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December 20, 1995

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
Proposed Changes to "Integrated Plant Assessment Methodology" (TAC Nos. M93326 and M93327)

REFERENCES:

(a) Public Meeting between NRC's and BGE's License Renewal Staffs, dated December 6, 1995, Discussions on Responses to a Request for Additional Information (RAI) Concerning the Baltimore Gas and Electric Company Report Entitled, "Integrated Plant Assessment Methodology"

(b) Letter from Mr. R. E. Denton (BGE) to Document Control Desk (NRC), dated December 15, 1995, "Response to Request for Additional Information (RAI) Concerning the Baltimore Gas and Electric Company Report Entitled, "Integrated Plant Assessment Methodology, dated August 18, 1995" (TAC Nos. M93326 and M93327)

At the public meeting held on December 6, 1995 (Reference a), Baltimore Gas and Electric Company committed to provide a marked-up revision (attached) of the Integrated Plant Assessment Methodology that incorporates the responses provided in Reference (b). By January 12, 1996, we will forward a final version of the revised methodology.

A001
1/1

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

Very truly yours,

for
R. E. Denton
Vice President - Nuclear Energy

RED/JMO/bjd

Attachment As Stated

cc: (Without Attachment)
D. A. Brune, Esquire
J. E. Silberg, Esquire
L. B. Marsh, NRC
D. G. McDonald, Jr., NRC
S. F. Newberry, NRC
S. A. Reynolds, NRC
T. T. Martin, NRC
Resident Inspector, NRC
R. I. McLean, DNR
J. H. Walter, PSC
T. Tipton, NEI

CALVERT CLIFFS NUCLEAR POWER PLANT
INTEGRATED PLANT ASSESSMENT METHODOLOGY

1.0 INTRODUCTION

The purpose of this Methodology is to document the plant-specific process used for conducting the Integrated Plant Assessment (IPA) for Aging and the Time-Limited Aging Analysis (TLAA) Review for the Calvert Cliffs Nuclear Power Plant (CCNPP) in order to produce the information specified in the License Renewal (LR) Rule Section 54.21 (Contents of Application - Technical Information).

During the performance of the IPA process steps described in this methodology, all plant structures and components (SCs) which are subject to aging management review (AMR) are identified. For the identified SCs, justification is developed that demonstrates that the effects of aging on the intended functions of these SCs are adequately managed (see definitions).

In addition to the IPA process, this methodology describes the TLAA review process which complements the IPA. This review identifies TLAAs in the CCNPP Current Licensing Basis (CLB) which meet the specific criteria defined in the LR Rule. It also identifies exemptions still in effect which are based on a TLAA. For each of the identified analyses, the review task provides justification that the analysis is valid for the period of extended operations, provides a means for updating the analysis so that it will be valid for the period of extended operation or documents that the aging issue covered by the TLAA is adequately managed.

The IPA process for CCNPP has been divided into several distinct tasks. Each of these tasks, as well as the TLAA review task, will be discussed in subsequent sections of this methodology. The purpose of this section of the methodology is to provide general background information regarding the Baltimore Gas & Electric Company (BGE) Life Cycle Management (LCM) Program and to briefly introduce the topics presented in the following sections of IPA Methodology.

1.1 Background

Baltimore Gas and Electric Company has embarked on a comprehensive, long-term LCM Program for CCNPP, Units 1 and 2. The LCM Program directly supports BGE's Corporate Operational Strategy of preserving the long-term operation of CCNPP. In this capacity, the LCM Program governs the major evaluations to determine the reconfiguration of systems and structures (SSs) to improve reliability, increase availability, reduce operations and maintenance cost, provide recommendations to the capital improvement plan for the site, prepare License Renewal Applications (LRAs) for both Units, as well as contingency plans for decommissioning. The LCM Program also coordinates site activities regarding reactor vessel issues (including pressurized thermal shock [PTS]) and provides input to corporate Generation Planning and Accounting offices for strategic generation planning. Additional services governed by the LCM Program include project management of the 24-month cycle project, the Instrumentation and Controls Upgrade Project and Power Uprate Feasibility Studies.

Because of its role in preserving the long-term operation of CCNPP, the LCM Program has integrated specific design, engineering, operations, and maintenance activities to focus attention on material conditions and aging management. The LCM Program involves all five Nuclear Energy Division departments and a number of other BGE divisions.

1.2 Methodology Summary

The BGE IPA methodology is based on the premise that, with the possible exception of the detrimental effects of aging on the functionality of certain systems, structures and components (SSCs) in the period of extended operation, the plant's CLB ensures an adequate level of safety for continued plant operations. Figure 1-1 illustrates the flow path of the BGE IPA, as implemented at CCNPP. The relationship between the IPA and the TLAA review is shown in Figure 1-2.

The Methodology is divided into eight sections. The contents of Sections 2.0 through 8.0 are summarized below.

Section 2.0, IPA Methodology Bases and Definitions, contains the following information:

- Definitions of important terms and acronyms that are integral to the IPA methodology.
- Assumptions and initial conditions on which the IPA methodology is based.
- Source documents which were used to develop the methodology.

Section 3.0, System Level Scoping, describes the scoping steps where SSs that perform specific functions (described in Section 54.4 of the LR Rule) are identified as the initial scope of equipment, which will be the subject of the IPA for aging.

Section 4.0, Component Level Scoping, describes how the SS intended functions are identified in more detail, and how individual components of the SS are evaluated to determine which components contribute to the intended functions. This section provides two parallel processes for component level scoping, one used for system components and the other for structural components.

Section 5.0, Pre-Evaluation, describes the various steps which are undertaken to determine which components are "subject to AMR" in the subsequent task of the IPA.

Section 6.0, AMR, describes how the determination is made that existing, modified or new programs or activities for those SCs subject to AMR adequately manage the effects of aging.

Section 7, Commodity Evaluations, describes alternate IPA process steps used at CCNPP for specific commodity groups.

Section 8.0, TLAA Review, describes the process for selecting TLAAs which need to be addressed for LR and methods for addressing the identified analyses.

