membrane and rubber water stops are relied upon to protect the concrete foundations. If not, provide the basis for excluding them from the scope of license renewal.

BGE Response

The heavy waterproofing membrane and rubber waterstops exist but are not relied upon to protect the concrete in exterior walls and base slabs. The rubber waterstops in expansion joints limit leakage into the Intake Structure from external floods, as mentioned in the response to NRC Question No. 3.3.4.

NRC Question No. 3.3.6

Subsurface drains are typically relied upon to lower the elevation of groundwater around the plant. Describe whether or to what extent the drainage system was considered to be within the scope of license renewal and if not, justify why. Summarize the operating experience of the drainage system and groundwater levels. Describe the consequence of elevated groundwater levels on the aging degradation of the various structures. Also, provide a discussion of how failure of the drain system would impact the aging effects (such as settlements) that is considered not plausible.

BGE Response

The passive permanent pipe drain system is not within the scope of license renewal because it does not meet any of the scoping criteria. The fact that it exists, and maintains a lowered and stable groundwater elevation around the plant, is considered in determining the plausibility of settlement. The original groundwater surface was in the 15' to 20' range (UFSAR Section 2.7.3.2) and the permanent pipe drain system is designed to maintain the level below 10'.

Recent measurements indicate groundwater levels are at approximately 10'. There are two outlets for the subsurface drainage, so drainage can occur even though drainage from one exit is partially blocked. See the response to NRC Question No. 3.3.48 for additional information.

In the unlikely event that the subsurface drainage failed completely, the groundwater levels could gradually approach the pre-construction levels. This would increase the exposure to groundwater - moving it higher on the structures, but this is not expected to create problems.

Settlement of structures has not been an issue for Calvert Cliffs and we have not identified any symptoms warranting monitoring. Settlement will be little affected by the small changes in groundwater level postulated above. The soil bearing values are extremely high - on the order of 80,000 psf ultimate bearing capacity with allowable bearing capacity in excess of 15,000 psf - and post-construction settlement was predicted to be 1/2" or less (see UFSAR Section 2.7.6.2).

According to the Electric Power Research Institute TR-103842, "Class I Structures License Renewal Industry Report, Revision 1," settlement occurs during construction, if at all. "Following completion of construction, settlement rates decline, and long-term settlement is generally small. Possible exceptions would include sites with *soft soil* and/or *significant* changes in underground water conditions. Such site conditions *could* warrant *continuing* settlement monitoring . . ." (emphasis added.) Since none of these conditions exist or are postulated, settlement is not considered to be a plausible ARDM. Further discussion of the basis for determining that settlement is not plausible is presented in BGE LRA Sections 3.3A, "Primary Containment Structure;" 3.3B, "Turbine Building Structure;" 3.3C, "Intake Structure;" 3.3D, Miscellaneous Tank and Valve Enclosures;" and 3.3E, "Auxiliary Building and Safety-Related Diesel Generator Building Structures."

In NUREG-1557, Table B9 indicates settlement monitoring only for sites with soft soil and/or significant changes in groundwater conditions. Therefore, no settlement monitoring program is required.

NRC Question No. 3.3.7

As stated in the application, the need for a new aging management program for caulking and sealants which do not function as fire barriers was identified. Provide a description, in summary form, of this new program including the schedule for implementation, experience of failures of caulking and/or sealants, if any, that resulted in aging degradation of concrete and/or steel components, and corrective actions.

BGE Response

Program Description and Schedule: It should be noted that the new caulking and sealant inspection program is intended to provide a more systematic and function-based approach for monitoring the condition of these components than currently exists. The approach currently planned includes the following elements:

1. Periodic visual inspection of caulking and sealants for the applicable penetration seals according to function-based guidance provided by Design Engineering; and
2. Inspection results will be documented and will influence the timing and periodicity of subsequent inspections.

Development of the caulking and sealant inspection program is controlled under BGE's program for managing NRC commitments. The current BGE schedule, based on current priorities and workloads and, therefore, subject to change, is as follows:

• Complete scoping	July 31, 1999
• Establish inspection requirements	December 31, 1999
• Develop inspection procedures and perform trial inspections	December 31, 2000
• Migrate inspections into site scheduling process	December 31, 2001

Experience with failures of caulking and sealants: Baltimore Gas and Electric Company has experienced inleakage of water into various buildings, some of which has been attributed to degraded caulking and/or sealants. Some of these involved rain water or groundwater inleakage that resulted in aging degradation of concrete and/or steel components. Various site buildings have been affected, including the North Service Building, Turbine Building, Intake Structure, and Auxiliary Building. Affected components have included electrical panels, lighting fixtures and conduit, and structural steel beams. Degradation was corrected in accordance with the site Corrective Actions Program and included restoration of sealant to minimize or eliminate leakage, restoration or replacement of affected components, and restoration of protective coatings where applicable. In a few cases, excavation of concrete was conducted to provide or improve access to affected portions of structural steel beams.

NRC Question No. 3.3.8

The modified aging management program of Structure and System Walkdowns was credited (or will be credited) as an aging management program for seismic Category I structures. It is the staff's understanding that there are many SR reinforced concrete walls (e.g., Auxiliary Building walls, Intake Structure walls, etc.) in CCNPP. Provide the basis for why these SR reinforced concrete walls are not covered in the structure walkdown (refer to Attachment 4 to MN-1-319; Concrete Structures Other Than Containment [concrete slabs, beams, columns, base plates, and foundations]).

BGE Response

Although there are no plausible aging mechanisms for concrete walls covered by Attachment (4) of MN-1-319, there is an oversight in the procedure. Walls should have been covered. A request to modify the procedure is being processed.

NRC Question No. 3.3.9

Provide the details of specific national codes and standards (e.g., ACI *[American Concrete Institute]*, AISC *[American Institute of Steel Construction, Inc.]*, etc.) including their editions that will be used to determine repairs and acceptance criteria. If there are changes with respect to specific national codes and standards previously committed to as part of the initial licensing basis, describe plans for incorporating these changes in the CCNPP UFSAR.

BGE Response

Baltimore Gas and Electric Company has requested clarification from NRC on this item and has agreed to work toward clarification through forthcoming interaction, most likely in the form of a public meeting. Baltimore Gas and Electric Company may supplement this response, based on the outcome of that interaction.

NRC Question No. 3.3.10

Section 3.3C.2 states that a structure performance assessment is currently required for Category I structures at CCNPP at least once every six years. Regulatory Guide 1.127 recommends a frequency of five years for the inspection and evaluation of the steel components of the Intake Structure. Describe the basis for the frequency of the structural performance assessments at CCNPP and describe the attributes of the aging management program as it relates to Regulatory Guide 1.127 for steel components.

BGE Response

Structure walkdowns are performed under MN-1-319 every refueling outage and scheduled to ensure that every structure at CCNPP will receive a walkdown at a minimum every third refueling outage. The refueling outage interval for CCNPP is two years. Hence, a structure performance assessment will be performed on each structure once every six years (minimum).

Although, American Society of Mechanical Engineers (ASME) Section XI, Article IWL-2000, is applicable to concrete containment structures, it is referenced here to establish credible justification for the CCNPP six-year inspection frequency. Per ASME Section XI, IWL-2410, "Concrete shall be examined in accordance with IWL-2510 at 1, 3, and 5 years following the completion of the containment Structural Integrity Test CC-6000 and every 5 years thereafter." Additionally, "If plant operating conditions are such that examination of portions of the concrete cannot be completed within this stated time interval, examination of those portions may be deferred until the next regularly scheduled plant outage." Additionally, "The 10 year and subsequent examinations shall commence not more than 1 year prior to the specified dates and shall be completed not more than 1 year after such dates." Based on ASME Section XI, Article IWL-2000, it is allowable to perform inspections around plant outages at a six-year inspection frequency.

