FINAL SAFETY EVALUATION (FSE)

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

CONCERNING

METHODOLOGY FOR MEETING THE REQUIREMENTS OF 10 CFR PART 54

BALTIMORE GAS AND ELECTRIC COMPANY

CALVERT CLIFFS NUCLEAR POWER PLANT

UNIT NOS. 1 AND 2

DOCKET NOS. 50-317 AND 50-318

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1.0 INTRODUCTION

1.1 The License Renewal Rule

Pursuant to Title 10 of the Code of Federal Regulations (10 CFR) 50.51, licenses to operate nuclear power plants are issued by the U.S. Nuclear Regulatory Commission (NRC) for a fixed period of time not to exceed 40 years; however, these licenses may be renewed by the NRC for an additional period of up to 20 years before expiration of the current operating term. The revised license renewal rule, 10 CFR Part 54, published on May 8, 1995 (60 FR 22461), and effective on June 7, 1995, sets forth the requirements for the renewal of operating licenses for nuclear power plants.

Applicants for license renewal are required by the license renewal rule to perform, among other things, an integrated plant assessment (IPA) and an evaluation of time-limited aging analyses. The first two steps of the IPA, 10 CFR 54.21(a)(1) and 10 CFR 54.21(a)(2), require the applicant to identify and list, from those systems, structures, and components (SSCs) within the scope of the license renewal rule, those structures and components (SCs) that are subject to an aging management review and to describe and justify the methods used to determine those structures and components subject to review. SSCs within the scope of the license renewal rule are those meeting the criteria in 10 CFR 54.4. SCs subject to an aging management review are those that meet the criteria of 10 CFR 54.21(a)(1)(i) and (ii). Specifically, SCs that perform an intended function without moving parts or without a change in configuration or properties (i.e., "passive" SCs) and those that are not subject to replacement based on a qualified life or specified time period (i.e., "long-lived" SCs) are subject to an aging management review.

The final step in the IPA, 10 CFR 54.21(a)(3), requires an applicant to demonstrate, for all SCs identified as subject to an aging management review, that the effects of aging will be adequately managed so that the intended function(s) of the SCs will be maintained consistent with the plants current licensing basis including all design basis conditions for the period of extended operation. The license renewal rule also requires an applicant to perform an evaluation of time-limited aging analyses (TLAAs) in accordance with 10 CFR 54.21(c).

1.2 Scope and Conduct of NRC Staff Review

In a letter dated August 18, 1995, Baltimore Gas and Electric Company (BGE) submitted their "Integrated Plant Assessment Methodology" and requested that the staff review and approve their methodology as an acceptable method to meet the requirements of 10 CFR 54.21(a)(1) and (2). In a letter dated November 8, 1995, BGE revised their August 18 letter to request that the staff approve their methodology as an acceptable method for meeting the requirements of 10 CFR Part 54.

The NRC staff has reviewed BGE's methodology to determine if 1) the process described therein sufficiently describes and justifies an acceptable method for identifying SCs at Calvert Cliffs Nuclear Power Plant, Units 1 & 2 that are subject to an aging management review for license renewal; 2) that the process described in the methodology report for demonstrating that aging effects will be adequately managed is conceptually sound and consistent with the intent of the license renewal rule; and 3) that the process described therein for evaluating time limited aging analyses pursuant to 10 CFR 54.21(c), is conceptually sound and is consistent with the intent of the license renewal rule. Due to the fact that the BGE report describes its processes and methodology, the staff did not review the report with the intent of approving any specific aging management program for any structures or components at Calvert Cliffs or of approving any specific TLAA evaluation. Such reviews and determinations are reserved for future structure and component evaluations that will be submitted as part of a plant specific license renewal application.

During the review of the BGE report, the staff recognized that the BGE methodology for performing an aging management review and an evaluation of TLAAs leads to some supporting information being retained on-site while other supporting information would be submitted in a license renewal application. The staff concern was that an adequate "demonstration" would not be provided in the renewal application as required by the final rule. The BGE methodology does not address in detail what is to be submitted in the renewal application but has been modified to clarify that the application will contain a demonstration that the effects of aging are adequately managed, as well as a description of programs and activities which manage the aging effects. Detailed justification will remain on site. The staff considers the issue closed because BGE has committed to meet the final rule by providing modified language in their methodology consistent with the final rule. BGE is expected to submit for staff review a series of renewal technical reports on evaluating plant structures and components. The BGE renewal application will simply reference these technical reports when approved by the staff. The staff believes that the issue of whether there will be sufficient level of detail provided in an application to make its required findings with respect to managing the effects of aging and regarding the evaluation of TLAAs is better judged in specific BGE structure and component aging management and TLAA renewal technical reports. In addition, the staff expects to gain sufficient experience with the level of detail issue during the industry license renewal demonstration project scheduled in the near future and is prepared to address this issue in future license renewal technical reports. Therefore, the staff's review does not address whether this BGE methodology provides for a

sufficient level of detail in a license renewal application for the staff to make its findings that aging effects will be adequately managed and that an evaluation of time-limited aging analyses have been acceptably performed.

This safety evaluation covers Sections 1 through 8 of BGE's Integrated Plant Assessment Methodology. As requested by BGE, this safety evaluation report does not cover Attachment 2, Sample Results, to the methodology.

The NRC staff will review the implementation of this methodology, and the results of the screening, should BGE submit a license renewal application. At that time, the staff's review may involve audits and/or inspections in selected areas of interest to ensure the methodology has been implemented consistent with the intent of the license renewal rule. For guidance in performing the review, the NRC staff consulted the statements of consideration (SOC) for 10 CFR Part 54 (60 FR 22461). Although not within the scope of this safety evaluation, the NRC staff examined some of the example screening results presented in the Attachment 2 to the methodology for an understanding of the logic flow of the methodology using actual plant SSCs.

The NRC staff's findings in this safety evaluation are based on the requirements of 10 CFR Part 54, specifically 10 CFR 54.21(a)(1)(i) and (ii), 10 CFR 54.21(a)(2), 10 CFR 54.21(a)(3), 10 CFR 54.21(c)(1)(i), (ii), and (iii), and 10 CFR 54.21(c)(2). Additionally, the staff's findings are based on the three criteria for including SSCs as within the scope of the license renewal rule as contained in 10 CFR 54.4(a) summarized below:

Criterion (1): Safety-related SSCs

Criterion (2): Non-safety-related SSCs whose failure could affect performance of safety-related SSCs

Criterion (3): SSCs relied on for meeting NRC regulations for fire protection (FP), equipment qualification (EQ), pressurized thermal shock (PTS), anticipated transients without scram (ATWS), and station black-out (SBO)

In the BGE methodology, BGE refers to the three criterion as "scoping criteria." However, for consistency and efficiency, in this safety evaluation they will be referred to as Criteria (1) through (3).

After completing an initial review of the methodology, the NRC staff issued a request for additional information (RAI) to BGE on November 16, 1995, transmitting questions concerning the methodology and attachments. The RAI contained 40 questions concerning the methodology as well as 14 questions concerning the level of detail of the sample results contained in Attachment 2 to the BGE methodology. The level of detail questions were sent only as information for future BGE renewal technical reports. By letter dated December 15, 1995, BGE provided a response to each of the 40 methodology RAI questions. BGE did not respond to the 14 level of detail RAIs but stated that these questions would be addressed during the development of BGE renewal

technical reports. In a letter dated January 11, 1996, BGE submitted a revised methodology consistent with their December 15, 1995, response to the RAIs.

The NRC staff held public meetings with BGE to discuss the specifics of their methodology, the RAIs, and their responses to RAIs. BGE provided further clarification of its methodology in a number of telephone calls conducted in December 1995 and January 1996. These additional clarifications were ultimately factored into follow-on written correspondence. A listing of all written correspondence, including letters and meeting summaries is provided in Section 5 of this safety evaluation.