IPA Flow Diagram

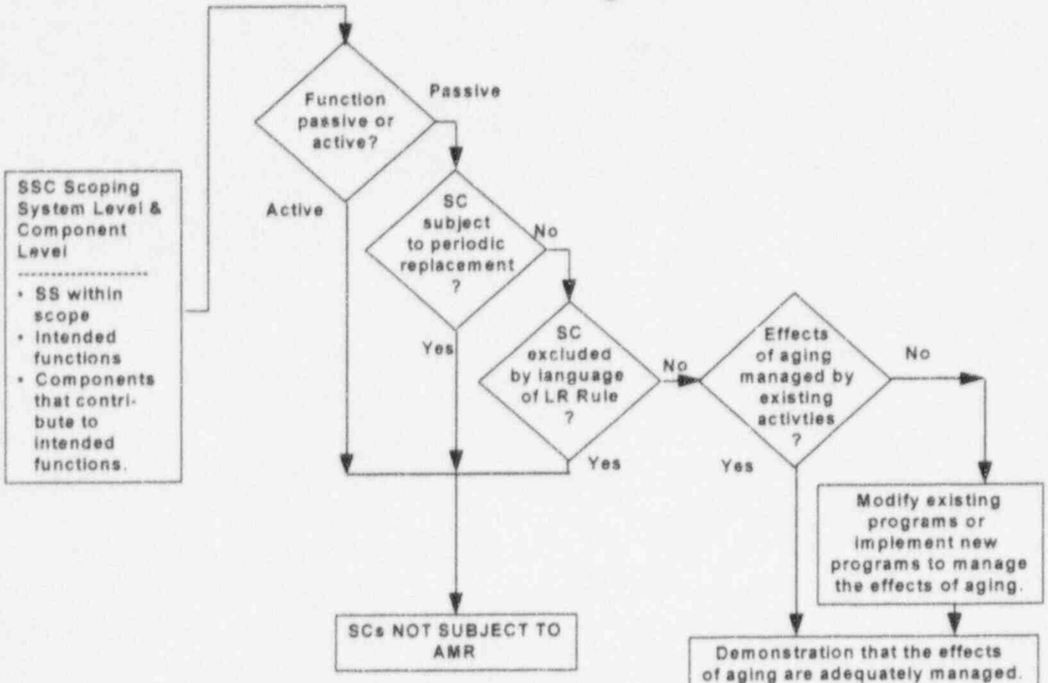

Figure 1-1

IPA Process and TLAA

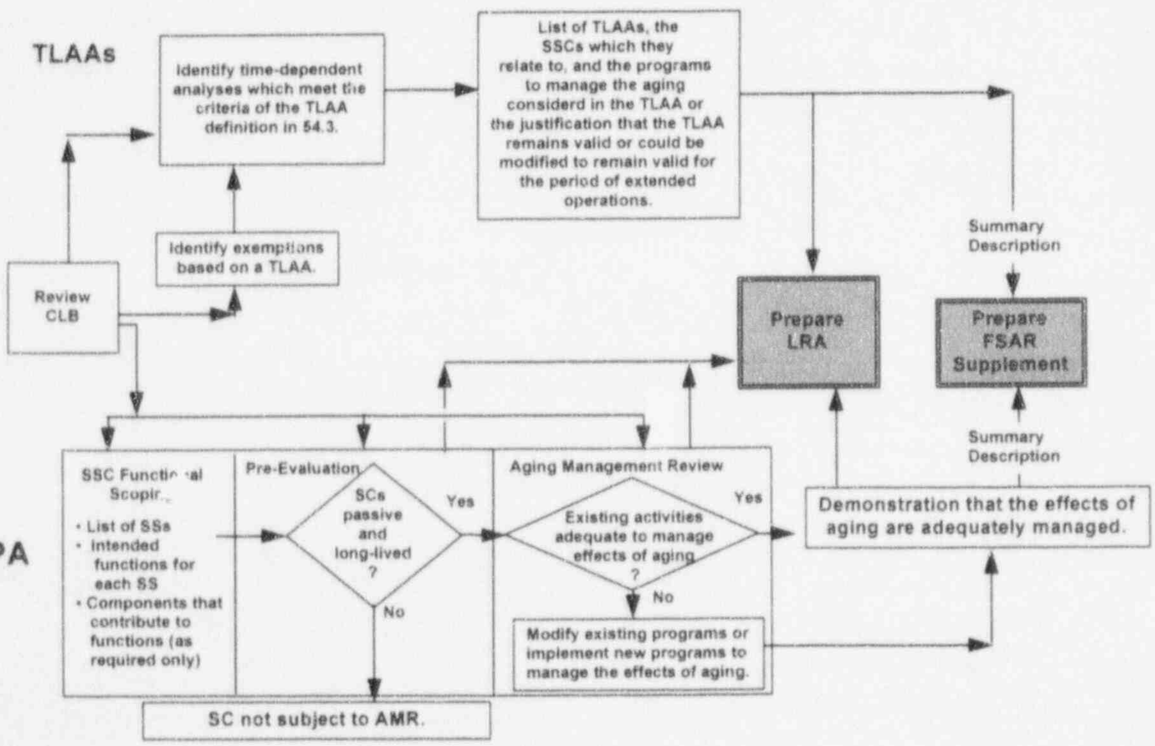

Figure 1-2

2.0 IPA METHODOLOGY BASES AND OVERVIEW

This section defines the terms and acronyms (Section 2.1) that are used throughout the methodology. Section 2.2 presents the assumptions and initial conditions on which the IPA methodology is based. Finally, Section 2.3 presents an overview of the methodology tasks.

2.1 Definitions

There are a number of terms and acronyms that are used throughout this methodology. These terms are defined below and the meaning of acronyms is provided in Table 2-1. Many of the following definitions, identified by *, are taken from the LR Rule, Sections 54.3, 54.4, 54.21, and 54.31 or from the Statements of Consideration to the Rule. The specific rule section which is the source of the definition is noted parenthetically for definitions marked with an asterisk. |

1. **Adequately Managed -** The effects of aging are adequately managed for a group of SCs if their intended passive functions will be maintained consistent with the CLB during the period of extended operations.

2. **Age-Related Degradation** - A change in SSC performance or physical or chemical properties resulting in whole or part from one or more aging mechanisms. Examples of this type of change include changes in dimension, ductility, fatigue resistance, fracture toughness, mechanical strength, polymerization, viscosity, and dielectric strength.

3. **Aging Mechanisms** - The physical or chemical processes that result in degradation. These mechanisms include, but are not limited to, fatigue, erosion, corrosion, erosion/corrosion, wear, thermal embrittlement, radiation embrittlement, microbiologically induced effects, creep, and shrinkage.

4. **Critical Safety Function (CSF)** - A condition or action that prevents core damage or minimizes radiation release to the public. A CSF may be fulfilled through automatic or manual actuation of a system or systems, from passive[1] system performance, from inherent plant design, or from operator action while following recovery guidelines set down in procedures. The seven CSFs include:

   Reactivity Control
   Reactor Coolant System (RCS) Pressure and Inventory Control
   RCS Heat Removal
   Containment Isolation
   Containment Environment Control
   Radiation Control
   Vital Auxiliaries (VA)

[1] The definition of CSF is taken directly from CCNPP Q-List documentation which pre-dates the current version of the LR rule. Therefore, the term "passive" in the CSF definition is not necessarily identical to the term defined in this methodology and used for convenience in the SOC accompanying 10 CFR Part 54.

5.(*) **Current Licensing Basis (CLB)** - The set of NRC requirements applicable to a specific plant and a licensee's written commitments for assuring compliance with and operation within applicable NRC requirements, and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The CLB includes the NRC regulations contained in 10 CFR Parts 2, 19, 20, 21, 30, 40, 50, 51, 54, 55, 70, 72, 73, 100, and appendices thereto; orders; license conditions; exemptions; and technical specifications. It also includes the plant-specific design basis information defined in 10 CFR 50.2, as documented in the most recent Final Safety Analysis Report (FSAR) as required by 10 CFR 50.71, and the licensee's commitments remaining in effect that were made in docketed licensing correspondence, such as licensee responses to NRC bulletins, generic letters, and enforcement actions, as well as licensee commitments documented in NRC safety evaluations or licensee event reports. [§ 54.3]

6. **Device Type (DT)** - A more specific categorization of components according to their function and design. Equipment types (ETs) are broken into a number of DTs. For example, the ET for valves include DTs hand valve, check valve, control valve, and others. Device types are the starting point for the grouping process in the AMR task. Components are grouped by DT as they enter this task. Device types may be divided to form more specific groups if needed, or the DT may define the component group for evaluation. Whenever the LR Rule calls for justifications for SCs, the discussions provided by the BGE IPA process are at the device-type level.

7. **Equipment Type (ET)** - A general categorization of components according to their function and design. Examples of specific ETs are valve, piping, instrument, etc. For those SCs subject to AMR, the list of age-related degradation mechanisms (ARDMs) which needs to be addressed is developed for each ET. Structural components are categorized into generic groupings of concrete/architectural and steel components.

8. **Extended Operations, Period of** - The additional amount of time beyond the expiration of the current operating license that is requested in the renewal application.

9. **Function Catalog** - A Function Catalog for a particular intended function of a system consists of the list of all system components required to support that intended function that are within the boundary of the given system.

10. **Functional Requirements** - The general, high level functions which an SS may be called on to perform. The functional requirements are used during the system- scoping process to establish conceptual boundaries so that when a detailed function is determined to be an intended function, the evaluator will know which SS to associate the function with. The term "functional requirements" is used to distinguish these high level functions from the detailed intended functions contained in the screening tools and used during the component level scoping process.

11.(*) **Integrated Plant Assessment (IPA)** - A licensee assessment that demonstrates that a nuclear power plant facility's systems, structures, and components requiring AMR in accordance with §54.21(a) for LR have been identified and that the effects of aging on the functionality of such SCs will be managed to maintain the CLB, such that there is an acceptable level of safety during the period of extended operations. [§54.3]

12.(*) **Intended Function** - I~~t~~hose functions that are the bases for including SSCs within the scope of LR. [§54.4b]

13. **Licensed Life** - The maximum period of operations, in calendar years, as defined by statute. For CCNPP, this period is 40 years.

14. **Life Cycle Management Evaluation Database (LCMEVAL)** - A computer-based application which is used to facilitate the component level scoping process for systems. The LCMEVAL was created, tested and documented, in accordance with the BGE Quality Assurance Program for Software Development, to justify its use in the safety-related (SR) scoping tasks. Master Equipment List data, Q-List data, drawing references, and other information useful in the scoping process are extracted one system at a time from controlled plant databases, loaded into LCMEVAL, and made available to the evaluator. The LCMEVAL helps to streamline the scoping process by automating key steps and facilitating storage and printing of the results.

15.(*) **Long-Lived** - Components are considered to be long-lived if they are not subject to periodic replacement based on qualified life or~~,~~ specified time period ~~or properly justified replacement on condition program~~. [§54.21(a)(1) ~~and Statements of Consideration (SOC), i.e., 60 FR at 22478~~]

16. **Maintenance Strategy** - A philosophy regarding the level and type of maintenance that a component will receive throughout its life cycle. An adequate maintenance strategy is defined by the following program attributes:

   a. **Discovery** - Identification of performance or condition degradation;

   b. **Assessment/analysis** - Comparison with criteria or other guidance to determine the degree of the degradation;

   c. **Corrective action** - Mitigation of the degradation; and

   d. **Confirmation/Documentation** - Verification and documentation that the intended function was restored from its degraded condition as a result of the corrective action.

17. **Master Equipment List (MEL)** - A compilation of the NUCLEIS Equipment Technical Database (NETD) technical data on equipment for a given system.

18.(*) **Nuclear Power Plant** - A commercial nuclear power facility of a type described in 10 CFR 50.21(b) or 50.22. [§ 54.3]

19. **NUCLEIS Database** - A mainframe computer-based information system used to initiate, plan, schedule, track and provide a history of maintenance for all plant components. NETD is an acronym used to denote the NUCLEIS Equipment Technical Database, which is that part of the NUCLEIS information system, indexed by component, which contains information specific to each component.

20.(*) **Passive** - A function is said to be passive if it is performed without moving parts ~~does not require motion~~ or a change in configuration or properties in order to perform the function during normal operating conditions or in response to an accident. [§ 54.21(a)(1)].

21. **Plant Event Evaluations** - Pre-existing evaluations which show compliance with regulations concerning fire protection (FP), environmental qualification (EQ), PTS, anticipated transients without scram (ATWS) and station blackout (SBO). These evaluations provide the bases for in-scope determinations under §54.4 Criterion 3.