Calvert Cliffs is not committed to Regulatory Guide 1.127, "Inspection of Water-Control Structures Associated With Nuclear Power Plants."

NRC Question No. 3.3.11

Describe the past performance experience of the permanent pipe drain system for the primary containment structure foundation. Please provide the basis for concluding that most of the predicted settlement is in terms of uniform settlement, for any previously experienced cracking of the concrete basemat, degradation, deformation or excessive straining of the containment dome, wall and basemat.

BGE Response

The passive permanent pipe drain system (subsurface drainage) is outside the perimeter of the main plant structures and is intended to maintain a lower groundwater level throughout the plant area, not just in the vicinity of the Containment Structures. See the responses to NRC Question Nos. 3.3.6 and 3.3.48.

The uniform settlement prediction is an interpretation of the material in UFSAR Sections 2.7.3.2, 2.7.5.1, and 2.7.6.2.

NRC Question No. 3.3.12

Provide a summary description of the Time-Limited Aging Analysis (TLAA) that will be performed for the three types of containment prestressing tendons and explain the basic assumptions and limitations that will be used in the evaluation.

BGE Response

In their simplest form, the expected value curves plot as straight lines on semi-log paper like most time-dependent decay curves. Upper and lower bounds are usually drawn parallel. Superimposed may be some lower limits to reflect design requirements with some margin. This TLAA is discussed in BGE LRA Section 2.1.3.6.

NRC Question No. 3.3.13

Are the transfer tube/bellows and containment sump recirculation penetrations accessible for periodic inspections? If not, discuss the rationale for concluding that the functionality and integrity of these items are assured and maintained during the license renewal period.

BGE Response

The fuel transfer tube and the containment sump recirculation penetrations are constructed from stainless steel, and no ARDMs were determined to be plausible for these components. Therefore, no inspections are credited for aging management of these components. The transfer tube/bellows and containment sump recirculation penetrations are not readily accessible for periodic inspection, but an inspection is possible. A visual examination of the fuel transfer tube from the refueling canal was performed in April 1995. This inspection verified that there were no indications of damage or corrosion.

NRC Question No. 3.3.14

Provide a discussion of how the following degradation mechanisms were determined to be non-plausible for the CCNPP primary containment structure: (a) scaling, cracking and spalling of concrete dome, wall and basemat, and loss of bond and material of embedded steel and reinforcement; (b) cracking, distortion, component stress level increase, and loss of strength and modulus due to elevated temperature of the concrete basemat; and (c) corrosion and loss of prestress of hoop and dome tendons.

BGE Response

a. Scaling, cracking and spalling of concrete, and loss of bond and material of embedded steel and reinforcement, are not classified as degradation mechanisms; instead, they are considered an aging effect of degradation mechanisms such as freeze-thaw or corrosion of embedded steel/rebar. This ARDM/aging effect classification is consistent with NUREG-1557. Additionally, BGE has determined freeze-thaw is not plausible because the concrete used meets the basis requirements contained in NUREG-1557 Table B-9. Baltimore Gas and Electric Company LRA Table 3.3A-3 indicates it is not plausible for Containment Structures.

b. American Society of Mechanical Engineers Code, Section III, Division 2, indicates that as long as concrete temperatures do not exceed 150°F, aging due to elevated temperature exposure is not significant. Localized hot spots are limited in area and do not exceed 200°F by design. American Concrete Institute 349 allows local area temperatures to reach 200°F before special provisions are required.

   The ambient bulk temperature inside the Containment during normal plant operation is limited to 120°F, and the concrete surface temperature for the design of the Containment Structure is limited to 150°F. Areas inside the primary shield wall may be subjected to sustained internal heat buildup. However, thermal insulation and an air-cooling system are provided at the inner surface of the reactor cavity wall to maintain the concrete temperature at or below 150°F.

   The concrete around the eight hot pipe penetrations (two main steam lines, two feedwater lines, two steam generator blowdown lines, one reactor coolant letdown line, and one reactor coolant sample line) is also subject to extended high temperature or local heatup. However, the concrete is protected by insulation and penetration coolers supplied from the Component Cooling System to restrict the maximum temperature in the concrete to 150°F.

   Therefore, elevated temperature is not a plausible aging mechanism for any structural components of the Containment.

c. Corrosion of tendons/prestress losses are considered plausible for the CCNPP Containment Structure and are discussed on page 3.A-5, and pages 3.3A-14 through 3.3A-18 of the LRA.

NRC Question No. 3.3.15

Since 1997, CCNPP Units 1 and 2 have experienced degradation in their containment prestressing systems. Provide a description of the aging effects associated with this degradation and aging management program(s) that will be relied on to manage these aging effects for the period of extended operation.

BGE Response

The discussion of this event is on page 3.3A-15 of the BGE LRA. As noted in this discussion, BGE provided NRC the evaluation of this event in Reference (2) (Reference 8 of LRA Section 3.3A). Also, as noted in this discussion, NRC indicated a need for a long-term plan (see Reference (3), which was Reference 9 of LRA Section 3.3A). Baltimore Gas and Electric Company's long-term plan was provided in Reference (4). The aging management program is described on pages 3.3A-16 through 3.3A-18 of the BGE LRA.

NRC Question No. 3.3.16

Provide a discussion of how STP-M-663-1 and STP-M-663-2, in conjunction with the proposed lift-off force TLAA, will ensure that the effects of tendon corrosion and loss of prestress force are adequately managed. Describe how items such as: (a) preventive actions will mitigate or prevent aging degradation; (b) aging effects will be detected before losing structure and component function; (c) measures incorporated in the procedure will effectively reflect past CCNPP operating experience with respect to tendon corrosion and loss of prestress and eliminate the root causes identified during post tendon degradation assessment; and (d) timely detection of aging effects and corrective action implementation are fully realized.

BGE Response

As noted in the response to Question 3.3.12, the TLAA is discussed in BGE LRA Section 2.1.3.6. The aging management program (Surveillance Test Procedures [STP-M-663-1 and STP-M-663-2, "Containment Tendon Surveillance,"]) will be altered to reflect full implementation of 10 CFR 50.55a on the use of ASME Section XI, Subsection IWL. This will change the inspections as described on page 3.3A-17. The aging management program is described on pages 3.3A-16 through 3.3A-18 of the BGE LRA as discussed in the response to Question 3.3.15.

NRC Question No. 3.3.17

Provide a discussion of how STP-M-663-1/2 surveillance procedures effectively manages the potential additional tendon force loss (8 to 14 %) due to elevated temperature resulting from abnormal sun exposure or proximity to hot penetrations (refer to NUREG-1611 *["Aging Management of Nuclear Power Plant Containments for License Renewal"]*, page 18, issue 14).

BGE Response

Baltimore Gas and Electric Company STPs have not addressed local elevated temperatures due to sun exposure and hot penetrations. We have seen indications of more tendon relaxation on the west side, but not a consistent pattern.

NRC Question No. 3.3.18

Referring to page 3.3A-15, fourth paragraph, it is stated that , ". . . Other intended function (structural or functional support to SR equipment, shelter/protection of SR equipment, and missile barrier) will not be affected because those functions will be provided by the containment wall itself." Clarify this conclusion with consideration that the design strength of the containment wall is dependent on the availability of the prestress level prescribed in the design analysis calculations and any reduction or deviation of the actual prestress level in a wall section from that of the designed prestress level will reduce both the strength and the margin of the wall, which may lead to loss of wall integrity and functionality.