1.3 Relationship to Previous Staff Draft Safety Evaluation

On March 21, 1994, the staff issued a draft safety evaluation to BGE on their report entitled, "Integrated Plant Assessment Methodology, Volume 1: Systems, Structures, and Components Screening," dated March 2, 1993 (referred to hereafter as the 1993 methodology). The 1993 methodology contained the process that BGE proposed for screening systems, structures, and components important to license renewal (ITLR). The amended license renewal rule deleted the definition of ITLR and deleted the technical specification screening criterion for SCs requiring an aging management review for license renewal. However, the amended rule included screening of "long-lived" and "passive" structures and components.

Although these changes did not significantly alter BGE's screening methodology, since BGE submitted a new methodology consistent with the amended rule, the staff concluded that a new safety evaluation was appropriate. However, the staff refers to several screening results tables and screening tools contained in BGE's 1993 methodology that are not provided in the August 1995 methodology but are still used by BGE in the implementation of their methodology.

2.0 SUMMARY OF BGE's INTEGRATED PLANT ASSESSMENT METHODOLOGY

The objective of the BGE methodology is to document the plant specific process for meeting the requirements of 10 CFR 54.21 (Contents of Application - Technical).

Sections 1 through 5 of the methodology describes BGE's processes for evaluating SSCs within the scope of the license renewal rule (10 CFR 54.4) to identify those SCs required to be subjected to a plant specific aging management review in order to demonstrate that the effects of aging on the intended functions of these SCs are adequately managed. Additionally, the methodology contains BGE's process for subjecting these SCs to an aging management review as well as the process for evaluating TLAAs.

Attachment 2 to the BGE IPA methodology includes sample SC screening results from implementing the methodology procedures for several Calvert Cliffs systems. As discussed above in Section 1.2, Attachment 2 to the methodology is not within the scope of this review.

The BGE methodology describes a process that (1) identifies those systems and structures (SSs) that perform the specific functions described in 54.4 of the rule and defines those SSs as being within the scope of license renewal, (2) identifies the intended functions of the SSs within the scope of LR, (3) identifies the components and their functions that contribute to the performance of the identified intended functions of SSs within the scope of LR, (4) identifies SCs that require an aging management review, (5) provides conceptually an aging management review approach that is focused on ensuring that the effects of aging are adequately managed in the period of extended operation, and (6) provides conceptually an approach to evaluating TLAAs for the period of extended operation.

2.1 Levels of Scoping

BGE's methodology consists of three separate levels of scoping: (1) system and structure level scoping, (2) component level scoping, and (3) pre-evaluation scoping. The BGE methodology also provides for commodity evaluations which, in some cases, utilize a slightly modified scoping process. Commodity evaluations and the unique scoping associated with these commodities are discussed in Section 2.6 of this safety evaluation.

2.2 System Level Scoping

Section 3 of the methodology provides a process for identifying those SSs within the scope of license renewal. The results of the system level scoping methodology are presented in the following tables and screening tools maintained on site.

(1) Table 1, System/Structure Information consists of descriptions and general functional requirements of all SSs.

This Table is contained in the BGE 1993 methodology.

(2) Design Basis Event (DBE) Screening Tool consists of DBE Flow Charts and Vital Auxiliaries (VA) Screening Tool identifying the safety-related SSs (Criterion 1) and non-safety-related SSs that affect performance of safety-related SSCs (Criterion 2) for each DBE described in Chapter 14 of the Calvert Cliffs Updated Final Safety Analysis Report (UFSAR).

These DBE Flow Charts and VA Screening tools are contained in the 1993 methodology.

(3) FP, EQ, PTS, SBO, ATWS Screening Tools identify SSs and functions relied on for meeting NRC regulations for FP, EQ, PTS, SBO, and ATWS (Criterion 3).

These screening tools are contained in the 1993 methodology.

(4) Table 2, System Level Scoping Results is a summary of SSs that are within the scope of license renewal and notes the particular criteria applicable for making the structure or system within the scope of license renewal.

On completion of this step, all systems and structures that are within the scope of license renewal and the corresponding scoping criteria that cause them to be within the scope will have been identified. (Note: BGE assigns every component to a system or structure.)

2.3 Component Level Scoping

Section 4 of the BGE methodology describes the process for determining the structures and components within the scope of license renewal. The decision criteria for including components within the scope of LR are the same three criteria used to establish the SSs within the scope of license renewal.

The component level scoping methodology consists of (1) component level scoping for systems and (2) component level scoping for structures.

2.3.1 Component Level Scoping for Systems

The component level screening methodology for systems uses the results of the SS level scoping step. Specifically, the systems that are within the scope of license renewal are reviewed to identify all components in each system and to determine which system components contribute to the performance of a particular system intended function. The component level scoping for systems first creates a detailed list of the intended functions associated with each system (i.e., Systems Function Table). The Systems Function Table is compiled using the Systems and Structures Scoping results, Q-list documentation, plant drawings, the UFSAR, System descriptions and other references. The next step in the component level scoping process for systems is to determine, for each intended function in the Systems Functions Table, which components are needed to perform that function. This step results in the development of a list of components and their functions called a function catalog. Lastly, the function catalogs are resorted by component instead of intended function to produce a list of system components within the scope of license renewal.

2.3.2 Component Level Scoping for Structures

The component level scoping methodology for structures takes the results of the SS level scoping and reviews the structures to determine which structural components are necessary for the structures to perform their intended functions. This scoping process is performed in two parallel paths. The first path is the same as the component level scoping for systems for those "systems" type structural components that can be identified in the site equipment database (such as containment personnel hatch and containment penetrations). However, remaining "structural" type components such as beams, columns, and walls are scoped differently since these components are generally not included in the site equipment database.

In order to scope structural type components that are not contained in the site equipment database, BGE developed a generic listing of structural type components. This list was generated by reviewing the structural component types contained in the Containment Industry Technical Report and the Class 1 Structures Industry Technical Report. Additionally, fire and flooding related

structural component types were added for completeness. Unique structural component types (such as prestressed tendons in the containment and the sluice gates in the intake structure) are added to the list. This list then serves as the equivalent of a master equipment list for the structural scoping task.

BGE has also developed a Structure Intended Functions Table which lists the 10 CFR 54.4 functions associated with structures being scoped. These functions mirror the intended functions delineated in 54.4 but are unique to structures.

Using this generic listing of structural component types and the Structure Intended Function Table, the process requires the reviewer to systematically review each structure within the scope of license renewal and identify all the generic and unique structural components and their associated intended functions. These results are then integrated with those structural components scoped using the system process path to yield a complete list of structural components and their intended functions.

2.4 Pre-evaluation

Section 5 of the BGE methodology describes the pre-evaluation step. This process takes the SCs within the scope of license renewal (as determined from the previous steps) and reviews them to determine which SCs require an aging management review. The pre-evaluation process also determines whether the aging management review (AMR) will be performed on a component by component basis or on a commodity level (discussed later).

The pre-evaluation step uses the 10 CFR 54.21(a)(1)(i) and (ii) criteria for determining whether an SC is subject to an aging management review. As discussed previously, an AMR is required for structures and components (1) that perform an intended function without moving parts or without a change in configuration or properties (i.e., passive SCs) and 2) that are not subject to periodic replacement based on qualified life or specified time interval (i.e., long-lived SCs).

The pre-evaluation step begins on a system/structure level and screens each identified structure and component intended function (from the previous scoping results) to determine if the function is active or passive. All active functions are screened out. This process is repeated until all the identified functions for each system/structure have been screened. Next, all the remaining passive SCs are screened to determine if they can be excluded as not "long-lived" based on the 10 CFR 54.21(a)(1)(ii) criterion of replacement based on a qualified life or specified time period. The BGE methodology recognizes, however, that a qualified life may not necessarily be based on a calendar time period. This step results in the list of SCs that are subject to an aging management review. Finally, the SCs that are part of the electrical panel (EP) or instrument line (IL) commodity groups are identified for a commodity AMR. All other SCs are targeted for a component level AMR under their specific systems.