22. **Plausible Age-Related Degradation Mechanisms (ARDMs)** - (See Aging Mechanisms) An ARDM is considered plausible for a specific component if, when allowed to continue without any prevention or mitigation measures or enhanced monitoring techniques, it could not be shown that the component would maintain its capability to perform its intended, passive function throughout the period of extended operation.

23. **Program/Activity (PA)** - A group of procedures, formal or informal, that provide reasonable assurance that SSCs are capable of fulfilling their intended functions. This may range from a formalized, long-established group of procedures to a one-time only procedure.

24.(*) **Renewal Term** - The period of time that is the sum of the additional amount of time beyond the expiration of the operating license (not to exceed 20 years) that is requested in the renewal application plus the remaining number of years on the operating license currently in effect. [§54.31(b)]

25. **Screening Tool** - A summary of source document(s) compiled through the research of an event/topic which contains lists of responding SSCs and their intended functions.

26. **Structure** - The term structure, when used as a stand-alone term in this methodology, refers to a building. When a component of a structure is referred to, the term "structural component" is used for clarity.

27.(*) **Structures and Components (SCs)** - The phrase "structures and components" applies to matters involving the IPA required by §54.21(a) because the AMR required within the IPA should be a component level review rather than a more general system level review. [SOC i.e., 80 FR ~~at~~ 22462] In this Methodology, the term "structural components and components" (SCs) refers to the component level concept.

28.(*) Systems, Structures and Components (SSCs) - Throughout these discussions, the term "systems, structures and components" is used when referring to matters involving the discussions of the overall renewal review, the specific LR scope[2], TLAA and the LR finding. [SOC i.e., 80 FR 22462]

29.(*) Structure or Component Subject to Aging Management Review - Structures and components subject to an AMR shall encompass those SCs:

(1) That perform an intended function, as described in §54.4, without moving parts or a change in configuration or properties; and

(2) That are not subject to replacement based on a qualified life or specified time period;~~ and~~

~~(3) That are not subject to replacement based on a properly justified replacement on condition program.~~ [§54.21(a)(1)~~ and SOC i.e., 60 FR 22478~~]~~.~~

30.(*) Systems, Structures, and Components within the Scope of LR - are:

(1) Safety-related SSCs, which are those relied on to remain functional during and following design basis events (DBEs) [as described in 10 CFR 50.49(b)(1)] to ensure the following functions:

(i) The integrity of the reactor coolant pressure boundary (PB);
(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or
(iii) The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposure comparable to the 10 CFR Part 100 guidelines.

(2) All non-safety-related (NSR) SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs (1) (i), (ii), or (iii) of this definition.

(3) All SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48), EQ (10 CFR 50.49), PTS (10 CFR 50.61), ATWS (10 CFR 50.62), and SBO (10 CFR 50.63). [§54.4a]~~.~~

31.(*) Time-Limited Aging Analysis (TLAA) - those licensee calculations and analyses that:

(1) Involve SSCs within the scope of LR as delineated in §54.4(a);

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2 Note that the CCNPP scoping process is a two-step process with the initial step being conducted at the SSC or system level. The second step is conducted at the component level and the term SCs applies in this step.

(2) Consider the effects of aging;

(3) Involve time-limited assumptions defined by the current operating term, for example, 40 years;

(4) Were determined to be relevant by the licensee in making a safety determination;

(5) Involve conclusions or provide the basis for conclusions related to the ability of the SSCs to perform its intended functions, as delineated in §54.4(b); and

(6) Are contained or incorporated by reference in the CLB.

[§54.3]

Table 2-1 List of Acronyms

AFW	Auxiliary Feedwater
AMR	Aging Management Review
ARDM	Age-Related Degradation Mechanism
ATWS	Anticipated Transient Without Scram
BGE	Baltimore Gas and Electric Company
CCNPP	Calvert Cliffs Nuclear Power Plant
CCW	Component Cooling Water
CEA	Control Element Assembly
CLB	Current Licensing Basis
CSF	Critical Safety Function
DBE	Design Basis Event
DT	Device Type
EP	Electrical Panel
EQ	Environmental Qualification
ET	Equipment Type
FP	Fire Protection
FSAR	Final Safety Analysis Report
GIP	Generic Implementation Procedure
II/I	Seismic two over one design criteria
IL	Instrument Line
IPA	Integrated Plant Assessment
IR	Issue Report
LCM	Life Cycle Management
LCMEVAL	Life Cycle Management Evaluation Database
LR	License Renewal
LRA	License Renewal Application
MEL	Master Equipment List
NETD	NUCLEIS Equipment Technical Database
NSR	Non-Safety-Related
PAM	Post-Accident Monitoring

Table 2-1 List of Acronyms	
PB	Pressure Boundary
PTS	Pressurized Thermal Shock
PWSCC	Primary Water Stress Corrosion Cracking
SBO	Station Blackout
SCs	Structures and Components
SG	Steam Generator
SOC	Statements of Consideration
SQUG	Seismic Qualification Utility Group
SR	Safety-Related
SS	System and Structure
SSCs	Systems, Structures and Components
SVP	Seismic Verification Project
TLAA	Time-Limited Aging Analysis
UFSAR	Updated Final Safety Analysis Report
VA	Vital Auxiliary

2.2 Assumptions and Initial Conditions

The IPA methodology relies on a number of basic assumptions and initial conditions. They include:

2.2.1 The scoping methodology assumes that the most effective approach in scoping SSCs is the use of two levels of scoping, i.e., system level and component level. This segregates SSCs into logical, manageable pieces and is similar to approaches used during design, construction, and operation.

2.2.2 The criteria underlying the system level and component level scoping processes are identical.

2.2.3 The purpose of the IPA methodology is to provide a basis for the procedures which implement the steps of the scoping task and the steps of the IPA. Sections 1 through 5 of the methodology implement the requirements of §54.21(a)(2) to describe and justify the methods used in §54.21(a)(1).

Sections 6, 7 and 8 go beyond the requirements of §54.21(a)(2) by describing the methods used to perform the AMR and TLAA review. However, the description of these methods should facilitate a better understanding of the results produced by these tasks. The results will be documented in the LRA and FSAR Supplement.

2.2.4 The IPA methodology is designed to make maximum use of existing BGE programs, system and equipment lists, documents, and databases to reduce duplication of effort and produce implementation results which reference equipment nomenclature already familiar to site personnel.

2.2.5 During the scoping task, tanks which are included in more than one site documentation system, e.g., both on the site structures list and as a component of a particular system in an MEL, are included only as components of a system during the IPA process.

2.2.6 Because the tasks described in this methodology are essential for providing the justification for the safety finding of §54.29, these tasks are performed in accordance with the BGE quality assurance program.

2.2.7 Structural components and components, which contribute to one or more passive functions and are long-lived, require evaluation to demonstrate that the effects of aging are adequately managed.

There are a variety of methods available for managing the effects of aging in order to assure the passive intended function. The appropriate method for a given situation depends on a number of factors, including the severity of the aging effects and the level of concern associated with degraded equipment condition. This correlation of the effects of aging to the appropriate level of aging management is discussed in detail in Section 6 of this methodology.

2.3 IPA Methodology Overview

The IPA methodology describes two scoping tasks, two IPA tasks, and the TLAA review task. Each is described briefly below.

2.3.1 System Level Scoping

System level Scoping (Section 3) establishes boundaries for plant SSs, develops screening tools which capture the §54.4 scoping criteria, and then applies the tools to identify SSs within the scope of LR.

2.3.2 Component Level Scoping

Component Level Scoping (Section 4) evaluates the components of SSs within the scope of LR to identify those which are required for the SS to perform its intended functions. Such components are designated as within the scope of LR.

2.3.3 Pre-Evaluation

Pre-evaluation (Section 5) determines which SCs, of those within the scope of LR, are subject to AMR. During the performance of this task, the following categories of SCs are eliminated from further IPA review:

- Those which contribute only to active functions;
- Those which are replaced based on time or qualified life; ~~and~~ and
- Those specifically excluded by the Rule language in 54.21(a)(1)(i).
- ~~Those which are replaced on the basis of a condition-based program. (Justification of the adequacy of such a replacement program is included in the LRA.)~~

The result of this task is the list of all SCs in the given system which will be subject to AMR.

2.3.4 AMR

The AMR task (Section 6) demonstrates that the effects of aging are adequately managed (see Definitions). Several different techniques for developing this justification are presented in this section. All the techniques provide the demonstration necessary~~an equivalent level of assurance~~ to support the finding of §54.29 with respect to the management of effects of aging.

2.3.5 Commodity Evaluations

Six commodity evaluations are described in Section 7 of the IPA Methodology. These techniques are used for a specific set of components found in a number of systems, but which perform the same or similar functions regardless of their system.

2.3.6 TLAA Review

The TLAA Review is described in Section 8 of the IPA methodology. This task searches the CCNPP CLB, independent of the IPA process, to locate issues related to the current operating life of the plant which also meet certain other specified criteria. For the identified TLAA, the justification is provided that the time-limited issue is or will be addressed through one of the three approaches specified in §54.21(c). Note that this task is not technically part of the IPA, but its description is included in the IPA Methodology for convenience.

TABLE 2-2

SOURCE DOCUMENTS

This list of documents represents the sources used for developing the IPA methodology. This table does not represent all references which might be used in actually performing the tasks described in the methodology. References used in the application of the methodology to a specific system are included in the implementing procedures and in the task-specific results.