BGE Response

The purpose of the discussion in the fourth paragraph was to focus the reader on the most likely effects that the subject aging mechanisms would have on the Containment Structures' intended functions if they were allowed to progress unmanaged for an extended period of time. During the initial scoping process, we considered the concrete containment wall (including reinforcing steel) and the post-tensioning system together when determining the intended functions because we recognized that they work together to maintain the strength of the Containment. During the AMR process, we looked more closely at the individual contributions of these components in supporting the intended functions. When considering the potential effects of corrosion of the tendons and prestress losses, it became apparent that the primary concern with degradation of the post-tensioning system is for the potential for eventually not being able to withstand the forces associated with a loss-of-coolant accident, which is the accident that sets the maximum pressure limit for the Containment Structure. Potential degradation of the concrete and reinforcing steel of the containment wall is the primary threat to maintaining the intended functions of providing structural or functional support to SR equipment, providing shelter/protection of SR equipment, and serving as a missile barrier.

NRC Question No. 3.3.19

Are there any parts of the primary containment structures 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: (1) Preventive actions that will mitigate or prevent aging degradation; (2) Parameters monitored or inspected relative to degradation of specific structure and component intended functions; (3) Detection of aging effects before loss of structure and component intended functions; (4) Monitoring, trending, inspection, testing frequency, and sample size to ensure timely detection of aging effects and corrective actions; (5) Acceptance criteria to ensure structure and component intended functions; and (6) Operating experience that provides objective evidence to demonstrate that the effects of aging will be adequately managed.

BGE Response

Some parts of the Containment Structures are inaccessible for inspection, and that has not been a licensing concern under the current licensing basis. Inspections of Containment Structures require the use of 1992 editions of ASME Section XI, Subsections IWE and IWL. Please note that these standards do not require looking at inaccessible areas, unless one is following conditions found in adjacent accessible areas. For instance, if we find a crack above grade, we are expected to dig out enough earth and remove waterproof membrane to find the end of the crack.

NRC Question No. 3.3.20

Referring to the plausibility of microbiologically-induced corrosion of fuel transfer tube, provide an explanation for concluding that the stress level of the CCNPP fuel transfer tube is lower than the threshold to cause the microbiologically-induced corrosion.

BGE Response

Baltimore Gas and Electric Company has determined that there is no threshold for stress to cause microbiologically-induced corrosion. Therefore, as indicated in Attachment (2), the words "insufficient tensile stresses," should be removed from the second paragraph under Group 2 - Aging Mechanism Effects on BGE LRA page 3.3A-19.

NRC Question No. 3.3.21

Provide the justification for the inspection frequencies in CCNPP procedures MN-3-100 *["Painting and Other Protective Coatings"]*, MN-1-319, STP-M-665-1/2 and STP-M-661-1/2, and discuss how they compare to related industry standards including that of the "Rules for Inservice Inspection, Section XI, ASME Boiler and Pressure Vessel Code," and justify any deviations.

BGE Response

The 1998 edition of Rules for Inservice Inspection, Section XI, ASME Boiler and Pressure Vessel Code is used as the basis for this response.

Document	CCNPP Inspection Frequency	ASME Section XI Inspection Frequency
MN-1-319	"Structure walkdowns should be performed every refueling outage and scheduled to ensure that every structure at CCNPP will receive a walkdown as a minimum every third refueling outage. Hence a structure performance assessment will be performed on each structure once every 6 years (minimum)."	Containment "Concrete shall be examined in accordance with IWL-2510 at 1, 3, and 5 years following the completion of the containment Structural Integrity Test CC-6000 and every 5 years thereafter." Additionally, "If plant operating conditions are such that examination of portions of the concrete cannot be completed within this stated time interval, examination of those portions may be deferred until the next regularly scheduled plant outage." Section XI does not address other structures.

MN-3-100	Plant personnel "shall perform a walkdown of containment at the start of each scheduled refueling or maintenance outage to verify the condition of all Service Level I coatings."	As stated above, IWL-2410 references IWL-2510. Under IWL-2510, coated concrete is addressed. Therefore, coated concrete has the same inspection frequency as non coated concrete (5 years). The containment liner plate receives a general visual approximately every 3 1/3 years and the accessible surface areas receive a VT-3 [a type of visual examination described in ASME XI, IWA-2212] once every 10 years.
STP-M-665-1/2	Every 36 +/- 14 months and prior to every Type A test.	Corresponds with the frequency for liner general visual examinations under IWE.
STP-M-661-1/2	Every refueling outage. "This procedure shall be performed towards the scheduled end of the refueling outage."	ASME section XI does not contain criteria regarding containment sump inspections.

Calvert Cliffs Procedures MN-3-100 and STP-M-661-1/2 are performed every refueling outage. It is not feasible to perform these inspections more frequently because of plant operations. The MN-1-319 frequency is addressed in detail by the response to Question 3.3.10. Procedure STP-M-665-1/2 is currently commited to an inspection frequency based upon integrated leak rate testing according to 10 CFR Part 50, Appendix J.

NRC Question No. 3.3.22

Explain and justify the modification of CCNPP Administrative Procedure MN-1-319 pertaining to the "authority to deviate from scope or schedule" described on page 3.3A-24 of the application.

BGE Response

This procedure requires structural performance assessments on each structure once every six years (or sooner.) Any extension beyond the six-year frequency requires approval by the General Supervisor - Plant Engineering. This assures that this determination is made at the appropriate management level.

NRC Question No. 3.3.23

Provide a summary discussion of the method and procedures used in the 1992 containment inspection including a list of deficiencies found. Describe how the experience from the inspection was incorporated into the proposed revision of the walkdown procedure MN-1-319, as applicable. In addition, clarify the basis upon which you concluded that the components in the containment system were in good to excellent condition.

BGE Response

The walkdown report is available onsite. The methodology employed was generally consistent with ASME Section XI ISI rule, although it was not a 100% inspection, but a general visual inspection of the interior and exterior surfaces. The experienced Bechtel engineers characterized conditions of all of the various components rated as good to excellent. Of the 73 areas rated by the Bechtel engineers, 31 were rated as "Good," 25 were rated as "Good to Very Good," 7 were rated as "Very Good to

Excellent," and 10 were rated as "Excellent." The report defines good as "appearance demonstrates an acceptable surface with no evidence of degradation sufficient to warrant further evaluation or repair." The report defined excellent as "appearance suggests essentially no degradation compared to the presumed as-built condition, and appears to be of the highest construction standards." In their report, the engineers also indicated some items with the potential for further evaluation. These items included grease cap gaskets/grease leakage and weathered surface for the containment exterior; and liner plate corrosion/expansion joint deterioration and refueling canal/containment interface for the containment interior. In addition to the above, the response to NRC Question No. 3.3.2 discusses the potential and plausible ARDMs and effects for these components.

Calvert Cliffs Administrative Procedure MN 1-319 will be modified per the description on pages 3.3A-23 and 3.3A-24. The 1992 containment inspection is not the impetus for this procedure enhancement.

NRC Question No. 3.3.24

Provide a justification for excluding from the AMR that part of the liner that is embedded horizontally inside the concrete basemat from the AMR, and discuss how the aging effects of this part of the liner will be managed to ensure its functionality for the extended period of operation. It appears that the embedded horizontal basemat liner, because of its relatively low elevation and horizontal orientation, tend to have a higher likelihood of water accumulation/retention on its surfaces, which in turn, might result in a higher potential for liner corrosion/degradation. Discuss how this specific concern as well as any other applicable aging effects are factored into your liner aging management program.

BGE Response

Baltimore Gas and Electric Company's AMR report included that part of the liner that is embedded horizontally inside the concrete basemat. It concluded that the "inside surface of the basemat liner is covered with an 18-inch-thick concrete slab, and the containment atmosphere is not corrosive. Therefore, corrosion of the inside surface of the basemat liner is not a plausible aging mechanism."

We also took into account the basemat thickness and concrete quality, and concluded that corrosion of the exterior surface of the liner is not plausible.

The most likely location for moisture ingress is the expansion joint between the top of the slab and the sloping section of wall liner plate. This is addressed on page 3.3A-26.

American Society of Mechanical Engineers Section XI, Subsection IWE, exempts inaccessible areas from examination.