2.5 Aging Management Review (AMR)

Section 6 of the BGE methodology describes the process of performing an aging management review. This BGE process is used to evaluate the effects of age-related degradation and to identify and evaluate aging management programs to determine that the effects of aging will be adequately managed for renewal.

The BGE aging management review process may be performed in one of two general ways. In some circumstances, BGE indicates that it may be possible to demonstrate that the effects of aging will be adequately managed without an explicit evaluation of the age-related degradation mechanisms. In other instances, BGE indicates that it may be efficient to evaluate the effects of specific age-related degradation mechanisms on the intended functions.

2.5.1 Effects of Aging are Managed Without Specifically Evaluating Age-Related Degradation Mechanisms

The BGE process indicates that an explicit evaluation of the age-related degradation mechanisms would not be performed for four cases described in Section 6 of the BGE methodology.

BGE indicates that the effects of aging on the passive function would be reflected in a change in one or more monitored performance or condition characteristics of the structures and components of the following three cases:

(1) Complex assemblies whose only passive function is closely linked to active performance,

(2) Component assemblies subject to complete refurbishment, or

(3) Structures and components subject to replacement on condition.

The fourth case is long-lived components subject to environmental qualifications (EQ) which are addressed separately as a TLAA.

2.5.2 Performing Aging Management Review by Evaluating Aging Mechanisms

2.5.2.1 Identifying Plausible Age-Related Degradation Mechanisms

When evaluating the effects of specific age-related degradation mechanisms on the intended functions, the BGE process indicates that the first step is to create a potential list of age-related degradation mechanisms. If a system contains several structures and components with similar characteristics, the BGE process may group these structures and components for a common evaluation. Groups may be further subdivided into the individual subcomponents which make up the components in the group if this facilitates the subsequent evaluation.

For each age-related degradation mechanism/subcomponent combination, if the age-related degradation mechanism does not affect the material, is not perpetuated by the environment or occurs to such a small degree that the

intended function is maintained, the age-related degradation mechanism is designated as not plausible by BGE for the subcomponent. The plausible age-related degradation mechanisms are identified.

2.5.2.2 Methods to Manage Effects of Aging

The BGE methodology indicates that one of the goals of aging management is to manage the effects of aging such that the intended functions are maintained consistent with the current licensing bases (CLB). The BGE process states that the site maintenance strategy consists of the following four phases:

(1) Discovery
(2) Assessment/Analysis
(3) Corrective Action
(4) Confirmation/Documentation

The selection of the appropriate method for detecting aging effects, that is, discovery, is performed through an expert panel review of each plausible age-related degradation mechanism/subcomponent combination. Once degradation is discovered, the BGE process indicates that the last three phases of the strategy, that is, assessment/analysis, corrective action, and confirmation/documentation, are required by the CLB.

The BGE process also indicates a need to address unresolved Generic Safety Issues (GSIs) or Unresolved Safety Issues (USIs) related to the effects of aging in accordance with the guidance in the SOC accompanying the final rule.

2.6 Commodity Evaluations

Section 7 of the BGE methodology also provides for performing aging management reviews by commodity groups. The intent of commodity evaluations is identical to the previously described scoping and aging management review process, i.e., to demonstrate that the effects of aging are adequately managed. However, commodity evaluations are performed as a matter of efficiency where grouping of components is feasible. BGE has identified six commodity groups: 1) electrical panels, 2) instrument lines, 3) cables, 4) cranes and fuel handling equipment, 5) components supports, and 6) fire protection (FP) equipment.

For the EP and IL Commodity group, the BGE methodology uses the scoping processes described above and groups the commodities during the pre-evaluation process and subjects them to an aging management review according to Section 6, AMR, of the BGE methodology. For the IL commodity, the pre-evaluation process specifically excludes IL components that do not "contribute significantly" to the pressure boundary function of the IL. The BGE methodology uses this criteria to classify IL components that are similar to the "active" IL components excluded from an aging management review delineated in 54.21(a)(1) (i.e., pressure transmitters, pressure indicators, and water level indicators). The remaining four commodity groups have somewhat modified scoping processes due to the uniqueness of the commodity group or on-site documentation. These four commodity evaluations are discussed below.

2.6.1 Cables

The Calvert Cliffs Nuclear Power Plant (CCNPP) equipment database does not contain specific equipment connectivity for individual cables, therefore, they are scoped by reviewing a separate circuit and raceway database containing information on cables, their service function, materials, and to and from locations. This information is then correlated to design drawings to develop a complete list of cables at CCNPP. For the purposes of meeting 54.21(a)(1), BGE considers all cables as subject to an aging management review.

Next, as part of the aging management review for all cables, BGE relies on its TLAA evaluation process (Section 8 of the BGE methodology; Section 2.7 of this safety evaluation) required by 10 CFR 54.21(c) for its AMR for all cables subject to the Commission's EQ rule (10 CFR 50.49) since EQ is a TLAA. The remaining non-EQ cables are then grouped by common material characteristics and environment. For these groups of non-EQ cables, the aging management review process next determines the potential age related degradation mechanisms and concludes that no aging management is necessary for those groups of cables for which there are no plausible aging mechanisms. At this point the component level scoping process is used to determine which cables of those remaining meet the criteria for being within the scope of license renewal (i.e., 54.4). For these remaining cables, aging management alternatives are selected using the process described in Section 6.3 of the BGE methodology.

2.6.2 Cranes/Fuel Handling Equipment

The system level scoping results in five systems within the scope of license renewal which are related to cranes and fuel handling. Since the intended functions of these five systems are structural in nature they are addressed as a commodity. The five systems include 1) spent fuel storage, 2) refueling pool, 3) new fuel storage and elevator, 4) fuel handling, and 5) cranes.

The components that make up this commodity group are scoped in the same manner as the Component Level Scoping process for structures (Section 4.2 of the BGE methodology; Section 2.3.2 of this safety evaluation). Once the components within the scope of license renewal are defined, the commodity evaluation identifies which of these components have already been addressed as part of another aging management review. (e.g., the AMR of the building which houses the component or the commodity evaluation of the structural supports). If the components have already been addressed as part of another AMR, they are eliminated from further AMR for this commodity. Next, the remaining components are put through a pre-evaluation type scoping process to determine which components are passive. These remaining passive components are evaluated for the effects of aging in accordance with Section 6.2 of the BGE methodology.

2.6.3 Component Supports

The scoping of the component supports commodity begins with a process similar to the component level scoping for structures described previously. A generic list of component support types is developed by reviewing industry and plant specific information, including Seismic Qualification Utility Group, (SQUG) guidance, ASME Section XI component support inspection documentation, and the

CCNPP System Level Scoping Results. All component support types which could provide support to equipment within the scope of license renewal are identified. However, snubbers (not including supports) are specifically excluded as active equipment consistent with the license renewal rule. The Component Level Scoping results for each system within the scope of license renewal are then reviewed to determine the list of component support types which provide support for components within the scope of renewal. The results are a listing of component support types for each system within the scope of license renewal. These component support types are treated as passive, long-lived structural components and are subjected to an AMR described in Section 6.2 of the BGE methodology.

2.6.4 FP Equipment

The system level scoping of the BGE methodology results in seven systems that are within the scope of license renewal primarily because of FP functions. These systems include 1) well and pre-treated water, 2) FP, 3) plant heating, 4) condensate, 5) plant drains, 6) liquid waste, and 7) fire and smoke detection. Since most of the FP intended functions are active, an alternate approach for conducting the component level scoping is used. For these systems, identification of detailed system functions is performed as described in Section 4.1.1 of the BGE methodology, however, the pre-evaluation scoping is performed to eliminate the active functions. The passive intended functions of the systems are then subjected to the component level scoping process to develop the component function catalogs. The pre-evaluation scoping process is repeated to eliminate all short-lived components. The Section 6 AMR principles of the BGE methodology are then applied to the scoped FP components.