1. Life Cycle Management/License Renewal Program Management Plan, Revision 2, April 1992

2. 10 CFR Part 54, "Nuclear Power Plant License Renewal, Final Rule," May 8, 1995

3. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities" (routinely updated)

4. 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," January 1, 1991

5. Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Updated Final Safety Analysis Report, Revision 17, November 1994

6. Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Technical Specifications Manual, through Amendment 205 (May 1995) for Unit 1, and Amendment 183 (April 1995) for Unit 2

7. CCNPP Design Standard, "Structure and Component Evaluation," (DS-011) Revision 0, June 7, 1995

8. CCNPP Design Standard "Control of Equipment Technical Databases," (DS-032) Revision 0, January 25, 1995

9~~8~~. CCNPP System Descriptions~~.~~, (various revisions)

10~~9~~. NRC Regulatory Guide 1.97, "Instrumentation for Light-Water Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," Revision 3

11~~0~~. CCNPP Plant Drawings (various)

12~~1~~. NUREG-1377, "Listing of Nuclear Plant Aging Research Reports," and the reports themselves

13~~2~~. Industry Technical Reports on PWR Reactor Vessel, PWR Reactor Vessel Internals, PWR Containment, PWR Reactor Coolant System, Class 1 Structures and Environmentally-Qualified Cables in Containment

3.0 SYSTEM LEVEL SCOPING

This section describes how all plant SSs are reviewed to determine those that are within the scope of LR. This is accomplished through application of the system-scoping process (Figure 3-1).

Determining which SSCs are within the scope of LR is the first major task described in the IPA methodology. Section §54.21(a)(1) of the LR Rule states that the IPA must be conducted -

> *For those systems structures and components within the scope of this part, as delineated in §54.4, . . .*

In other words, the results of the system level and component level scoping tasks are the starting point of the IPA.

System level scoping consists of several activities. Section 3.1 describes how SSs are identified and listed. Section 3.2 describes the development of conceptual boundaries for SSs. Section 3.3 describes the development of system screening tools. Section 3.4 describes how all in-scope SSs are identified. Section 3.5 describes how the scoping results are documented.

3.1 Identification of SSs

The SS listing for CCNPP is provided in Table 3-1. The CCNPP Design Standard for "Control of the Equipment Technical Databases," (See Table 2-1, Reference 8) was used to develop the list of systems at CCNPP. This approach ensures that system designations are consistent with those established for current site programs and the MEL. The structures list was obtained through a review of the latest revision to the Plant Property and Building Drawing No. 61-502-E. Tanks identified on this drawing are not included in the list of structures since tanks are included as components of associated systems.

3.2 Define Conceptual Boundaries

This step of the system level scoping process tabulates some basic information about each of the SSs listed in Table 3-1. This information, referred to as the "conceptual boundaries" of the SS, is needed to ensure a consistent understanding of what is meant by each of the SS names in this table.

The identification of the SS conceptual boundaries is accomplished by reviewing the CCNPP Updated Final Safety Analysis Report (UFSAR), Technical Specifications, and System Descriptions, as well as conducting interviews with experienced plant personnel. For each of the SSs listed in Table 3-1, a brief system description is developed and the functional requirements are identified. The description includes a listing of the major components and major system interfaces for each SS. The functional requirements list includes only the general, high level functions that an SS may be called on to perform. In the follow-on steps of the scoping process, whenever an intended function is identified, the conceptual boundaries allow the evaluator to determine which SS the intended function should be associated with. The list of functional requirements does not represent a detailed list of intended functions, but it is sufficient to establish the conceptual boundaries of SSs. The component level scoping task (described in Section 4) develops a detailed list of SS intended functions.

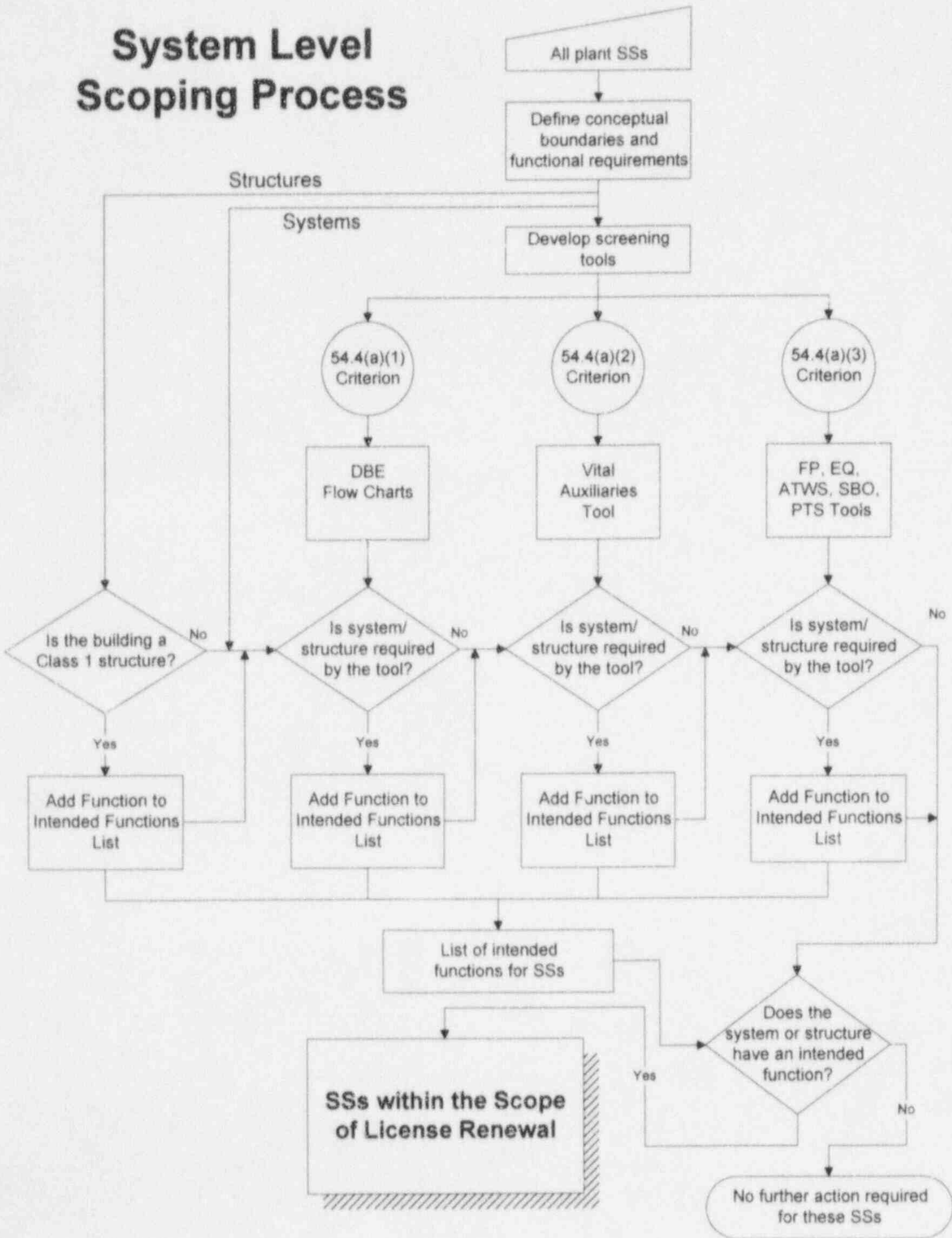
System Level
Scoping Process
All plant SSs
Define conceptual boundaries and functional requirements
Structures
Systems
Develop screening tools
54.4(a)(1) Criterion
54.4(a)(2) Criterion
54.4(a)(3) Criterion
DBE Flow Charts
Vital Auxiliaries Tool
FP, EQ, ATWS, SBO, PTS Tools
Is the building a Class 1 structure?
Is system/ structure required by the tool?
Is system/ structure required by the tool?
Is system/ structure required by the tool?
No
No
No
No
Yes
Yes
Yes
Yes
Add Function to Intended Functions List
Add Function to Intended Functions List
Add Function to Intended Functions List
Add Function to Intended Functions List
List of intended functions for SSs
Does the system or structure have an intended function?
Yes
No
SSs within the Scope of License Renewal
No further action required for these SSs

Figure 3-1

The following information is compiled for each SS and entered into a table designated as Table 1, "System/Structure Information:"

- System or structure name;
- Unit number;
- Identification number;
- Brief description, including major components and system interfaces;
- Source document reference (for the description);
- System or structure functional requirement(s); and
- Source document reference (for each functional requirement).

3.3 Screening Tools Preparation

Screening Tools are created during the scoping process in order to add efficiency to the process by allowing the evaluator to review each reference document only once, rather than once for each system. A screening tool is a summary of a source document or documents compiled through research of an event. The tool contains a list of SSCs which respond to the event and their intended functions.

The source documents identified in this section are reviewed against the §54.4 criteria contained in the LR Rule. For each criterion, appropriate information is taken from the source documents and summarized in one or more screening tools. The tools are then used to complete the screening process. Each tool is described below. An example of a portion of a screening tool is provided in Table 3-2.

3.3.1 Tools Addressing §54.4(a)(1) and (2)

10 CFR 54.4(a)(1) and (2) (referred to as §54.4 Criteria 1 and 2) are addressed together in the System Level Scoping process since both of these criteria were used to establish the CCNPP Q-List documentation.