NRC Question No. 3.3.25

Provide a justification for determining corrosion and degradation of the concrete shell-side liner surfaces and the anchor studs is not plausible. It is recognized that due to the presence of prestressing forces on the shell concrete, there will be a lesser degree of moisture penetration through the concrete to reach the liner surfaces and the anchor studs. However, it is not totally clear to the NRC staff that the concrete shell-side liner surface and anchor stud corrosion can be determined to be non-plausible. If available, please provide a description of the results actually observed from concrete side liner surface examination to support your non-plausibility conclusion.

BGE Response

Significant amounts of corrosion are not expected on the outside face of the liner plate because of defense in depth. The liner is covered with dense, high-quality concrete with ample reinforcing steel spaced to minimize cracking and potential moisture ingress. This concrete is prestressed, which further limits the cracking. The below-grade portion of the Containment is partially protected by the Auxiliary Building.

American Society of Mechanical Engineers Section XI, Subsection IWE, exempts inaccessible areas from examination.

NRC Question No. 3.3.26

How did BGE consider Generic Letter 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System After a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment," in the context of license renewal? Describe your plans for participating in any industry efforts in preparing the response to the generic letter as it relates to license renewal.

BGE Response

The BGE LRA was submitted to the NRC on April 8, 1998 and NRC Generic Letter 98-04 is dated July 14, 1998. Therefore, it was not possible for CCNPP to consider Generic Letter 98-04 in the context of the license renewal. However, CCNPP did consider degradation and aging management of containment coatings and the emergency sump cover and screen in Section 3.3A of the LRA. Additionally, CCNPP personnel are attending conferences, participating in conference calls, and maintaining contact with the industry effort preparing the response to Generic Letter 98-04.

NRC Question No. 3.3.27

Provide the basis for excluding the seismic Category II portions of the turbine building from consideration in addressing Intended Function No. 3.3.5. Was consideration given to the potential for adverse impacts on the SR structures, systems and components within the turbine building if aging-related degradation results in the turbine building, which is not a seismic Category I structure, being damaged or collapsing under a design basis event? Also, discuss how the venting functions will be maintained if the siding and retainer clips are not classified as SR (reference Section 3.3B.1, pages 3.3B5-6).

BGE Response

The scenario of a catastrophic failure of the Turbine Building due to a seismic event has been previously considered. It was discussed with the NRC when it was decided during plant construction that the Auxiliary Feedwater (AFW) Pump Room was to be located in the Turbine Building. It was also evaluated in 1990 during the design phase for installation of an automatic isolation of the SR portion of the Service Water System from the non-safety-related (NSR) portion in response to a postulated pipe rupture. Baltimore Gas and Electric Company has considered a catastrophic failure of the Turbine Building as being not credible. Based on our AMRs of plant structures, BGE considers a catastrophic failure to remain not credible through the period of extended operation.

In 1990, the interaction of the Turbine Building with Service Water System piping was investigated by BGE. We determined that during seismic events, braced steel framed power/industrial buildings, of a similar size to the CCNPP Turbine Building and having little or no seismic design by nuclear standards (i.e. seismic design per Uniform Building Code [UBC] requirements), performed well. We also noted the rugged steel construction of the Turbine Building and concluded, that based on the earthquake experience data, collapse of the Turbine Building from postulated seismic events would not be a credible issue.

Additionally, we found that the Turbine Building was designed for several loading conditions, including UBC seismic criteria with the 90 mph wind loading condition representing the controlling design case. As such, the Turbine Building was designed to resist lateral loads in excess of UBC seismic requirements. Lateral load resistance is provided by a steel-braced frame in the North-South direction and a combination of a steel-braced and moment-resisting frame in the East-West direction. This results in a ductile structure with inherent damping and energy absorbing capability. In addition, the complexity of the structure would result in several significant modes of vibration that would serve to reduce the magnitude of the building resonant frequencies. All these factors would tend to limit the building's response to seismic excitation and reinforce the position that the Turbine Building would maintain its integrity during a seismic event.

As stated on pages 3.3B-2 and 3.3B-3, the siding and retainer clips are considered SR. This classification assures that the necessary design criteria are specified and maintained. If postulated age-related degradation of the clips were allowed to continue unmitigated, the clips would actually release their respective walls at a lower differential pressure than that assumed in the analyses. Therefore, the degradation would not lead to a loss of venting function.

NRC Question No. 3.3.28

Regarding Structure Description/Conceptual Boundaries (page 3.3B-2), BGE states that "The circulating water intake and discharge conduits are incorporated into the spread footings."

a. Do these conduits perform any of the seven identified intended functions?

b. Are the conduits classified as SR? If not, describe their design standards.

c. Are conduits subject to any AMR? If so, where in the LRA are these conduits addressed? If not, justify why they were excluded.

d. Provide a summary description, including the important elements, of BGE's current and future program for managing aging effects on these conduits.

BGE Response

As described in the LRA and the UFSAR, the Turbine Building is a Class II structure. During the initial design and licensing of Calvert Cliffs, the decision was made to install the AFW Pump Rooms inside this building. These rooms are SR (Category I) areas, and are separated from the Turbine and Auxiliary Buildings by expansion joints. This was reviewed with the NRC during the initial licensing, but we have the unusual situation of Class I structures surrounded by a Class II structure.

The twelve circulating water intake pipes are on the east side of the condenser, so are far enough away that there is no interaction with the AFW Pump Rooms. The condenser discharge pipes transition into a discharge conduit, which has up to four chambers. The west side of the discharge conduit is almost under the east side of the AFW Pump Rooms, but 17 feet below.

a. The AFW Pump Rooms are separate structures with expansion joints all around them. Thus, the circulating water conduits do not perform any of the seven functions, even though some might argue that there is an indirect line of support through the western discharge conduit. The drawings for this area show concrete beams above the conduits, with square piers under building columns, and expansion joints around the piers.

   This means the AFW Pump Room floor slab is supported on backfill rather than directly on the discharge conduits. Therefore, we interpret that the conduits do not support the slab and do not perform an intended function.

b. The circulating water structures are not SR. They were designed and built to the same standards as other NSR structures.

c. They are not subject to AMR, since they do not perform any of the seven functions. Thus, they are not part of the LRA and do not have an ARDM program.

d. Please see above.

NRC Question No. 3.3.29

Address the following questions related to Table 3.3B-2 and Table 3.3B-3 regarding seismic Category I electrical duct banks:

a. Provide a summary description of how the seismic Category I conduits were encased in the ductbanks. Are a number of conduits individually encased in concrete or are a number of conduits collectively routed through void spaces under the turbine building?

b. What is the chain of events that may lead to water seepage into the conduits?

c. What are the consequences of water seepage into the conduits? How would this affect the power cables to the saltwater pumps?

d. Why is intended function No. 3.3.2 not affected by water seepage into the conduits? Explain this apparent inconsistency with Table 3.3B-2.

e. What is the basis for concluding that there are no plausible ARDMs for the ductbanks, relating to the possibility for flowing groundwater?

f. Provide a summary description, including the important elements (such as schedule for inspection, methods, criteria, etc.), of BGE's current and future aging management program for the ductbanks.

g. Address the effects of settlement on the ductbanks.

BGE Response

Regarding the Seismic Category I electrical duct banks under the Turbine Building:

a. We use the term "ductbank" to mean a group of individual conduits encased in weak (28-day strength of 2000 psi) concrete.

b. As is common in buried ductbanks, there is water seeping into the conduits.

c. Conduits are designed to drain. Cables in these conduits although wetted are not typically submerged. Water treeing is typically a concern for wetted high voltage cables. However, cables used in underground (buried or ductbank) service at Calvert Cliffs are jacketed for protection against moisture intrusion. Water treeing of these cables is also not plausible because the electrical stress level is below the screening threshold used by BGE. This threshold was chosen to agree with the threshold used by the Westinghouse Owner's Group in their aging management guidelines for cables. Therefore, the wetting of cables in these conduits does not result in any additional aging effects required to be addressed for license renewal.

d. The weak concrete encasement provides impact protection and cable separation. The cable jackets are the primary barrier for water.

e. Groundwater "flows" very slowly, so we do not anticipate erosion or leaching of calcium hydroxide, which are the ARDMs associated with flowing water.

f. Routine inspection of the duct banks is not practical, as they are buried beneath the ground floor slab of the Turbine and Service Buildings. Since no ARDMs are plausible, inspection is not required.

g. No significant settlement is expected. The basis for determining that settlement is not plausible is presented on pages 3.3B-9 and -10.