2.7 Time-Limited Aging Analysis Evaluation

Section 8 of the BGE methodology describes the process for evaluating TLAAs in accordance with the requirements in 54.21(c). The BGE process indicates that the CLB will be searched to identify TLAAs and exemptions based on TLAAs The definition of TLAA in 54.3 is used as the BGE criteria to identify TLAAs. Examples of potential TLAAs in documents supporting the final rulemaking are reviewed. National codes and standards governing the design of systems, structures, and components are reviewed as part of a joint industry effort to identify potential TLAAs. The Updated Final Safety Analysis Report (UFSAR) and docketed correspondence are searched.

The BGE process indicates that an option in evaluating TLAAs is given in 54.21(c)(1)(iii) to demonstrate that the effects of aging on the intended function will be adequately managed for the period of extended operation. Because the IPA also requires a demonstration that the effects of aging are adequately managed, the only remaining step in the BGE process is to review the IPA results to ensure that the TLAA evaluation requirements are met. When the BGE process chooses to extend an existing analysis or justify that the existing analysis remains valid, the techniques used to perform these tasks are those widely accepted in the regulations or national codes and standards which govern the TLAA. Further, the BGE process indicates a need to address unresolved GSIs or USIs related to TLAAs in accordance with the guidance in the SOC accompanying the final rule.

3.0 NRC STAFF EVALUATION

The staff reviewed Chapters 1 through 8 of BGE's methodology to determine if 1) the process described therein sufficiently describes and justifies a method for identifying SCs at CCNPP Units 1 & 2 that are subject to an aging management review for license renewal, and that such method, if implemented, provides reasonable assurance that the complete scope of SCs that need to be subjected to an aging management review as required by the license renewal rule will be identified; 2) that the process described therein for demonstrating that aging effects are adequately managed is conceptually sound and consistent with the intent of the license renewal rule; and 3) that the process described therein for evaluating time limited aging analyses, is conceptually sound and is consistent with the intent of the license renewal rule.

3.1 Source Documents

BGE's methodology relies on documents containing portions of the CLB to support scoping decisions. These documents include but are not limited to the following:

(1) UFSAR
(2) Technical Specifications
(3) Q-list Documentation
(4) BGE's responses to FP, EQ, PTS, ATWS, and SBO regulations
(5) Design Drawings
(6) Circuit and Raceway database

The staff finds the above list of documents acceptable for use in identifying SSCs within the scope of license renewal and for identifying SCs subject to an aging management review. The staff notes that other references such as vendor reports may be necessary for information.

BGE relies heavily on the use of the Calvert Cliffs Q-list Documentation in implementing their scoping methodology. Although the Q-List Documentation is not docketed and has not been formally reviewed and approved by the NRC, it is, nonetheless, implemented through the Calvert Cliff's existing quality assurance program in accordance with Appendix B to 10 CFR Part 50, and is subject to the NRC's regulatory oversight process. Thus, the staff finds that a wholesale review of the Calvert Cliffs Q-List Documentation is not necessary to have reasonable assurance that it can be used as described in the methodology to identify SSCs within the scope of license renewal. However, should BGE submit an application for license renewal, the NRC staff may choose to audit portions of the Q-list Documentation as part of the application review.

3.2 Levels of Scoping

Title 10 of the Code of Federal Regulations (10 CFR 54.21(a)(1)) requires that, for those SSCs within the scope of license renewal, an applicant identify and list those SCs subject to an aging management review.

The process described in BGE's methodology provides for three levels of scoping that are focused on satisfying the criteria for determining SCs that require an aging management review for license renewal: (1) system level scoping; (2) component level scoping; and (3) pre-evaluation scoping.

3.3 System Level Scoping

Section 3 of the BGE methodology, System Level Scoping, describes a process for applying each of the three criteria against all plant SSs to the determine SSs that are within the scope of license renewal. The NRC staff's evaluation of how BGE addresses each of these criteria is discussed below. "Screening Tools" are created during this scoping process and contain a list of SSCs which meet the specific scoping criteria of 10 CFR 54.4. The actual screening tool and supporting documentation are maintained on site. To support this review, the NRC staff performed an audit review of some of the screening tools for further understanding of the methodology. The NRC staff will review the results of the system level scoping performed by the screening tools when an application for license renewal is tendered.

3.3.1 System Level Scoping Using Criteria (1) and (2) of 10 CFR 54.4

The methodology uses the DBE accident analyses described in Chapter 14 of the UFSAR and the Calvert Cliffs Q-list Documentation to identify SSs meeting the requirement of Criteria (1) and (2) of 10 CFR 54.4 (i.e., safety related relied upon to remain functional during and following design-basis events and non-safety related whose failure affect these safety related). The Q-List Documentation contains accident shutdown flow sheets which identify safety - related functions and systems required for the performance of safety-related functions for 17 of the accident analyses described in Chapter 14 of the UFSAR. The scoping methodology requires that a DBE flowchart be prepared from each of the 17 accident shutdown flow sheets in the Q-list Documentation to identify SSs meeting criteria (1) and (2) of 10 CFR 54.4. For the remaining accident analyses described in Chapter 14 of the UFSAR that do not have accident shutdown flow sheets in the Q-list Documentation, the methodology directs that DBE flowcharts be prepared from the UFSAR Chapter 14 description unless all SSs required to perform in the accident analysis already appear in another DBE and VA flowchart or no SSs are required to perform. In addition, a vital auxiliaries flowchart is prepared to identify support equipment whose failure could prevent the performance of a safety-related function.

In order to ensure that structures falling within Criteria (1) and (2) are identified, the methodology includes reviewing Chapter 5 of the UFSAR and the Q-List Documentation to determine those structures or portions thereof that are Class 1.

The NRC staff finds that the process described in Section 3 of BGE's methodology is consistent with Criteria 1 and 2 of 10 CFR 54.4 and provides a comprehensive documentation search that provides reasonable assurance that all systems and structures meeting these two criteria will be identified.

3.3.2 System Level Scoping Using Criteria (3) of 10 CFR 54.4

The methodology requires BGE to review their evaluations for meeting the requirements of the FP, EQ, PTS, ATWS, and SBO rules and various CLB documents to identify the SSs falling within Criterion 3 of 10 CFR 54.4 for SSCs within the scope of the rule. Criterion 3 are those SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the requirements of the FP, EQ, PTS, SBO, and ATWS rules. The BGE scoping methodology requires that SSs be identified as within the scope of license renewal if the mitigation or support function associated with them are credited in the analysis or evaluation. The screening tools developed during the screening process to address Criterion 3 and the staff's evaluation of these tools are addressed below.

FP Screening Tool: Section 3.3.2.1 of the methodology states that the CCNPP UFSAR, FP Program documentation and the CCNPP Interactive Cable Analysis are reviewed to identify the system functions that address the Commission's regulations on FP and the BGE commitments for implementation of those regulations. The identified SSCs, intended functions, and appropriate source documents with revision numbers are summarized in the FP Screening Tool. The BGE FP Screening Tool is maintained on site; it was previously submitted in the BGE March 1993 Volume 1 methodology.

The staff reviewed the scope of the source documentation for the FP Screening Tool and finds it comprehensive enough to provide reasonable assurance that all SSs relied on to comply with the Commission regulations for FP (10 CFR 50.48) will be identified.

EQ Screening Tool: Section 3.3.2.2 of the methodology states that an EQ and Post-Accident Monitoring (PAM) tool are produced for the EQ screening tool preparation. Q-List data is reviewed to identify items which meet the requirements of 50.49 EQ rule. The CCNPP UFSAR is then reviewed to identify the systems containing components required for PAM category 1 or 2 (as defined in Regulatory Guide 1.97). The EQ Screening Tool is maintained on-site, and the EQ and PAM portions of the screening tool were previously submitted in the March 1993 methodology.