§54.4 Criterion 1

(1) Safety-related systems, structures and components which are those relied on to remain functional during and following design-basis events [as defined in 10 CFR 50.49 (b)(1)] to ensure the following functions --

(i) The integrity of the reactor coolant pressure boundary;

(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(iii) The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposure comparable to the 10 CFR Part 100 guidelines.

§54.4 Criterion 2

(2) All nonsafety-related systems, structures and components whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraph (a)(1)(i), (ii) or (iii) of this section (i.e., §54.4).

3.3.1.1 DBE Flow Chart Preparation

The CCNPP UFSAR Chapter 14 DBE accident analyses listed below are reviewed. This list contains both design basis accidents and anticipated operational occurrences. No external events are analyzed in Chapter 14 of the CCNPP UFSAR. All structures designed to withstand DBE external events are designated as Class 1 structures at CCNPP, and Class 1 structures are included within the scope of LR (Section 3.4.1.2).

Design Basis Event	Chapter 14 Location
Control Element Assembly (CEA) Withdrawal Event	Section 2
Boron Dilution Event	Section 3
Excess Load Event	Section 4
Loss of Load Event	Section 5
Loss of Feedwater Flow Event	Section 6
Excess Feedwater Heat Removal Event	Section 7
RCS Depressurization	Section 8
Loss of Coolant Flow Event	Section 9
Loss of Non-Emergency AC Power	Section 10
Control Element Assembly Drop Event	Section 11
Asymmetric Steam Generator (SG) Event	Section 12
CEA Ejection	Section 13
Steam Line Break Event	Section 14
SG Tube Rupture Event	Section 15
Seized Rotor Event	Section 16
Loss of Coolant Accident	Section 17
Fuel Handling Incident	Section 18
Turbine-Generator Overspeed Incident	Section 19
Containment Pressure Response	Section 20
Hydrogen Accumulation in Containment	Section 21
Waste Gas Incident	Section 22
Waste Evaporator Incident	Section 23
Maximum Hypothetical Accident	Section 24
Excess Charging Accident	Section 25
Feed Line Break Event	Section 26

The CCNPP Q-List includes Accident Shutdown Flow Sheets[3] for 17 of the DBEs. Each Accident Shutdown Flow Sheet identifies the CSFs and plant functions supporting CSFs, which are necessary to reach safe shutdown for the DBE identified, maintain fission product boundaries, and prevent offsite releases in excess of established guidelines. These flow sheets also identify the supporting systems (as well as VA systems) which are required to satisfy the associated CSF. The DBE flow charts are a consolidation of Q-List Accident Shutdown Flow Sheets and any additional supporting systems identified as relied on for that accident in UFSAR Chapter 14.

For the eight DBEs which are identified in the UFSAR and are not the subject of Q-List Accident Shutdown Flow Sheets, a DBE flow chart is prepared by the system level scoping process. These DBE Flow Sheets contain the following information depending on the reason that no Q-List Accident Shutdown Flow Sheet was prepared (as documented in Q-List documentation).

3 The terms "Q-List Accident Shutdown Flow Sheet" and "Vital Auxiliaries Flow Sheets" are used to refer to documentation which already existed as part of the CCNPP Q-List. The terms "DBE Flow Chart" and "Vital Auxiliaries Screening Tool" are used to denote the document created during the scoping process to compile the Q-List information and other specified information.

Reason Why No Accident Shutdown Flow Sheet is in the Q-List	Information Included in Scoping Results DBE Flow Chart
No active components are relied on to mitigate the event.	Passive components which mitigate the DBE.
No active or Passive components are required to mitigate the event.	A note stating that no active or passive components are required to mitigate the event.
All components relied on for the event are already included in another Accident Flow Sheet.	A note stating that all components required to mitigate the event are included in another DBE Flow Sheet, and specifying which other DBE(s).

The DBE flow charts for the remaining 17 DBEs identify the systems and the functions provided by each of these systems in order to support the CSFs necessary to reach safe shutdown for the specific DBE, maintain the fission product barriers, and prevent offsite releases in excess of established guidelines.

Q-List documentation also contains a specific flow sheet for VAs. Electric power distribution; control air; cooling water; and heating, ventilation, and air conditioning functions for the SR equipment required to respond to each DBE are annotated in the corresponding Q-List Accident Shutdown Flow Sheet. The Q-List Vital Auxiliaries Flow Sheet is a compilation of the systems performing these VA functions for all of the Q-List Accident Shutdown Flow Sheets. The VA screening tool prepared during the system level scoping process duplicates the SSCs listed on the Q-List Vital Auxiliaries Flow Sheet using the SS nomenclature shown in Table 3-1.

All systems and functions identified in the DBE flow charts and the VA screening tool are coded (by shading) to identify the source document(s) (i.e., UFSAR, Q-List Manual, or both).

By relying on the Q-List Accident Shutdown Flow Sheets and Vital Auxiliaries Flow Sheets, all SR SSs are identified, as well as all SSs that could fail and prevent the functioning of SR SSCs. This identification is not limited to first level, second level or any specific level of support equipment. Rather, the scoping is performed consistent with the CCNPP Q-List Design Standard which was developed with the intent of identifying and controlling a similar[4] scope of SSCs to that defined by the first two criteria of §54.4. Therefore, the CCNPP scoping process is consistent with the Commission's intent stated in the SOC to the LR Rule.

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4 The CCNPP Q-List documentation also establishes controls for PAM (Category 1 and 2) equipment. Post-Accident Monitoring equipment satisfies §54.4 Criterion 3, rather than 1 or 2.

The Q-List data in the NETD is reviewed to identify items listed as 5049 (items which must meet the requirements of 10 CFR 50.49). A list of the systems containing components designated as EQ is prepared with the Q-List revision number (or date, as appropriate) provided as a reference.

The CCNPP UFSAR is reviewed to identify the systems containing components required for PAM category 1 or 2 variables (as defined in Regulatory Guide 1.97). A PAM System summary table is prepared. It lists each system which is required for PAM, the variable(s) it monitors, and the appropriate source document and revision.

3.3.2.3 PTS Screening Tool Preparation

Since neither CCNPP Unit 1 nor 2 is expected to require an evaluation in accordance with Regulatory Guide 1.154 in order to satisfy 10 CFR 50.61 requirements, no equipment is included within the scope of LR due to the PTS Rule. The PTS Screening Tool is provided in the System Level Scoping Results, but this tool merely notes that no SSCs are relied on for this event. Additionally, the System Level Scoping Results, the component level scoping process, and the component level scoping results for each system include the contingency to implement a PTS scoping criterion, but the results indicate no PTS-related SSCs. If a Regulatory Guide 1.154 evaluation is required at some point in the future, the scoping process would be modified to require incorporating the PTS functions relied on in the 1.154 analysis into the PTS Screening Tool. The Regulatory Guide 1.154 analysis would also trigger an update to the system level and component level scoping results to include the SSCs associated with the 1.154 functions within the scope of LR.

3.3.2.4 ATWS Screening Tool Preparation

The CCNPP UFSAR is reviewed to identify the system functions that address the 10 CFR 50.62 requirements on ATWS. An ATWS Screening Tool is developed. The tool lists the SSCs which are relied on in response to an ATWS event. For each identified SS, the tool lists the intended function(s) provided and the appropriate source documents with the revision number.

3.3.2.5 SBO Screening Tool Preparation

The Station Blackout Analysis is reviewed to identify SSs which are relied on during the "coping duration" phase of an SBO event. An SBO Screening Tool is prepared which lists the SSs relied on in the Station Blackout Analysis, the function(s) that each provides, and the appropriate source documents with revision numbers. The power restoration phase of the Station Blackout Analysis is specifically excluded from review in this criterion since several success paths for restoring power after an SBO are already screened as within the scope of LR due to Criterion 1 (SR).

An applicant for LR should rely on the plant's CLB, actual plant-specific experience, industry-wide operating experience, as appropriate, and existing engineering evaluations to determine those NSR systems, structures, and components that are the initial focus of the LR review. (60 FR 22467)

3.3.2 Tools Addressing §54.4(a)(3)

§54.4 Criterion 3

(3) All systems, structures and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).

Plant evaluations have been performed to demonstrate compliance with the regulations identified in §54.4(a)(3) (referred to as §54.4 Criterion 3). These evaluations are reviewed to identify SSs that are relied on to mitigate the subject plant event as well as any systems or structures whose failure would result in failure of other equipment to mitigate the particular event. As was the case for Criteria 1 and 2, an SS is listed as within the scope of LR, when the mitigation function or support function associated with it is credited in the analysis or evaluation. Mentioning an SS in the analysis or evaluation does not necessarily indicate that the SS contributes to an intended function.

Additionally, if the SS function is identical to a SR function (as identified in the Q-List), then the function need not be repeated on the tools addressing §54.4 Criterion 3. The analyses and evaluations being reviewed in this step are used to identify intended, NSR functions.

3.3.2.1 FP Screening Tool Preparation

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, their intended function(s), and the appropriate source documents with revision numbers are summarized in the FP Tool.

3.3.2.2 EQ Screening Tool Preparation

Two tools are produced for this criterion, the EQ tool and the post-accident monitoring (PAM) tool.

3.4 SS Scoping

The scoping process is implemented for each SS by reviewing each of the screening tools generated in Section 3.3 and developing a System Level Scoping Results Table. (An example page of the System Level Scoping Results Table is shown in Table 3-3.) For the DBE tools and the VA tools, the function(s) being provided are noted on the System Level Scoping Results Table. Since the events summarized by the tools address the requirements of the §54.4 criteria, inclusion of an SS in a tool indicates that it is within the scope of LR. It is important to note that all intended functions are identified for each SS during the scoping process. Identifying only one intended function would be sufficient to make an in-scope determination; however, the list of all intended functions for an SS facilitates the component level scoping task. This step is repeated for each SS so that an in-scope determination is made for each.