NRC Question No. 3.3.30

In the last paragraph of Section 3.3B.1, replacement of components is discussed. Provide a description of how this process will be applied, and provide examples of structural components and subcomponents which may be subject to replacement.

BGE Response

Please see the response to Question 2 in Reference (5).

NRC Question No. 3.3.31

Are there any parts of the turbine building structures 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: (1) Preventive actions that will mitigate or prevent aging degradation; (2) Parameters monitored or inspected relative to degradation of specific structure and component intended functions; (3) Detection of aging effects before loss of structure and component intended functions; (4) Monitoring, trending, inspection, testing frequency, and sample size to ensure timely detection of aging effects and corrective actions; (5) Acceptance criteria to ensure structure and component intended functions; and (6) Operating experience that provides objective evidence to demonstrate that the effects of aging will be adequately managed.

BGE Response

The outside surfaces of below-grade portions of walls and slabs are inaccessible. However, since we can see one side of the concrete (except the area under condensers and tanks,) we have reasonable assurance that we will detect degradation before serious damage occurs.

NRC Question No. 3.3.32

Explain how the actions taken to manage recurring degradation of the structural components (Groups 1, 2, 3, and 4) identified in Section 3.3C.2 during the baseline inspection and subsequent inspections will be integrated into the aging management programs developed for the license renewal term.

BGE Response

The effects of degradation of structural components identified during baseline and subsequent inspections is documented and corrected in accordance with the CCNPP Corrective Actions Program. A summary of the CCNPP Corrective Actions Program, as well as discussions on plant modifications and plant program modifications, is contained in Section 2.0, "Integrated Plant Assessment Methodology," Subsections 6.3.3.1, 6.3.3.2, 6.3.3.3, and 6.3.4 of the BGE LRA.

NRC Question No. 3.3.33

Figure 3.3C.1 shows the evaluation boundary for the intake structure excludes the intake channel and baffle structure. Are the intake channel and baffle structure within the scope of license renewal? If not, provide a justification for not including them? If so, where are they addressed in the LRA?

BGE Response

The intake channel and baffle structure are not within the scope of license renewal. The functional requirements of the intake channel and baffle structure do not meet any of the scoping criteria.

The intake channel is designed to draw a large volume of water from the bottom strata of the bay with minimal ecological impact.

The baffle wall is designed to ensure that essentially all plant intake water is drawn from the bottom of the bay.

NRC Question No. 3.3.34

Referring to Table 3.3C-2, identify any masonry walls within the scope of license renewal (SR or NSR whose failure could directly prevent satisfactory accomplishment of any of the required SR functions) in the intake structure? If any intake structure masonry walls within the scope of license renewal are identified, identify where they discussed in the LRA. Describe any masonry walls that were excluded from the scope of license renewal and the basis for their exclusion.

BGE Response

There are no masonry block walls in the Intake Structure.

NRC Question No. 3.3.35

Table 3.3C-3 identifies the sluice gate as a long lived/passive structure within the scope of license renewal, but does not identify mechanical wear as a plausible ARDM. Provide a justification for excluding mechanical wear as a plausible ARDM.

BGE Response

As stated on page 3.3C-21 of the LRA, the sluice gates are used to isolate the circulating water pump inlet bays from the saltwater pump suction pits for maintenance purposes. The two wire rope/chain assemblies are provided to hold the sluice gate open in case the stem or lift mechanism fails. The SR function of each gate is to remain in a fixed position above the tunnel so as to not inhibit flow to the saltwater system. The two wire rope/chain assemblies and associated fittings are credited for this function.

If the sluice gates are subjected to mechanical wear, this would have no effect on the wire rope/chain assemblies ability to perform their intended function.

NRC Question No. 3.3.36

Section 3.3C.2 states that the expansion joints that run along the intake structure floor have experienced age-related degradation in the past. The degradation allowed water seepage up through the joints that required repairs to affected joints. This is an indication that the intake structure concrete floors, walls, and joints may be exposed to groundwater. What are the potential consequences of this exposure to groundwater with respect to aging degradation of the concrete floors and walls and was that identified as a plausible ARDM for inclusion in the AMR. If not, provide a justification for this conclusion.

BGE Response

A list of potential and plausible ARDMs for Intake Structure components is given in Table 3.3C-3. This table indicates that there are no plausible ARDMs resulting from exposure to groundwater. This is due to the concrete's low permeability and non-aggressive groundwater chemistry. As shown in Table 3.3C-3, aggressive chemical attack and corrosion of embedded steel/rebar are plausible ARDMs for the Intake Structure's fluid-retaining walls and slabs that are exposed to intake water from the Chesapeake Bay. Please see the Group 2 discussion on pages 3.3C-13 through 3.3C-18 of the BGE LRA.

NRC Question No. 3.3.37

The salinity and sulfate content of the Chesapeake Bay surface water as found in 1968-69 is high enough to chemically attack the steel components and sluice gates. Describe the basis upon which you concluded that the concentrations of these attributes have not increased in the last 30 years, and describe how the proposed aging management program would address significant increases if they were to occur in the future.

BGE Response

There is no conclusive evidence that indicates that there have been significant changes in the chemical characteristics of the Chesapeake Bay. Additionally, the component types specifically mentioned, sluice gates, and steel components are both subject to aging management programs as indicated in Section 3.3C of the LRA.

Page 3.3C-22 of the LRA states that sluice gates are inspected each plant refueling outage. If significant changes in the chemical characteristics of the Chesapeake Bay water were to occur, and this occurrence were to generate and/or increase age-related degradation, then the inspection frequency could be altered to compensate for this change in environment. Steel components described in Group 3 are not directly affected by Bay water chemistry.

NRC Question No. 3.3.38

Are there any parts of the intake structure 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: (1) Preventive actions that will mitigate or prevent aging degradation; (2) Parameters monitored or inspected relative to degradation of specific structure and component intended functions; (3) Detection of aging effects before loss of structure and component intended functions; (4) Monitoring, trending, inspection, testing frequency, and sample size to ensure timely detection of aging effects and corrective actions; (5) Acceptance criteria to ensure structure and component intended functions; and (6) Operating experience that provides objective evidence to demonstrate that the effects of aging will be adequately managed.

BGE Response

The outside surfaces of below-grade portions of walls and slabs are inaccessible. However, since we can see one side of the concrete cast against the earth (although the floor is very thick), we have reasonable assurance that we will detect degradation before serious damage occurs.

Also, much of the structure is under water during normal operation, but that is regularly inspected during outages, as described in Table 3.3C-4.

NRC Question No. 3.3.39

A 1994 inspection of the No. 12 condensate storage tank and No. 21 fuel oil storage tank enclosures identified minor surface corrosion on steel beams. This surface corrosion was deemed insufficient to affect the structural integrity of the enclosures. Provide a justification for this conclusion, and discuss how the AMR assessed the structural integrity of the enclosures.

BGE Response

For the inspection of the No. 12 Condensate Storage Tank and No. 21 Fuel Oil Storage Tank enclosures, CCNPP retained the services of Gilbert Commonwealth. As stated on page 3.3D-10, the consultants only found minor surface corrosion. This observation and the resultant conclusion that the minor surface corrosion was not a structural integrity issue is based upon the magnitude and severity of the corrosion and the sound engineering judgment of the consultants.