The staff reviewed the scope of the source documentation for the EQ and PAM portions of the EQ Screening Tool and finds it comprehensive enough to provide reasonable assurance that all SSs relied on to comply with the Commission regulations for EQ (10 CFR 50.49) will be identified.

PTS Screening Tool: Section 3.3.2.3 of the methodology states that neither CCNPP Unit 1 or 2 is expected to require a Regulatory Guide 1.154 (Format and Content of Plant Specific Pressurized Thermal Shock Safety Analysis Reports for Pressurized Water Reactors) evaluation to satisfy 10 CFR 50.61 requirements and therefore, no SSCs are within the scope of license renewal due to this Commission regulation. This tool merely notes that no SSCs are relied on for this event. The scoping results include the contingency to implement a PTS scoping criterion if a Regulatory Guide 1.154 evaluation is required in the future. A Regulatory Guide 1.154 analysis would update the system level and component level scoping results to included SSCs associated with Regulatory Guide 1.154 functions within the scope of LR.

The staff finds that the methodology requirement to identify all SSs in a Regulatory Guide 1.154 analysis that are relied on to comply with the PTS rule, meets the PTS provision of Criterion 3 of 10 CFR 54.4.

ATWS Screening Tool: Section 3.3.2.4 of the methodology states that the CCNPP UFSAR is reviewed to identify the system functions that address the 10 CFR 50.62 requirements on ATWS. The tool lists the SSCs which are relied on in response to an ATWS event. For each identified SS, the tool lists the intended functions provided and the appropriate source documents. This screening tool was previously submitted in the March 1993 methodology.

The staff reviewed the scope of the source documentation for the ATWS Screening Tool and finds it comprehensive enough to provide reasonable assurance that all SSs relied on to comply with the Commission regulations for ATWS (10 CFR 50.62) will be identified.

SBO Screening Tool: Section 3.3.2.5 of the methodology, states that BGE will review their SBO analysis to identify all SSs that are relied upon during the "coping duration" phase of an SBO event. The power restoration phase of the Station Blackout Analysis is specifically excluded in this tool since several success paths for restoring power after an SBO are already screened as within the scope of LR due to Criterion 1. The SBO Tool lists the SSs relied on in the Station Blackout Analysis, the functions that each provides, and the appropriate source documents. This screening tool was previously submitted in the March 1993 methodology.

The staff reviewed the scope of the source documentation for the SBO Screening Tool and finds that in conjunction with Criterion 1 that captures the power restoration phase of SBO, it is comprehensive enough to provide reasonable assurance that all SSs relied on to comply with the Commission regulations for SBO (10 CFR 50.63) will be identified.

3.4 Component Level Scoping

Section 4 of the methodology instructs that components of SSs be identified as within the scope of license renewal if they meet the criteria defined in 54.4. Component level screening described in the methodology is divided into two areas: (1) component level scoping for systems and (2) component level scoping for structures.

3.4.1 Component Level Scoping for Systems

The component level scoping for systems described in the methodology starts with the systematic review of all systems determined to be within the scope of license renewal to identify the associated intended functions that these systems perform. The results of this step are compiled in the System Function Table, with each function assigned an identification number. The plant's Master Equipment List provides a listing of all components for each scoped system. For each function in the System Function Table, a list of the components required to perform that function is identified and compiled in the Function Catalog. The Function Catalog is used to produce the Component Level Scoping Results Table which lists the components of each scoped system,

designates whether they are within the scope of license renewal, and provides their intended functions. A component that does not perform an intended function will be listed in the component level screening results, but designated as not within the scope of license renewal.

The NRC staff finds the component level scoping process for systems described in Section 4.1 of the BGE methodology provides reasonable assurance that all components within the scope of license renewal will be identified. This is because the component level scoping process for systems starts with all the systems identified as within the scope of license renewal; defines their intended functions in terms of the 10 CFR 54.4 criteria; and systematically reviews all of the system components, identifies all components that contribute to the performance of the system intended function or whose failure could prevent the performance of such function, and catalogs these component intended functions.

3.4.2 Component Level Scoping for Structures

The BGE methodology consists of reviewing the structures determined to be within the scope of license renewal, from the SS level scoping steps, to identify the structural components that contribute to the performance of an intended function, or whose failure could prevent an SSC from performing its intended function. To do this, BGE has identified a generic list of structural components and a generic list of intended functions that structures or structural components perform. For certain structures that are also part of a system, such as the containment, the system components will also be screened in the component level scoping process for systems described above.

The methodology requires that each structure within the scope of license renewal be reviewed against the generic list of structural intended functions to determine the intended functions that each structure within the scope of license renewal performs. The structure is then reviewed against the generic list of structural components to list the structural components actually contained in the structure. Any unique structural components in the these structures, such as prestressed tendons in the containment and containment liner, will be added to this listing. Each structure is then reviewed to determine what structural components it includes and what intended functions are applicable. The last step is to integrate these results with the results of the structures scoped via the component level scoping process for systems. The results will be a list of structural components within the scope of license renewal and their intended functions.

The NRC staff finds the component level scoping process for structures described in Section 4.2 of the BGE methodology provides reasonable assurance that all structural components within the scope of license renewal will be identified. This is because the component level scoping process for structures starts with all the structures identified as within the scope of license renewal and systematically reviews these structures to identify the structural components (from a comprehensive list of generic and unique structural components) that make up these structures and identifies the appropriate structural intended functions consistent with 10 CFR 54.4.

3.5 Pre-evaluation Scoping

Section 5 of the BGE methodology addresses the final level of scoping. The pre-evaluation scoping serves to determine, from the structures and components within the scope of license renewal identified from the component level scoping process, those SCs which require an aging management review. Additionally, the pre-evaluation process also identifies those SCs that will be placed in one of two commodity groupings. An aging management review for these SCs will be conducted on a group of components (commodity) rather than on an individual component basis. Commodity evaluations are discussed in Section 3.7 below.

The pre-evaluation process subjects all SCs for each system to the 10 CFR 54.21(a)(1) criteria for "passive" and "long-lived" in order to determine the set of structures and components requiring an aging management review for license renewal.

The pre-evaluation process first screens out those SCs whose functions involve moving parts or a change in configuration or property. This step results in only those SCs satisfying the 10 CFR 54.21(a)(1)(i) criterion for "passive" to be included in the next screening. Next, the pre-evaluation screens out those SCs that are subject to replacement based on a specified time period or a qualified life, but recognizes that a qualified life may be based on variables other than calendar time. This step results in only those SCs meeting the criteria of 10 CFR 54.21(a)(1)(i) and (ii) as subject to an aging management review. Finally, the pre-evaluation process identifies those passive, long-lived SCs for which an EP or IL commodity aging management review will be performed.

The staff agrees with the BGE methodology recognition that a qualified life does not necessarily have to be based on calendar time. A qualified life based on run time or cycles are examples of qualified life references that are not based on calendar time. Therefore, the staff finds that the pre-evaluation scoping process meets the requirements of 10 CFR 54.21(a)(1) regarding which SCs are subject to an aging management review for license renewal and therefore is acceptable. The staff, however, may review, on an application specific basis the specific application of the BGE's "passive" and "long-lived" screening of specific components to ensure this screening methodology is implemented consistent with the license renewal rule.

3.6 Aging Management Review

Section 6 of the BGE methodology describes the process of performing an aging management review. The BGE process is divided into whether an explicit evaluation of age-related degradation mechanisms would be performed. The BGE methodology indicates that in some circumstances, the effects of aging may be demonstrated to be adequately managed without an explicit evaluation of the age-related degradation mechanisms. The BGE methodology also indicates that in other instances, the effects of specific age-related degradation mechanisms on the intended functions would be evaluated.

The staff notes that the final rule does not require the specific identification of age-related degradation mechanisms. The final rule requires a

demonstration that the effects of aging will be adequately managed so that the intended functions are maintained consistent with the CLB for the period of extended operation. It is the applicant's option to discuss specific age-related degradation mechanisms as long as the effects of aging on the intended functions are identified and adequately managed for renewal. The staff finds the BGE process relating to whether the age-related degradation mechanisms would be explicitly evaluated acceptable because the BGE process evaluates aging management programs to ensure the effects of aging will be adequately managed for renewal.