3.4.1 Criteria 1 and 2 -- SR and SR Support SSs

3.4.1.1 DBE Flow Charts and VA Screening Tool

The DBE flow charts and the VA screening tool, (see Section 3.3.1.1), are used to identify those SSs whose functions support the CSFs for a DBE, or whose failure would prevent performance of the CSFs. Systems and structures listed in one or more of the DBE flow charts or the VA screening tool are included in the System Level Scoping Results Table under Criteria 1 and 2. For each SS listed in the results table, all applicable DBEs are identified along with the functions that the SS provides for each DBE. The source document references and revision numbers are not included in the scoping results table since this information can be found in each DBE flow chart or the VA screening tool.

3.4.1.2 Class 1 Structures

For all listed structures, the UFSAR Section 5 and Q-List Design Standard are reviewed to determine whether the structure or a portion thereof is designated as SR, Class 1. At CCNPP, all Class 1 structures (buildings) are designated as SR; therefore all Class 1 structures are screened as within the scope of LR. The results of this scoping step are incorporated, along with the appropriate source document references and revision numbers or dates, into the System Level Scoping Results Table for each of the structures.

3.4.2 Criterion 3 -- SSs Relied On in Plant Safety Evaluations

The corresponding screening tools (see Section 3.3.2) are used to identify the following SSs:

1) Those that perform functions designated as required for FP;

2) Those which contain components identified as EQ or PAM;

3) Those whose functions are relied on in plant event evaluations for ATWS, SBO, and PTS; or

4) Any combination of these factors.

If one of the SSs being screened is listed in any of these tools, it satisfies Criterion 3. The results of this scoping step are incorporated into the System Level Scoping Results Table for each of the SSs. The source document references and revision numbers are not included in the scoping results table since this information can be found in each screening tool.

3.5 Results

As a result of system level scoping, SSs are assigned to one of two categories: (1) those that are within the scope of LR; and (2) those that are not. Systems and structures that belong to category (1) require further scoping in preparation for the IPA process and proceed to component level scoping, as described in Section 4.0.

TABLE 3-1

CCNPP SYSTEMS AND STRUCTURES

1	Switchyard (500 kV) & Switchyard DC
2	Electrical 125VDC Distribution
3	Electrical 13kV Transformers & Buses
4	Electrical 4 kV Transformers & Buses
5	Electrical 480V Transformers & Buses
6	Electrical 480V Motor Control Centers
7	Electrical 13kV Unit Buses
8	Well and Pretreated Water
9	Intake Structure
11	Service Water Cooling
12	Saltwater Cooling
13	FP
14	Transformer Deluge
15	Component Cooling Water (CCW)
16	Electrical 250VDC
17	Instrument AC
18	Vital Instrument AC
19	Compressed Air
20	Data Acquisition Computer
21	Domestic Water
22	Makeup Demineralizer
23	Diesel Oil
24	Emergency Diesel Generator
25	Access Control Area Ventilation
26	Annunciation
27	Auxiliary SGs
28	Auxiliary Steam
29	Plant Heating
30	Control Room Heating, Ventilation & Air Conditioning
31	Meteorology Tower & Miscellaneous Computers
32	Auxiliary Building and Radwaste Heating & Ventilation
33	Turbine Building Ventilation
34	Condensate Precoat Filter
35	Chemical Additions - Turbine
36	Auxiliary Feedwater (AFW)
37	Demineralized Water and Condensate Storage
38	Sampling System
39	Condensate Polishing Demineralizer
41	Chemical and Volume Control
42	Circulating Water
43	Condenser Air Removal
44	Condensate
45	Feedwater
46	Extraction Steam
47	Feedwater Heater Drains and Vents
48	Engineering Safety Feature Actuation
49	Simulator Computer
50	Solid Waste Disposal
51	Plant Water
52	Safety Injection
53	Plant Drains
55	CEA Drive Mechanism & Electrical
56	Reactor Regulating
57	Technical Support Center Computer
58	Reactor Protective
59	Primary Containment
60	Primary Containment Heating & Ventilation
61	Containment Spray
62	Control Boards
63	Cathodic Protection
64	Reactor Coolant
65	Seismic
66	Cavity Cooling
67	Spent Fuel Pool Cooling
68	Spent Fuel Storage
69	Waste Gas
70	Refueling Pool
71	Liquid Waste
72	Sewage Treatment Plant
73	Hydrogen Recombiner
74	Nitrogen and Hydrogen
75	Low Voltage DC Control Power
76	Secondary Sample
77/79	Area/Process Radiation Monitoring
78	Nuclear Instrumentation
80	New Fuel Storage and Elevator
81	Fuel Handling
83	Main Steam
84	Reactor Vessel Internal
85	Plant Access and Surveillance
86	Power Plant Security
87	Unit Transformers
88	Visitor Center Security
89	Emergency Operations Facility Security
90	Service Building & Outlying Building Heating, Ventilation & Air Conditioning
91	Lube Oil Storage
92	Gland Steam
93	Main Turbine
94	Plant Computer

95 Carbon Dioxide
96 Fire and Smoke Detection
97 Lighting and Power Receptacle
98 Main Generator and Excitation

TABLE 3-1

CCNPP SYSTEMS AND STRUCTURES (Continued)

99	Cranes/Test Equipment	
100	Plant Communications	
101	Dry Fuel Storage	
102	Plant Areas	
103	Emergency Diesel Generator Building Heating, Ventilation & Air Conditioning (2)	
104	Lubrication	
105	Weight T sting Wire Ropes & Slings	(3)
106	Ladders ıd Gratings	(3)
107	Roads	
108	Docks and Marine Related Structures	
109	Shop Equipment	(3)
110	Manual Valve Componen\ıs	(3)
111	Materials Processing Facility	(3)

Additional Structures

Auxiliary Building.	
Condensate Storage Tank No. 12 Enclosure	
Domestic Water Treatment Plant	
Engine Generator House	
Equipment Hatch Access Building. No. 1	
Equipment Hatch Access Building. No. 2	
FP Pump House	
Fuel Assemblies	
Fuel Oil Storage Tank No. 21 Building.	
Hydrogen Storage Pad	
Modifications Mechanical Lock-up (No. 3)	
Modifications Mechanical Lock-up (No. 4)	
Oil Interceptor Pit	
Service Building [B-3]	
South Service Building.	
Switchgear Structure	
Transformer Foundations	
Turbine Building	
Waste Water Treatment Building.	
Well Observation Building	
Well Water Pump House	
Independent Spent Fuel Storage Installation	(4)
Diesel Generator Building 1	(2)
Diesel Generator Building 2	(2)

NOTES:

1. System listing is from Attachment 6 of DS-032, "Control of the Equipment Technical Databases"
2. Systems and structures associated with the new diesel generator installation do not become part of the CCNPP licensing basis until after the 1996 refueling outage, and therefore, are not yet included in the scoping results.
3. These systems were not included as systems in the LR scoping process because they are portable equipment or because they are already included in other systems.
4. The Independent Spent Fuel Storage Installation is not licensed under 10 CFR Part 50 and, therefore, is not in the scope of this LRA.

TABLE 3-2 **Revision 4**

Post-Accident Monitoring Screening Tool (Example)

Reference 1 - Calvert Cliffs Nuclear Power Plant, Units 1 & 2, Updated Final Safety Analysis Report (UFSAR), Section 7.5.8

Reference 2 - Calvert Cliffs Nuclear Power Plant, NUCLEIS Equipment Database

SYSTEM/ STRUCTURE	SYSTEM ID No.	MONITORING VARIABLE(S) / FUNCTION(S)
Electrical 125VDC Distribution	2	• Status of standby power (voltage, current)
Electrical 4kV Transformers and Buses	4	• Status of standby power (voltage, current)
Electrical 480V Transformers and Buses	5	• Status of standby power (voltage, current)
Service Water	11	• Service water pump status (motor current) • Containment cooler cooling water flow
Saltwater	12	• Saltwater pump status (motor current)
Component Cooling Water	15	• CCW heat exchanger outlet temperature • CCW to/from reactor coolant pumps containment isolation valve position • CCW pump discharge pressure (for flow indication) • CCW pump status (motor current)
Vital Instrument AC	18	• Status of standby power (voltage)
Compressed Air	19	• Instrument air containment isolation valve position indication
Data Acquisition Computer	20	• Provide fault protection for Instrumentation & Controls loops
Emergency Diesel Generator	24	• Status of standby power (voltage, current, VAR, frequency)
Auxiliary Building & Radwaste Heating & Ventilation	32	• Fuel pool exhaust fan damper position
AFW	36	• AFW flow to SGs • Motor-driven AFW pump status (motor current) • Condensate storage tank 12 level
Sampling System	38	• Containment hydrogen concentration