NRC Question No. 3.3.40

Has the AFW valve enclosure been previously inspected for corrosion of steel components or degradation of protective coatings? If so, provide a summary of the results.

BGE Response

A visual inspection of the AFW valve enclosure has not been performed specifically for license renewal. However, the AFW valve enclosure has been inspected under Procedure MN-1-319. The MN-1-319 inspection discovered areas of rust as well as flaking and bubbling coatings on several hangers. The degradation was not considered a personnel/equipment safety concern, or an operability concern and an Issue Report was generated to clean and repaint the rusted areas. Results of walkdowns performed under MN-1-319 are available for review at the CCNPP site.

NRC Question No. 3.3.41

Provide a description of the amount of corrosion or degradation of protective coatings that will be allowed on tanks and valve enclosures before corrective action is implemented. If degradation is observed, what will be the acceptance criteria to determine that intended functions will be maintained with a sufficient margin?

BGE Response

Degraded protective coatings are a precursor of corrosion, but in itself has no effect on the intended functions of the subject enclosures. Corrosion occurs over a long period of time before it threatens the intended functions of structural steel components or tanks. Therefore, there is ample time to discover and evaluate degraded protective coatings and take corrective action.

Procedure MN-1-319 requires system engineers to look for degradation that could challenge a component's ability to perform its functions. These walkdowns and the subsequent assessments meet the intent of condition monitoring as identified in Nuclear Energy Institute's NUMARC 93-01, "Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," to comply with the Maintenance Rule.

Most assessments of structure degradation are based on previous walkdowns. The system engineers differentiate between static (nothing is changing) and dynamic degradation. Dynamic degradation causes the system engineer to write an Issue Report, which is part of the site Corrective Actions Program as described on in BGE LRA Section 2.0, page 2.0-57.

NRC Question No. 3.3.42

Are there any parts of the tank and valve enclosures 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: (1) Preventive actions that will mitigate or prevent aging degradation; (2) Parameters monitored or inspected relative to degradation of specific structure and component intended functions;

(3) Detection of aging effects before loss of structure and component intended functions; (4) Monitoring, trending, inspection, testing frequency, and sample size to ensure timely detection of aging effects and corrective actions; (5) Acceptance criteria to ensure structure and component intended functions; and (6) Operating experience that provides objective evidence to demonstrate that the effects of aging will be adequately managed.

BGE Response

The outside surfaces of below-grade portions of walls and slabs are inaccessible. However, there are no plausible ARDMs for the concrete surfaces as shown in Table 3.3D-3.

NRC Question No. 3.3.43

Section 3.3E appears to address the license renewal aspects of the SR emergency diesel generator (EDG) structures, but not the station blackout diesel generator (DG) structure. Figure 3.3E-1, identifying site structures within the scope of license renewal, also does not include the blackout DG structure (attached to the EDG 1A building) as being within the scope of license renewal. Since the blackout DG systems are within the scope of license renewal according to Section 5.8 of the technical report, identify where in your application the license renewal aspects of the blackout DG structures are discussed. If you have concluded that the blackout DG structures are not within the scope of license renewal, provide your rationale for that conclusion.

BGE Response

As noted in Section 3.3E.1 and Subsection 4.2.2 of Section 2.0, a building is in the scope of license renewal if it performs one or more of the seven listed functions. The station blackout building does not perform any of the listed functions and, therefore, was excluded from the scope of license renewal. Please note that the building housing the station blackout diesel is structurally separate from the Class 1 "1A" EDG building.

NRC Question No. 3.3.44

Figure 3.3E-1 shows a number of within the scope of license renewal structures such as the condensate storage tank enclosure, AFW valve enclosure, and the fuel oil storage tank enclosure, that are somewhat physically removed from the systems they support. There are no interconnecting structural tunnels/raceways for piping and cabling shown on this figure. Please identify and describe any interconnecting structures associated with these components and address the corresponding license renewal aspects of these structures, as necessary. Also, address any other interconnecting structures between major buildings/components that are not shown on this figure and describe where the license renewal aspects are addressed.

BGE Response

Calvert Cliffs does not have any structural tunnels within the scope of license renewal. Ductbanks (i.e., structural raceways) within the scope of license renewal are shown in Figure 3.3E-1 of the LRA. Buried piping within the scope of license renewal is described in Sections 5.1, "Auxiliary Feedwater;" 5.7, "Diesel Fuel Oil System;" 5.10, "Fire Protection;" and 5.16, "Saltwater System."

There is one small section of NSR piping tunnel north of the Turbine Building that runs to the AFW valve enclosure.

NRC Question No. 3.3.45

One of the structural functions identified for structures that are within the scope of license renewal is to provide flood protection barriers for an internal flooding event. Generally, portions of the equipment and floor drainage system (EFDS) may also be relied upon for adequate protection against internal (and sometimes external) flooding. Identify if any of the EFDS associated with the auxiliary building and EDG structures that are relied upon for protection against internal or external flooding. Also, identify where the license renewal aspects of the within the scope of license renewal portions of the EFDS are addressed. Otherwise, provide justification for your determination that no portions of the EFDS are within the scope of license renewal.

BGE Response

None of the equipment and floor drain system are relied upon for protection against flooding. The Engineering Standard for Flooding (ES-001) states: "No credit is taken for drains for mitigating flood heights. This is a conservative, simplifying assumption that maximizes the flood height in the room containing the leakage source and is not meant to imply that drains are not functional." Therefore, no drains are within the scope of license renewal because of postulated internal or external flooding.

Note that the Plant Drain System and Liquid Waste System are within the scope of license renewal for fire protection purposes. See LRA Section 5.10, "Fire Protection," and subsections 5.10.3.12 and 5.10.3.14.

NRC Question No. 3.3.46

With regard to the discussion on page 3.3E-3, please discuss: (a) the basis for not including the 1-story missile protection structure located on the east side of the SR Diesel Generator Building (SR-DGB) within the review scope of the SR-DGB, and (b) describe actions taken to support your conclusion that there has been no evidence of age-related degradation for the SR-DGB.

BGE Response

a. This one story structure is more accurately a wall and roof slab, that provide a barrier for the entrance area into the SR Diesel Generator Building. This wall and roof slab is considered part of the SR Diesel Generator Building and is within the scope of the AMR.

b. The SR Diesel Generator Building has been inspected under administrative procedure MN-1-319. The MN-1-319 walkdown inspection did not discover any age-related degradation.

NRC Question No. 3.3.47

Regarding the entry on Table 3.3E-3, first column, "Concrete (Including Reinforcing Steel)," and "Structural Steel," please provide a justification for determining the following mechanisms as not being plausible ARDMs: corrosion of embedded steel/rebar, cracking of concrete/masonry walls, settlement and corrosion of structural steel.

BGE Response

Corrosion of embedded steel/rebar - Corrosion of embedded steel/rebar is considered a potential ARDM for the external surfaces of the foundations and walls (below grade) of the Auxiliary Building due to exposure to groundwater. Since the foundation mat of the SR Diesel Generator Building is above the groundwater elevation, this ARDM is not considered potential for this building. The natural environment created by the Chesapeake Bay is not sufficient to promote aggressive conditions, so corrosion of embedded steel/rebar is not potential for the above grade portion of the Auxiliary and SR Diesel Generator Buildings. Corrosion of embedded steel/rebar is also potential for the internal surfaces of fluid retaining walls and slabs (behind spent fuel pool [SFP] liner only) because it is potentially exposed to borated water from leaks in the SFP liner. No other internal surfaces are potentially regularly exposed to a corrosive environment.

The quality of concrete and continuity of concrete cover over the embedded steel/rebar play important roles in preventing corrosion. If not exposed to an aggressive environment (low pH or high chlorides with oxygen available), the age-related degradation due to corrosion of embedded steel/rebar will be insignificant.