During the review, the staff had a question about how the BGE methodology would consider operating experience, including how existing programs resulting from responses to NRC generic communication would be factored into the IPA. BGE responded to indicate that a specific site process exists that already evaluates and incorporates operating experience into plant documentation, maintenance, and operation. The staff finds the BGE response acceptable because the BGE methodology will review aging management programs, including existing programs resulting from responses to NRC generic communication, to identify programs necessary to manage the effects of aging for renewal.

Also, during the review, the staff had a question about the reliability of certain aging management programs. For instance, ultrasonic examinations and use of Appendix VIII on performance demonstration of the 1989 Addenda to the 1989 edition of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel code were discussed. BGE responded to indicate that the reliability of any specific program will be addressed when BGE demonstrates the adequacy of any credited aging management program in specific renewal aging management technical reports to be submitted. The staff finds the BGE response acceptable. Further, the staff would find the reliability of ultrasonic examination adequate if Appendix VIII of Section XI is followed in the BGE renewal technical reports.

3.6.1 Effects of Aging are Managed Without Specifically Evaluating Age-Related Degradation Mechanisms

The BGE process indicates that an explicit evaluation of the age-related degradation mechanisms would not be performed for four cases described in Section 6 of the BGE methodology. The staff evaluation of these four cases is discussed in Sections 3.6.1.1 through 3.6.1.4 of this safety evaluation.

3.6.1.1 Complex Assemblies Whose Only Passive Function is Closely Linked to Active Performance

The BGE process indicates that for some complex assemblies of structures and components, the principal intended function is an active function. Some of their components are subject to an aging management review because the components contribute to a passive pressure-retaining function to support the active functions of the entire assembly.

The BGE methodology cites the diesel generator supporting equipment as an example. It indicates that there would be a readily observable effect on the diesel generator performance if the pressure-retaining components of the supporting equipment deteriorated significantly.

The staff had a question that the periodic diesel generator test alone would not provide assurance that the diesel will start and run properly under all applicable design conditions. While the test verifies that the diesel will perform if all the support systems function, it provides little information related to the material condition of the support systems and their ability to withstand design basis event loads. For example, a seismic event could cause a diesel support system, such as the diesel embedment plate anchors or the fuel oil tank, to fail if the effects of aging on the support system are not managed during the period of extended operation.

The BGE methodology has since been modified to indicate that when particular performance and condition monitoring programs may only provide reasonable assurance that the intended functions can be performed under normal loading conditions, additional evaluation and/or inspection will be required in order to detect the effects of aging so as to ensure the ability to perform intended functions under certain more severe loading conditions which are part of the CLB. The staff finds this portion of the BGE process as modified acceptable because the effects of aging on the intended functions under CLB design conditions would be considered.

3.6.1.2 Component Assemblies Subject to Complete Refurbishment

The BGE process indicates that for some complex assemblies of structures and components, the entire assembly is subject to a program which requires complete refurbishment at periodic intervals. Components of such assemblies may be subject to an aging management review because their pressure-retaining function supports the active functions of the assembly. Deterioration of the pressure-retaining components would be discovered and corrected during the refurbishment activities before the deterioration could affect the intended function of the assembly in a manner not consistent with the CLB. The BGE methodology cites the main steam isolation valve operator as an example.

The staff finds this portion of the BGE process acceptable because the process states that the assembly components and subcomponents, including the pressure boundaries, are inspected for signs of aging and other degraded conditions. Thus, the effects of aging of the pressure-retaining components could be adequately managed for renewal without an explicit evaluation of age-related degradation mechanisms. The staff notes, however, that in the instances where such a process is used, the staff would expect the LR application to contain the criteria and rationale for performing refurbishment such that the staff can evaluate whether the effects of aging on structures and components are adequately managed by refurbishment.

3.6.1.3 Structures and Components Subject to Replacement on Condition

The BGE process indicates that there are cases where a passive structure or component is replaced based on an indication of the structure and component condition and appropriate acceptance criteria. The BGE methodology cites heat exchanger retubing as an example.

Condition monitoring programs assess passive aspects of structures and components based on inspection activities. The staff finds this portion of the

BGE process acceptable because the license renewal rule focuses on ensuring the passive functions of structures and components through aging management. Condition monitoring may be utilized as one way to perform such aging management.

3.6.1.4 Long-lived EQ components

The BGE process indicates that components subject to EQ which have qualified lives of 40 years or greater are subject to a TLAA evaluation according to Section 8 of the BGE methodology. Section 8 of the BGE methodology describes the process for evaluating TLAAs in accordance with requirements in 54.21(c). The staff finds this portion of the BGE process acceptable because EQ is a TLAA and is required to be evaluated in 54.21(c) to ensure functionality for renewal.

The BGE process also indicates that some portions of passive EQ components may not be covered by the EQ programs. For example, the EQ program only qualifies the organic material of a solenoid valve. Thus, the BGE process indicates that a separate aging management review will be performed for portions of passive EQ components which are not covered by the EQ program.

The staff also finds this portion of the BGE process acceptable. EQ programs, under 54.49, typically exclude consideration of aging of metallic components, such as corrosion of metal casing during normal plant service. The BGE process would include aging of metallic components which complements the EQ programs.

3.6.2 Performing Aging Management Review by Evaluating Aging Mechanisms

3.6.2.1 Identifying Plausible Age-Related Degradation Mechanisms

When evaluating the effects of specific age-related degradation mechanisms on the intended functions, the BGE process identifies plausible age-related degradation mechanisms.

The BGE process creates an initial list of potential age-related degradation mechanisms. If a system contains several structures and components with similar characteristics, such as materials, service environment, and design, the BGE process may group these structures and components for a common evaluation. Groups may be further subdivided into the individual subcomponents which make up the components in the group if this facilitates the subsequent evaluation, for example, subcomponents that do not perform any intended functions may be identified and excluded from an aging review.

The BGE process then identifies the plausible age-related degradation mechanisms. For each age-related degradation mechanism/subcomponent combination, if the age-related degradation mechanism does not affect the material, is not perpetuated by the environment or occurs to such a small degree that the intended function is maintained, the age-related degradation mechanism is designated by BGE as not plausible for the subcomponent.

The staff finds this portion of the BGE process acceptable because the applicable aging effects would be identified.

3.6.2.2 Methods to Manage Effects of Aging

The BGE methodology indicates that one of the goals of aging management is to manage the effects of aging such that the intended functions are maintained consistent with the CLB. The BGE process states that the site maintenance strategy consists of the following four phases:

(1) Discovery
(2) Assessment/Analysis
(3) Corrective Action
(4) Confirmation/Documentation

Discovery is the first phase of the BGE maintenance strategy and uses discovery techniques, such as visual inspection, eddy current testing, and ultrasonic examination, to identify the effects of aging. After degradation is discovered, the BGE process indicates that the last three phases of the strategy, that is, assessment/analysis, corrective action, and confirmation/documentation, are required by the CLB.

The staff concurs with BGE that once degradation is discovered, the CLB process would ensure that assessment/analysis, corrective action, and confirmation/documentation would be appropriately performed to maintain the intended functions under CLB design conditions. However, similar to the staff's concern discussed in Section 3.6.1.1 of this safety evaluation, the staff was concerned that the methodology did not link the selection of "discovery" methods to the goal of maintaining intended function under CLB design conditions. In essence, the methodology did not provide the staff the confidence that, if implemented, the aging management review would be focused on discovering aging effects in a timely manner to provide reasonable assurance that the structure or component's intended would be maintained under all CLB design conditions.