TABLE 3-3

BGE LCM PROGRAM
TABLE 2
SYSTEM LEVEL SCOPING RESULTS (EXAMPLE) Revision 4

System/Structure	Unit	ID	Req'd for DBE	DBE Plant Function(s)	Q	Class I or SR-1M	Class I or SR-1M Reference	PAM	FP	ATWS	SBO	PTS	EQ	In Scope Yes/No
			CRITERIA 1 & 2					CRITERION 3						
Switchyard (500 kV) and Switchyard DC	1&2	1	No	None	No	N/A	N/A	No	No	No	No	No	No	No
Electrical 125 VDC Distribution	1&2	2	VA	VA for Chemical & Volume Control System VA for AFW VA for Main Steam VA for Containment Spray VA for Primary Containment Heating & Ventilation VA for Emergency Diesel Generators VA for 4KV Transformers & Buses VA for 480V Motor Control Centers VA for 480V Pus System VA for Vital Instrument AC VA for Service Water VA for CCW VA for Saltwater Cooling VA for Control Room Heating, Ventilation & Air Conditioning VA for Auxiliary Building & Radwaste Heating & Ventilation VA for RCS VA for Emergency Safety Features Actuation System Load Shedding VA for Chemical & Volume Control System (Core Flush)	No	N/A	N/A	Yes	Yes	No	No	No	No	Yes
Electrical 13kV Transformers and Buses	1&2	3	No	None	No	N/A	N/A	No	No	No	No	No	No	No
Electrical 4kV Transformers and Buses	1&2	4	VA	VA for AFW VA for Safety Injection VA for Containment Spray VA for 480V Bus VA for 480V Motor Control Centers VA for Service Water VA for SW Cooling VA for Emergency Safety Features Actuation System Load Shedding	No	N/A	N/A	Yes	Yes	No	No	No	No	Yes
Electrical 480V	1&2	5	VA	VA for CVCS	No	N/A	N/A	Yes	Yes	No	No	No	No	Yes

4.0 COMPONENT LEVEL SCOPING

Component level scoping is the second and final task needed to determine the scope of SSCs to be addressed by the IPA for aging. The criteria for including components within the scope of LR are the same as those for SSs and are defined in §54.4.

The component level scoping process is conducted one system at a time for each SS designated as within the scope of LR. The scoping is accomplished through application of either the component level scoping process for systems, which is illustrated in Figure 4-1 and discussed in Section 4.1, or the component level scoping process for structures, illustrated in Figure 4-2 and discussed in Section 4.2. Section 4.3 describes several variations to the standard component level scoping process used in specific instances. Section 4.4 describes how the results are documented.

4.1 Component Level Scoping for Systems

The component level scoping process for systems is implemented by systematically reviewing the intended functions of the system (determined by the system level scoping process) to determine which system components contribute to the performance of the functions. Components are designated as within the scope of LR if they are required for their system to perform an intended function.

The component level scoping process for systems is divided into several distinct steps. Each step is discussed below.

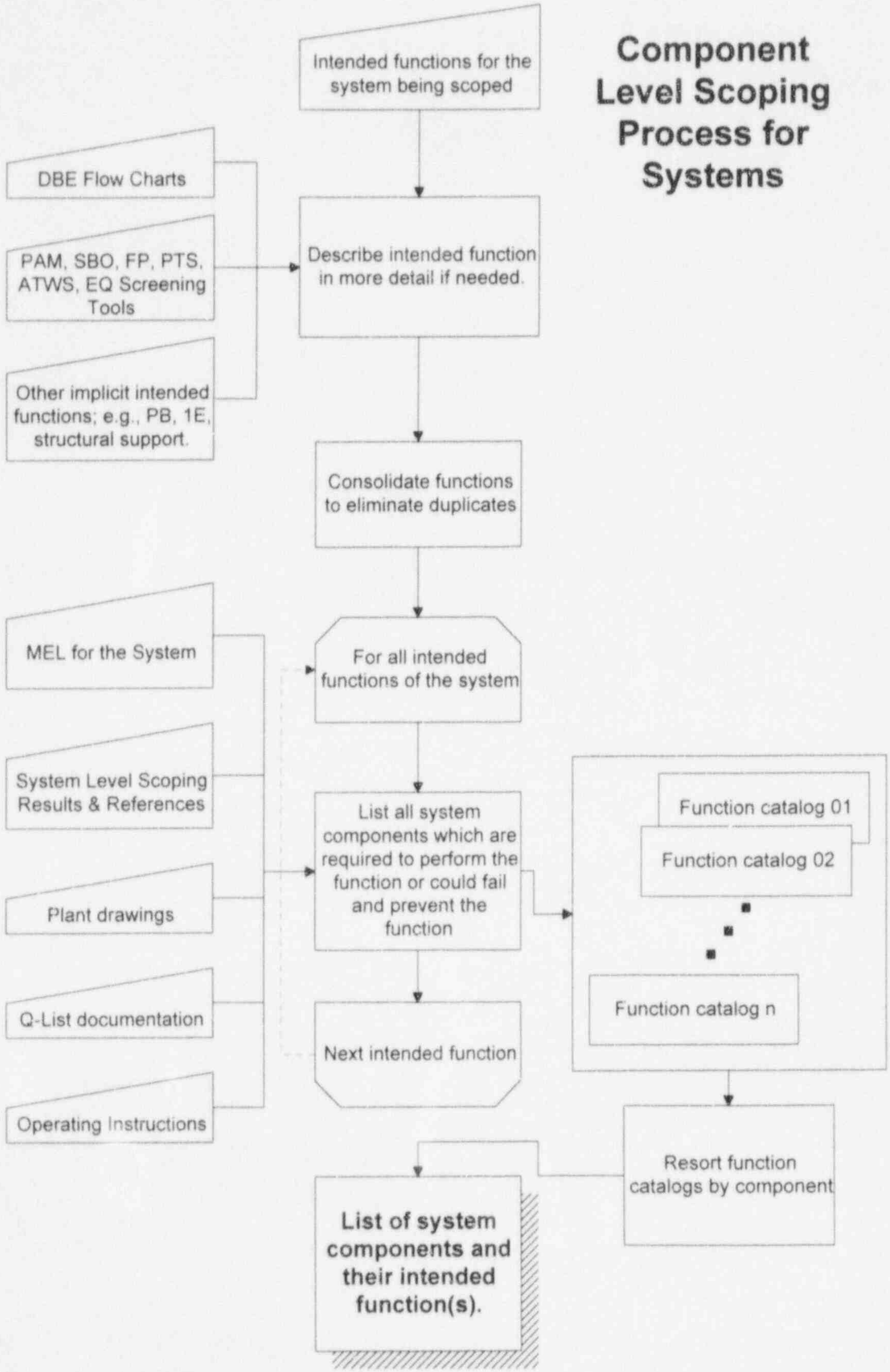
Component Level Scoping Process for Systems
Intended functions for the system being scoped
DBE Flow Charts
PAM, SBO, FP, PTS, ATWS, EQ Screening Tools
Other implicit intended functions; e.g., PB, 1E, structural support.
Describe intended function in more detail if needed.
Consolidate functions to eliminate duplicates
MEL for the System
System Level Scoping Results & References
Plant drawings
Q-List documentation
Operating Instructions
For all intended functions of the system
List all system components which are required to perform the function or could fail and prevent the function
Next intended function
Function catalog 01
Function catalog 02
Function catalog n
Resort function catalogs by component
List of system components and their intended function(s).