The fluid-retaining walls and slabs supporting the SFP liner, as well as the foundations and below-grade walls of the Auxiliary Building, were constructed with concrete conforming to ACI Codes and American Society for Testing and Materials specifications ensuring low permeability. Additionally, the Auxiliary Building was designed in accordance with ACI 318, which specifies a reinforcement distribution that minimizes crack development; thus, the concrete cover over embedded steel components will effectively prohibit exposure of embedded steel components to potentially corrosive environments.

During construction, analyses of groundwater at the CCNPP site indicated neutral pH, with concentrations of aggressive chemical species well below the levels that can lead to corrosion of embedded steel/rebar. Aggressive chemistry was not present in the groundwater at the CCNPP site during construction, and there is no conclusive evidence that the groundwater chemistry has become aggressive.

The effects of boric acid leakage on reinforced concrete were analyzed in response to leaks at the Unit-2 refueling pool noted in 1994 and 1995. An engineering evaluation of the applicable concrete standards and tests on rebar concluded that the corrosion rates for embedded steel resulting from boric acid leakage are negligible. Based on these determinations, corrosion of embedded steel/rebar in the listed concrete structural component types in the Auxiliary Building is considered to be not plausible.

Cracking of concrete/masonry walls - Some walls on every floor level of the Auxiliary Building incorporate masonry block construction. Such walls are only restrained at the top and bottom. Concrete blocks (shielding) are also located throughout the Auxiliary Building. These blocks have shielding characteristics similar to solid concrete and a specified density of 145 pounds per cubic foot. The concrete blocks are stacked to form walls that are then laced with steel for stability and strength. Horizontal and vertical concrete block joints are mortared. Concrete block shield walls are supported by plate anchorages to the floor slab; they are not restrained between existing concrete walls or slabs. Cracking of masonry block walls is considered a potential ARDM for concrete blocks (shielding) and masonry block walls for the Auxiliary Building. This ARDM is not applicable to the SR Diesel Generator Building because it does not contain any concrete blocks or masonry block walls.

Settlement - The basis for determining that settlement is not plausible for the Auxiliary Building and SR Diesel Generator Building is presented on pages 3.3E-10, 3.3E-12, and 3.3E-13.

Corrosion of structural steel - Corrosion of structural steel is considered a potential ARDM for steel (susceptible to general corrosion) components designated as "steel components," i.e., all components marked with an * in Table 3.3E-3 of the BGE LRA. When structural components fabricated from carbon steel are exposed to moisture, oxygen, and aggressive ions, corrosion is potentially significant. Coatings serve as a protective layer, preventing moisture and oxygen from directly contacting the steel surfaces. Proper selection of materials and protective coatings can mitigate this ARDM. However, corrosion of structural steel is considered plausible for the carbon steel structural component types in the Auxiliary and SR Diesel Generator Buildings, and is addressed in Group 2 of the technical report. Corrosion of the SFP liner is addressed in Group 3 of the technical report.

NRC Question No. 3.3.48

With regard to the discussion on page 3.3E-12, please discuss if any maintenance or water table elevation monitoring programs are in place to ensure proper functioning of the system and what their role would be in the aging management program.

BGE Response

Calvert Cliffs does not have a water table monitoring program but a maintenance program for the passive subsurface drainage system was developed. Please refer to the response to NRC Question No. 3.3.6.

NRC Question No. 3.3.49

The last paragraph of page 3.3E-12 states that "Most of the predicted settlement is expected in terms of uniform settlement." Please describe the results of monitoring the settlement that led to the assessment that the differential settlement is expected to be small and have a negligible effect. If no monitoring has been performed, provide a justification for this statement.

BGE Response

As discussed in the response to NRC Question 3.3.6, Calvert Cliffs does not have a settlement monitoring program. The statement is an engineering interpretation of material in UFSAR Sections 2.7.3.2, 2.7.5.1, and 2.7.62.

NRC Question No. 3.3.50

With regard to the discussion on page 3.3E-13, please provide a summary description (including scope and findings) of any past or existing inspection program(s) which led you to state that "no cracking or other evidence of settlement that would affect structural integrity has been observed to date."

BGE Response

Calvert Cliffs has indications of cracks in some of the reinforced concrete structures. Baltimore Gas and Electric Company has concluded that some of the cracks are initial settlement cracks and do not affect the structural integrity. This conclusion is supported by the results of a walkdown of the Auxiliary Building that was performed in November 1994, which was conducted specifically to inspect the building for evidence of the effects of aging. Selected areas of the interior and exterior, based on their potential for degradation due to aging mechanisms, were inspected by an experienced structural engineer from Bechtel. The results were that there was no cracking or other evidence of settlement observed.

The Auxiliary Building and SR Diesel Generator Building are also periodically inspected as part of the Structure and System Walkdown Program. The walkdown inspection procedure utilizes a checklist process, including a specific check for settlement, to assess the structural adequacy of the buildings. If component failures are noted, a determination is made as to the ability of the structure to perform its intended functions. Degradation of structures or structure components/elements are documented and resolved through the CCNPP Corrective Actions Program.

NRC Question No. 3.3.51

Page 3.3E-18 indicates that one of the objectives of Calvert Cliffs Administrative Procedure MN-1-319 program is to assess the condition of the structures, systems, and components such that any abnormal or degraded condition will be identified, documented, and corrective actions taken before the condition proceeds to failure of the structures, systems and components (SSCs) to perform their functions. Please discuss the frequency with which walkdowns of the SSCs will be carried out and the basis for those frequencies.

BGE Response

The frequency basis for MN-1-319 structural walkdowns is discussed above in the response to Question 3.3.10.

NRC Question No. 3.3.52

With regard to the discussion on page 3.3E-20, what has been the average leak rate of water from the SFP liners based on past years of observation? If the SFP liner cannot be confirmed as the source of water collected during the monthly testing, indicate what other potential sources of water the leakage observed to-date can be attributed to in the results of the monthly test? Discuss if there are written procedures available which are used to guide the liner walkdown task and ensure its reasonable performance of functions. Also, based on your past experience, have you ever identified any significant corrosion, thinning, or cracking of liner plates? If yes, discuss the corrective actions taken.

BGE Response

As stated on page 3.3E-20, the average leak rate is 0.1 gallons per month. We have not found other feasible sources of water. Since the pool is flooded, walkdowns are not practical; the procedures that guide the leakage monitoring are given on page 3.3E-21. We have no record of significant corrosion, thinning, or cracking of the liner plates.

NRC Question No. 3.3.53

With regard to the discussion on page 3.3E-21, is it your conclusion that the conditions necessary for stress corrosion cracking of the SFP liner do not exist supported by actual field observation of liner conditions?

BGE Response

There appears to be a misunderstanding. The first sentence at the top of page 3.3E-21 is the final sentence of the paragraph begun on the previous page. This discusses the actual benign environment of the SFP. The following two paragraphs conclude that intergranular stress corrosion cracking is plausible for the heat-affected zones in and around welds joining the liner plates. See also Table 3.3E-3

This is also discussed in the responses to Questions 152 and 167 of Reference (1).

NRC Question No. 3.3.54

Provide a summary description (including operating experience) of the SFP liner performance program including the scope and inspection frequency.

BGE Response

The program is outlined in Group 3, on pages 3.3E-20 through 3.3E-22.

NRC Question No. 3.3.55

Page 3.3E-26 states that "Experiments have shown that the Carborundum sheets can experience spalling and surface abrasion, which result in a loss of boron carbide, ..." Please discuss the extent of actual spalling you have experienced to date. Also discuss the potential for the debris from Carborundum spalling to accumulate in a asymmetrical fashion to the extent that partial clogging of some gaps between the spent fuel rack cells can result in the loss of partial fuel cooling function. What programs and activities are in place to manage the potential accumulation of the debris for the period of extended operation?