In response, BGE revised the methodology to state that the discovery methods may require augmentation for license renewal to ensure that the effects of aging are discovered in a timely manner such that there is reasonable assurance that the CLB will be maintained. In addition, BGE states that one of the goals of aging management is to manage the effects of aging such that the intended functions are maintained consistent with the CLB. BGE emphasizes that each phase of the maintenance strategy would take this goal into consideration when determining the adequacy of an existing or proposed program or activity. The staff finds this portion of the BGE process as modified acceptable because it meets the 10 CFR 54.21(a)(3) language of "consistent with the CLB" and it does not prevent the staff from pursuing aging management issues in the actual technical reviews. When BGE submits their renewal aging management technical reports, the staff review would verify that the discovery methods proposed by BGE are appropriate to ensure the intended functions under CLB design conditions.

The BGE process indicates that the selection of the appropriate method for detecting aging effects, is performed through an expert panel review of each plausible age-related degradation mechanism/subcomponent combination. The expert panel considers (1) existing plant programs, such as inservice

inspection programs, (2) site issue reporting and corrective action programs, (3) plant modifications, (4) age-related degradation inspections, and (5) industry operating experience. The NRC staff will review the proposed aging management program when a renewal application is submitted.

Existing plant programs consist of programs such as inservice inspection and preventive maintenance. Site issue reporting programs involve aging degradation observed in the vicinity of work areas and are intended to be a complementary programs. Plant modifications would consider improving the equipment resistance to the effects of aging. Age-related degradation inspections consist of two distinct cases: inspections to support a determination that the effects of aging is or is not plausible, and inspections to validate the effectiveness of programs to mitigate the effects of aging. Monitoring industry operating experience is a proactive activity to discover unknown and theorized aging mechanisms.

The staff finds this portion of the BGE process acceptable in detecting aging effects because the guidance of the expert panel in conjunction with the wide range of programs reviewed by the expert panel should provide information in developing the appropriate discovery technique. As discussed earlier, BGE indicates that the discovery methods may require augmentation for license renewal to ensure that the effects of aging are discovered in a timely manner such that there is reasonable assurance that the CLB will be maintained.

The BGE process also indicates a need to address unresolved GSIs or USIs related to the effects of aging in accordance with the guidance in the SOC accompanying the final rule. This is acceptable to the staff.

3.7 Commodity Evaluations and Scoping

The staff reviewed BGE's commodity evaluations methodology contained in Section 7 of the BGE report and finds that the performance of aging management reviews on commodities of components as described in the report is a logical and efficient approach provided that the commodities evaluated are grouped by similar characteristics such as design, function, and environment. Grouping commodities in such a manner provides reasonable assurance that the aging degradation considered occurs at essentially the same rates and to the same degree for all SCs within that commodity and that any aging management will be equally effective for all SCs within the commodity group. Since BGE's methodology requires that commodity groups be generated based on similar characteristics such as design, function, and environment, the BGE proposal to perform aging management on certain SCs via commodity evaluations is acceptable.

In addition, the BGE commodity evaluation methodology provides for a modified scoping process for several commodity groups. The staff reviewed these modified approaches to determine if they are consistent with the license renewal rule and also provide reasonable assurance that the SCs that require an aging management review will be identified. The staff's evaluation of the scoping aspects of the various commodity groups and any unique aging management review steps are discussed below:

3.7.1 Electrical Panels

Electrical panel (EP) scoping is performed utilizing the system level, component level, and pre-evaluation level scoping steps discussed earlier. EPs are grouped by common material, function, and environment and an aging management review is performed in accordance with Section 6.2 of the BGE methodology. Since the EP commodity evaluation process provides for scoping as discussed and evaluated earlier, the staff finds it to provide reasonable assurance that all EPs within the scope of license renewal and subject to an aging management review will be identified.

3.7.2 Instrument Lines

Scoping for instrument lines is also performed utilizing the system level, component level, and pre-evaluation level scoping steps discussed earlier. The BGE methodology for scoping IL components will include small branch instrument lines such as tubing, fittings, and hand valves because of their pressure-retaining boundary. However, the BGE methodology will exclude associated instrumentation, such as water level transmitters, differential pressure transmitters, and pressure switches, from an aging management review because they are excluded by rule and also because they do not contribute significantly to the pressure-retaining boundary.

The staff finds the grouping of instrument lines as a commodity for aging management acceptable because the aging evaluation of instrument lines will be performed and grouping is an efficient method to address similar equipment.

The staff agrees with the BGE methodology to exclude "active" instrumentation, such as water level transmitters, differential pressure transmitters, and pressure switches, from an aging management review. This is because 54.21(a)(1)(i) explicitly excludes pressure transmitters, pressure indicators, and water level indicators, as examples of "active" components which perform their intended functions with moving parts or with a change in configuration or properties, from an aging management review. In addition, the staff agrees with BGE that the pressure-retaining boundary of these "active" instrumentation is also excluded from an aging management review. This is because while 54.21(a)(1)(i) explicitly states that pumps and valves are excluded from an aging management review, with the explicit exception of their pressure-retaining boundary, no such exception is stated when excluding pressure transmitters, pressure indicators, and water level indicators from an aging management review.

However, BGE methodology indicates that the pressure retaining boundary of "active" instrumentation is excluded from an aging management review in part because the instrumentation does not contribute significantly to a pressure retaining function. The staff believes that this BGE reasoning may not be entirely consistent with the intent of the final rule. The staff believes that the pressure retaining boundary of "active" instrumentation may be excluded from an aging management review because "functional degradation resulting from the effects of aging on active functions is more readily determinable, and existing programs and requirements are expected to directly detect the effects of aging." (60 FR 22472) "Active" instrumentation is sensitive equipment

which is subject to extensive surveillance and testing. For example, technical specification surveillance programs will detect degradation of the passive, pressure retaining function of pressure transmitters from the effects of aging on the active function through response-time testing.

3.7.3 Cables

As discussed in Section 2.6.1, the BGE methodology does not perform any scoping of cables to determine which cable types meet the criterion of 54.21(a)(1). BGE considers all cables subject to an aging management review. BGE generates the complete list of cables and their locations at CCNPP by reviewing their circuit and raceway database and design drawings. Therefore, the staff finds that such a review provides reasonable assurance that all cables at CCNPP will be identified and since BGE considers all cables subject to an aging management review, there is reasonable assurance that all cables meeting the requirements of 10 CFR 54.21(a)(1) will be identified.

BGE's methodology for performing an aging management review of cables separates cables into EQ cables and non-EQ cables. BGE utilizes its TLAA evaluation process for its aging management review for EQ cables. The staff finds this approach to be acceptable since EQ is a TLAA issue and 10 CFR 54.21(c) requires an evaluation to address the TLAA associated with these components.

The remaining non-EQ cables are grouped by common material characteristics and environment in accordance with Section 6.2.2, SC Grouping, of the BGE methodology. Those groups of cables that are found not to be subject to plausible aging mechanisms are determined not to require aging management. The staff finds this acceptable because aging management should not be required if it can be shown that no plausible aging can take place.

Of the remaining cables, the methodology determines which groups of cables meet the requirement of 10 CFR 54.4 for being within the scope of the license renewal rule and determines appropriate aging management alternatives for these cables in accordance with Section 6.3 of the BGE methodology. The staff finds this approach acceptable because the rule does not require aging management for structures and components that are not within the scope of the license renewal in accordance with 10 CFR 54.4.

3.7.4 Cranes/Fuel Handling Equipment

The staff finds that the BGE commodity methodology for the cranes and fuel handling equipment commodity utilizes the system level, component level scoping, and pre-evaluation scoping processes discussed earlier, however, the pre-evaluation step only determines whether the SC is passive. The staff finds this acceptable because such a screening process includes "long-lived" SCs as well as "short-lived" SCs, and therefore, conservatively includes more SCs as being subject to an aging management review than required by the license renewal rule.

3.7.5 Component Supports

As described in Section 2.6.3 of this safety evaluation, the BGE methodology for component supports generates a generic list of component support types by reviewing the system level scoping results, ASME Section XI component support inspection documentation, and SQUG guidance. The methodology then systematically applies this generic list to both the system level scoping results and the component level scoping results to determine the complete list of component support types within the scope of license renewal. These component support types are then evaluated for aging management in accordance with Section 6.2 of the BGE methodology. The staff finds that the scope and breadth of documentation utilized to generate a list of generic component support types at CCNPP provides reasonable assurance that all component supports at CCNPP will be included in such a list, and further that the process of applying this list to the system level and component level scoping results provides reasonable assurance that all component supports within the scope of license renewal and subject to an aging management review, in accordance with 10 CFR 54.21(a)(1) will be identified.

3.7.6 FP Equipment

As discussed in Section 2.6.4, the BGE methodology identifies systems that are within the scope of license renewal due primarily to their FP functions. The commodity evaluation methodology performs a modified component level scoping process on these systems. The component level scoping process described in Section 4.1.1 of the BGE methodology is utilized except that the function catalogs that are generated do not include any active functions. The pre-evaluation scoping step is then performed on the results of this modified component level scoping step to determine "short-lived" versus "long-lived". The staff finds this approach acceptable in that it yields the same results as if the function catalogs included active functions and were then screened out during the pre-evaluation step.

3.8 Time-Limited Aging Analysis Evaluation

Section 8 of the BGE methodology describes the process for evaluating TLAAs in accordance with requirements in 54.21(c). The BGE process indicates that the CLB will be searched to identify TLAAs and exemptions based on TLAAs. The definition of TLAA in 54.3 is used as criteria to identify TLAAs. The staff finds the BGE process to identify TLAAs acceptable because the search is based on the rule definition of TLAA and CLB documents that are being searched.

The BGE process indicates that an option in evaluating TLAAs is given in 54.21(c)(1)(iii) to demonstrate that the effects of aging on the intended function will be adequately managed for the period of extended operation. Because the IPA also requires a demonstration that the effects of aging are adequately managed, the only remaining step in the BGE process is to review the IPA results to ensure that the TLAA evaluation requirements are met.

BGE has elected to use the IPA to satisfy the requirement to evaluate TLAAs for renewal. The staff finds this portion of the BGE process acceptable because

the TLAA will be evaluated. Where the TLAA is evaluated is not important as long as there is a "pointer" to a distinct portion of the IPA where the TLAA is evaluated for renewal in accordance with 54.21(c).

However, the staff indicated in the request for additional information that TLAAs generally address aging effects that are difficult to be directly monitored. For example, there are currently no acceptable non-destructive methods to measure the extent of embrittlement of a reactor vessel. Also, there are currently no acceptable non-destructive methods to measure the integrity of cables. Thus, in general, it may be unrealistic to rely on the IPA to completely address TLAAs in 54.21(c)(1)(iii). In response, BGE revised their methodology to indicate that for these situations, the IPA may involve extending the TLAA or justifying that the current analysis remains valid for the period of extended operation in accordance with 54.21(c)(1)(i) and (ii). This is acceptable to the staff.

The BGE process indicates that when extending an existing analysis or justifying that the existing analysis remains valid, the techniques used to perform these tasks are those widely accepted in the regulations or national codes and standards which govern the TLAA. The BGE methodology cites the pressurized thermal shock rule (50.61) as an example. The staff finds this portion of the BGE process acceptable, however the staff wishes to clarify that the applicable analysis technique can be the one that is in effect in the plant's CLB at the time of renewal application.

By letter dated January 11, 1996, BGE indicates that the timing for performing the TLAA evaluation will be addressed in the BGE renewal technical report on TLAAs which will be submitted later in 1996. The staff concurs with BGE that the specific timing for evaluating TLAAs may be deferred to the detailed technical review of the BGE TLAA technical report.

Further, the BGE process indicates a need to address unresolved GSIs or USIs related to TLAAs in accordance with the guidance in the SOC accompanying the final rule. This is acceptable to the staff.

4.0 CONCLUSIONS

Based on the evaluation of BGE's Integrated Plant Assessment Methodology as discussed above, the NRC staff concludes that the BGE methodology sufficiently describes and justifies an acceptable process for identifying SCs at Calvert Cliffs, Units 1 & 2 that are subject to an aging management review for license renewal and therefore would meet the requirement of 54.21(a)(2). In addition, this process, if implemented, provides reasonable assurance that all SCs subject to an aging management review pursuant to 10 CFR 54.21(a)(1) will be identified. The NRC staff, however, may review, on an application specific basis, BGE's implementation of this methodology to ensure that all SCs requiring an aging management review are identified.

Additionally, the NRC staff concludes that the process described in the methodology for demonstrating that aging effects will be adequately managed

pursuant to 10 CFR 54.21(a)(3) and for evaluating time-limited aging analyses pursuant to 10 CFR 54.21(c) are conceptually sound and consistent with the intent of the license renewal rule.

Finally, the NRC staff concludes that the issue of whether the methodology provides for a sufficient level of detail in a license renewal application for the staff to make its findings and the issue regarding the timing of TLAA evaluations shall be reserved for specific BGE application related license renewal technical reports.

5.0 CORRESPONDENCE

1. Letter to U.S. Nuclear Regulatory Commission from Robert E. Denton of Baltimore Gas and Electric Company dated March 2, 1993. This letter transmitted the "Calvert Cliffs Nuclear Power Plant Integrated Plant Assessment Methodology Volume 1: Systems, Structures and Components Screening."

2. Letter to U.S. Nuclear Regulatory Commission from Robert E. Denton of Baltimore Gas and Electric Company dated March 12, 1993. This letter transmitted additional portions of the "Calvert Cliffs Nuclear Power Plant Integrated Plant Assessment Methodology Volume 1: Systems, Structures and Components Screening."

3. Letter to Robert E. Denton of Baltimore Gas and Electric Company from Dennis M. Crutchfield of the NRC dated March 21, 1994. This letter transmitted the staff's draft safety evaluation on BGE's March 1993 methodology report.

4. "Summary of Meeting with Baltimore Gas and Electric Company (BGE) Concerning License Renewal" dated March 20, 1995, prepared by Stephen T. Hoffman for a meeting held on March 8, 1995.

5. Letter to U.S. Nuclear Regulatory Commission from Robert E. Denton of Baltimore Gas and Electric Company dated August 18, 1995. This letter transmitted the revised "Calvert Cliffs Nuclear Power Plant Integrated Plant Assessment Methodology" based on the NRC amended license renewal rule.

6. Letter to U.S. Nuclear Regulatory Commission from Robert E. Denton of Baltimore Gas and Electric Company dated November 8, 1995. This letter submitted a schedule for submitting license renewal documentation and revised their request for NRC staff review of the "Calvert Cliffs Integrated Plant Assessment Methodology."

7. Letter to Robert E. Denton of Baltimore Gas and Electric Company from John P. Moulton of the NRC dated November 16, 1995. This letter was a request for additional information that submitted 40 questions and 14 level of detail comments to BGE concerning their "Calvert Cliffs Nuclear Power Plant Integrated Plant Assessment Methodology."

8. "Summary of Meeting Between the NRC Staff and Baltimore Gas and Electric to Discuss the Request for Information on Integrated Plant Assessment Methodology Report" dated December 22, 1995, prepared by John P. Moulton for a meeting held on December 6, 1995.

9. Letter to U.S. Nuclear Regulatory Commission from Robert E. Denton of Baltimore Gas and Electric Company dated December 15, 1995. This letter provided BGE's response to the NRC staff request for additional information dated November 16, 1995.

10. Letter to U.S. Nuclear Regulatory Commission from Robert E. Denton of Baltimore Gas and Electric Company dated December 20, 1995. This letter provided proposed changes to the "Integrated Plant Assessment Methodology."

11. Letter to U.S. Nuclear Regulatory Commission from Robert E. Denton of Baltimore Gas and Electric Company dated January 11, 1996. This letter provided Revision 1 to the "Integrated Plant Assessment Methodology."