BGE Response

Our racks are constructed with a "sandwich" of Carborundum material between two sheets of stainless steel. The plate edges are tack welded at three-inch centers to minimize the potential to erode the filler material. This configuration is different than the sample coupons used for Engineering Test Procedures 86-03, "Analysis of Neutron Absorbing Material in Spent Fuel Storage Racks," (discussed on BGE LRA pages 3.3E-24 and 25), which have a "sight hole" in the center and have experienced local flow erosion at this hole in the plate.

We have not observed any material degradation in the racks. With our geometry and the stability of the material, we do not expect any debris, even during extended operation. Because we do not expect any debris, we have no specific program to monitor debris accumulation.

NRC Question No. 3.3.56

With regard to the discussion on page 3.3E-26, please provide a discussion of the modified content of the coupon surveillance program which reflects the reevaluation of the sampling intervals to monitor Carborundum and Boraflex condition through the period of extended operation.

BGE Response

The intent is to change the withdrawal sequence of samples, extending the period between tests if it is feasible. This evaluation is not complete.

NRC Question No. 3.3.57

Are there any parts of auxiliary building and EDG structures 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: (1) Preventive actions that will mitigate or prevent aging degradation; (2) Parameters monitored or inspected relative to degradation of specific structure and component intended functions; (3) Detection of aging effects before loss of structure and component intended functions; (4) Monitoring, trending, inspection, testing frequency, and sample size to ensure timely detection of aging effects and corrective actions; (5) Acceptance criteria to ensure structure and component intended functions; and (6) Operating experience that provides objective evidence to demonstrate that the effects of aging will be adequately managed.

BGE Response

The outside surfaces of below-grade portions of walls and slabs are inaccessible. However, there are no plausible ARDMs for the concrete as shown in Table 3.3E-3.

NRC Question No. 6.2.1

Discuss whether corrosion allowances were provided in the design of electrical commodities and how corrosion is addressed as part of the aging management program.

BGE Response

No corrosion allowances were included in the specification of electrical panels. Corrosion was deemed plausible for the boric acid pump and saltwater air compressor local control stations of Group 6, and the battery racks of Group 1. Aging management of the effects of corrosion for the Group 6 local control stations is by age-related degradation inspection. Aging management of the effects of corrosion for the Group 1 battery racks is by the existing Preventive Maintenance Program.

NRC Question No. 6.2.2

Page 6.2-1 of the application states that operating experience relevant to aging was obtained based on CCNPP specific information and past experience. Please provide a summary discussion of any industry wide operating experience that you concluded was applicable to aging mechanisms for electrical commodities.

BGE Response

Various Electric Power Research Institute reports, NUREGs, and Sandia National Laboratory Aging Management Guidelines were consulted during the development of the AMR for Electrical Commodities to assist in the identification of potential aging mechanisms.

NRC Question No. 6.2.3

Page 6.2-2 of the report states that "EC *[electrical commodities]* are usually not subject to extreme conditions or excessive loads; however, some CCNPP EC are subject to corrosive environments." Provide a summary description on how the environmental stressors (vibration, heat, radiation, and humidity) and operational stressors (internal heating from electrical or mechanical loading, physical stresses from mechanical or electrical surges, vibration, and abrasive wearing of parts) that have resulted in age-related failures in electrical commodities were explicitly addressed in the aging management program(s).

BGE Response

Baltimore Gas and Electric Company has experienced vibration-induced problems with certain terminal block connections in the field. These connections were replaced with splices to eliminate the problem. Aging mechanisms are deemed plausible if the aging is known to be active, i.e., is being observed or if it could result in failure during the period of extended operation even if currently unobserved. Plausibility is, therefore, by nature a conservative decision.

Baltimore Gas and Electric Company has identified the plausible aging of electrical panels and the programs credited for managing those effects in Section 6.2 of the LRA.

NRC Question No. 6.2.4

Clarify your basis for concluding that the Preventive Maintenance Program can be relied on to detect electrical stressors, as described on page 6.2-9 of the report.

BGE Response

Design of industrial devices includes normal electrical stress with a healthy margin such that aging of terminal blocks, insulation, and insulators associated with normal electrical stress is not plausible. The electrical stress in this context is not that associated with normal operation or with random and infrequent abnormal events such as circuit faults and transients. Electrical stress, as defined for this section of the LRA, includes the overheating at loose connections and operating in a low voltage condition for an extended period of time. The Preventive Maintenance Program can manage electrical stress by including visual inspection for the effects of abnormal electrical stress. This includes specifically looking for signs of overheating of terminal blocks, insulation, or insulators. Such signs include cracking, crazing, or locally discolored spots.

NRC Question No. 6.2.5

Does the Preventive Maintenance Program include monitoring and trending? If so, please describe the monitoring and trending activities.

BGE Response

The Preventive Maintenance Program is an inspection program. It does not include monitoring or trending.

NRC Question No. 6.2.6

Are there any parts of the electrical commodities 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: (1) Preventive actions that will mitigate or prevent aging degradation; (2) Parameters monitored or inspected relative to degradation of specific structure and component intended functions; (3) Detection of aging effects before loss of structure and component intended functions; (4) Monitoring, trending, inspection, testing frequency, and sample size to ensure timely detection of aging effects and corrective actions; (5) Acceptance criteria to ensure structure and component intended functions; and (6) Operating experience that provides objective evidence to demonstrate that the effects of aging will be adequately managed.

BGE Response

All electrical panels and cabinets in the scope of license renewal are accessible for inspection.

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. C. H. Cruse (BGE) to NRC Document Control Desk, dated October 28, 1997, "Containment Tendon Engineering Evaluation Report"
3. Letter from Mr. A. W. Dromerick (NRC) to Mr. C. H. Cruse (BGE), dated January 23, 1998, Review of Containment Tendon Evaluation Report - CCNPP Unit Nos. 1 and 2 (TAC Nos. M99880 and M99881)
4. Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated May 14, 1998, "Containment Tendon Long-Term Corrective Action Plan"
5. Letter from Mr. C. H. Cruse (BGE) to NRC Document Control Desk, dated November 12, 1998, Response to Request for Additional Information for the Review of the Calvert Cliffs Nuclear Power Plant, Units 1 & 2, Integrated Plant Assessment, Generic Areas

ATTACHMENT (2)

ERRATA TO SECTION 3.3A, PRIMARY CONTAINMENT STRUCTURES, AND 3.3D, MISCELLANEOUS TANK AND VALVE ENCLOSURES; LICENSE RENEWAL APPLICATION

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
November 19, 1998

ATTACHMENT (2)

ERRATA FOR SECTIONS 3.3A, PRIMARY CONTAINMENT STRUCTURES, AND 3.3D, MISCELLANEOUS TANK AND VALVE ENCLOSURES; LICENSE RENEWAL APPLICATION

The following changes apply to Section 3.3A Primary Containment Structures, of the BGE LRA.

We have determined that the lubrite plates that support the steam generators are bronze, not steel. Therefore:

- On page 3.3A-8, in Table 3.3A-1, the asterisk (*) should be removed from the "Lubrite Plates" entry.
- On page 3.3A-11, in Table 3.3A-3, a column should be added with the heading "Lubrite Plates" and a row should be added with the heading "Wear." No check marks (✓) should be indicated in any of the added cells.

- On page 3.3A-19, in the lower middle of the second paragraph under "Group 2 - (corrosion of steel) - Aging Mechanism Effects," the words (and comma) "insufficient tensile stresses," should be deleted.

The following changes apply to Section 3.3D, Miscellaneous Tank and Valve Enclosures, of the BGE LRA.

- On page 3.3D-7, in Table 3.3D-2, for the Auxiliary Feedwater Valve Enclosure, the function of the Post-Installed Anchors should be changed from "NA" to "1" and the function of the Floor Grating, and Stairs and Ladders should be changed from "5" to "none."