Figure 4-1

Component Level Scoping for Structures

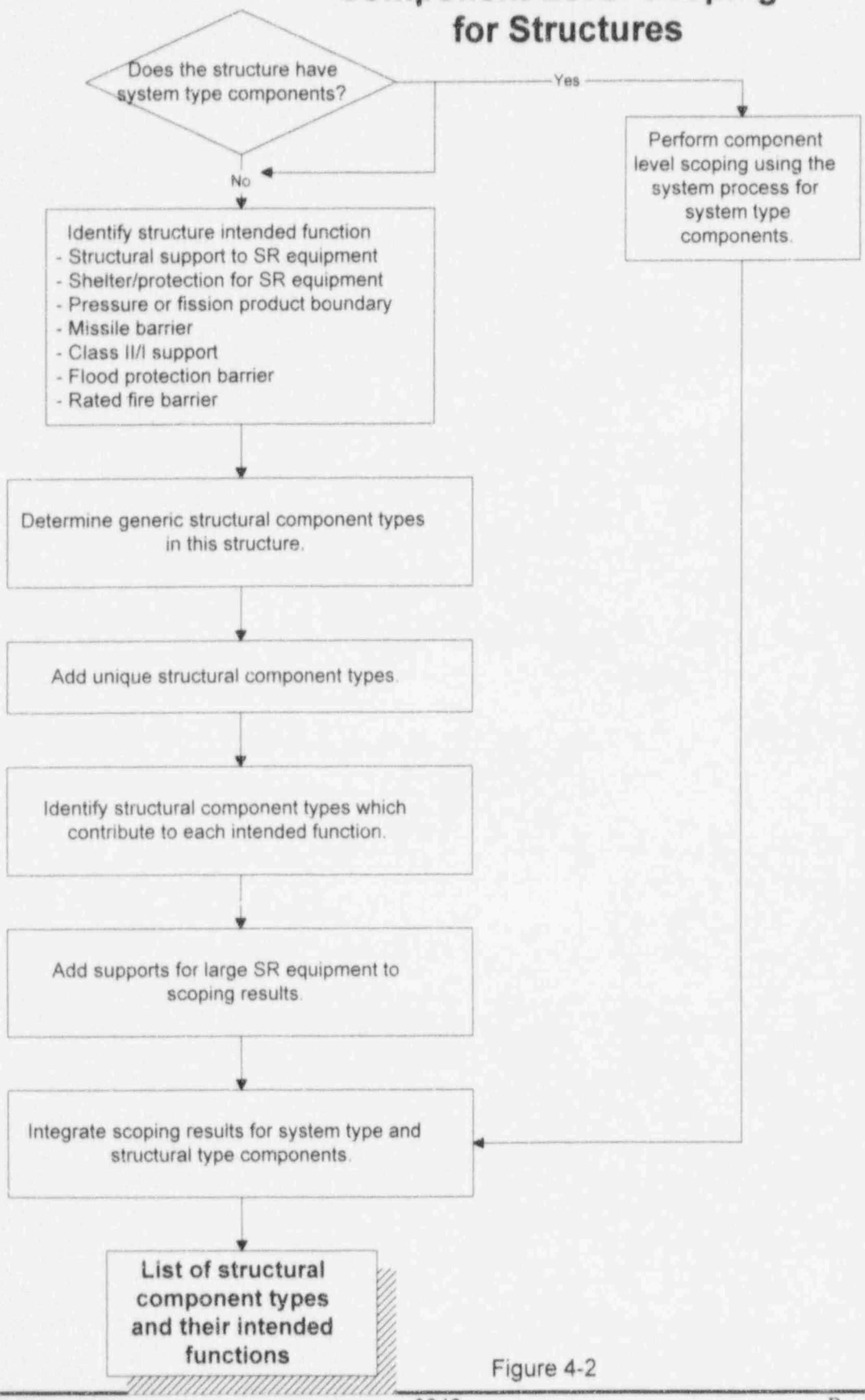

Figure 4-2

4.1.1 Identification of Detailed System Functions

The purpose of this step of the scoping process is to create a detailed list of the intended functions associated with the system being scoped. The list is compiled in a System Functions Table using the System and Structure Scoping Results, Q-List documentation, plant drawings, the UFSAR, System Descriptions and other references. It should be noted that these intended functions are required to be performed under a variety of design conditions in accordance with the CLB.

The System and Structure Scoping Results contain screening tools which associate intended functions with individual systems. The first substep of creating the detailed function list is to review all of the screening tools and, in the System Functions Table, record the intended functions of the system being scoped.

The CCNPP Q-List Design Standard (Table 2-1 Reference 8) is the site reference which governs what components are controlled as SR, SR support, or other miscellaneous category equipment. To ensure consistency with the Q-List documentation, the LCMEVAL software application is used to compile a listing of all Q-List categories which are associated with any components in the system being scoped (Q-List Criteria listing). This listing represents the Q-List related functions associated with the system being scoped. The following Q-List categories correspond to §54.4 criteria as described below:

Q-List Flow Sheets -
These flow sheets identify components which are relied on to respond to UFSAR Chapter 14 DBEs or serve as VA to SR equipment. Criteria 1 and 2.

PB - The category of PB mechanical items which maintain the system PB of the RCS, maintain the radiological boundary to prevent exceeding 10 CFR Part 100 limits, or maintain safety system boundary to limit system leakage. Criteria 1 and 2. (Criterion 2 because PB includes the components needed to maintain the PB of fluid systems which are not fission product boundary fluid systems.)

1E - The category of electrical equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or otherwise are essential in preventing significant release of radioactive material to the environment. Criteria 1 and 2. (Criterion 2 because 1E includes electrical isolation devices whose sole "intended" function is to prevent an electrical fault in a NSR portion of the system from affecting the SR functions of the system.)

1M - The category of mechanical equipment that is essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or otherwise are essential in preventing significant release of radioactive material to the environment. Criterion 1.

PAM - Post-accident monitoring category of instrumentation used to assess the environs and plant conditions during and following an accident. Criterion 3, subset of EQ.

5049 - This category identifies items which are required to be environmentally qualified to the requirements of 10 CFR 50.49. Criterion 3.

CLS1 - The category for those SSCs, including their foundations and supports that are designed to remain functional in the safe shutdown earthquake, as defined in 10 CFR Part 100. Criterion 2. ("CLS1" is the Q-List Manual designation for items referred to as "Seismic Category 1" or "Class 1" elsewhere in this methodology.)

Q - The category for any item specified by the Q-List Committee as requiring the same level of quality assurance as provided for SR items. (Criterion to be determined during scoping.)

SBO - The category of equipment required to withstand and recover from an SBO event. Criterion 3.

After producing the Q-List Criteria Listing for the system being scoped, this list is consolidated with the functions already listed in the System Functions Table to finalize the detailed functions listing for the system. The Q-List does not contain information related to several of the regulated events in §54.4 Criterion 3. Therefore, for the categories shown below, no consolidation with Q-List-related functions is possible. The associated screening tools and their references are used to validate the detailed system function(s) for these criteria.

FP - The functions required by 10 CFR 50.48 for FP and safe shutdown after fire.

ATWS - The functions required by 10 CFR 50.62 to provide diverse scram and diverse turbine trip capability during an ATWS event.

PTS - The functions required by 10 CFR 50.61 to provide protection during a PTS event.

The final step of intended function identification is to eliminate redundant functions. Functions enveloped by another function or identical to another function are consolidated. The enveloping function is designated as the "Parent" function, while the enveloped function is the "Child" function. The child function is retained on the System Functions Table in order to be able to trace the steps of the process which created the table. Parent functions and functions for which no consolidation is possible are assigned a unique identification number (Function ID) to facilitate subsequent steps in the scoping process. (For the remainder of this methodology, the term "intended function" refers to a parent function unless otherwise specified.)

4.1.2 The MEL

To ensure that all components in the plant are scoped with one and only one system, the site MEL is used to provide the equipment list for the component level scoping task for each system. This list is the portion of the NETD which contains all equipment for a given system.

In developing the NETD, conventions were established for determining the boundaries between systems. These conventions provided the guidance for determining which system each component in the IPA would be assigned to. Several example conventions are listed below. The complete system boundary guidelines are contained in the site design standard for controlling equipment technical databases.

- Heat exchangers are assigned to the load system.
- Electrical components are assigned to load system from the load side of the circuit breaker.
- Sensors are assigned to the system in which they sense. Actuators are assigned to the system in which the actuation takes place.
- Transformers are assigned to the lower voltage system.

As each scoping task is begun, the LCMEVAL software application is loaded from the NETD with the MEL for the system to be scoped. Each of the components on this list must be dispositioned during the scoping task as either contributing to an intended function listed in the System Functions Table or not needed for any of these functions.

4.1.3 Development of Function Catalogs

The next step in the component level scoping process for systems is to determine, for each intended function, which components from the system MEL are needed to perform the function. A list of components for each function is called the function catalog.

In order to determine the relationship between a given function and the components contributing to the function, Q-List documentation, UFSAR, Technical Specifications, system screening tools and references associated with the screening tools are used.

The active components associated with mitigating the consequences of individual DBEs or providing VA functions to SR equipment are listed in the plant Q-List documentation along with a reference to their safety function(s). Consequently, whenever a System Functions Table contains a DBE function or a VA function, the Q-List provides a direct input to the scoping process for determining which components of the given system contribute to §54.4 Criterion 1 and 2.

The Q-List documentation also includes Piping and Instrumentation Drawings which are coded to reflect the portions of each system which passively support the system PB function for that portion of the system relied on to mitigate DBEs. Whenever the system function table contains DBE functions and the MEL contains mechanical PB components, a PB function catalog is created for the system. For each component in the MEL, a determination is made, based on these Q-List-coded Piping and Instrumentation Drawings, whether the component is within the annotated PB portion of the drawing. If so, the component is included in the PB catalog. Those passive components which perform in exactly the same manner for any intended function are not included in catalogs associated with other functions in order to avoid redundancy.

The Q-List documentation also contains listings which associate specific components to PAM and EQ functions. This listing is used as a direct input to the scoping process whenever PAM or EQ functions are contained in the system function table. Based on this input, a function catalog is created for both PAM and EQ. In order to be more specific regarding which components actually contribute to providing each of the required PAM indications, plant drawings and the BGE UFSAR are consulted. In addition to the component listing, the PAM catalog contains a letter in the notes column to specify which PAM indication is associated with each component.

The Q-List documentation contains a listing which associates specific components to the Class 1 function. This listing is used as a direct input to the scoping process whenever there is a Class 1 function in the System Functions Table. Based on this input, a function catalog is created for Class 1. This catalog normally contains electrical panels (EPs) and other enclosure devices which contain SR equipment but have no explicit active safety function.

Many electrical and a few mechanical components are identified in the Q-List Manual as 1E only or 1M only. Such components perform the same function in support of a number of important events but are not actually associated with any particular DBE in the Q-List documentation. When a system contains components that are SR and designated only as 1E or 1M, a separate function catalog is created to contain these components.

The NETD contains a field which associates specific components with the Station Blackout Analysis. This SBO designation is used as an input to scoping for SBO and further review is conducted during the IPA process as described below:

- The NETD SBO designation is assigned to components <u>mentioned</u> in the Station Blackout Analysis. Other components which must function so that these "mentioned" components can perform their SBO function are identified and added to the SBO function catalogs.
- Much of the equipment mentioned in the Station Blackout Analysis is mentioned because it is secured at the start of an SBO event or is used when restoring power after the end of the event. These components do not contribute to any

SBO functions in the SBO tool, and therefore are not included within the scope of LR. These components are not included in the SBO function catalogs.

When the process is complete, the SBO function catalog or catalogs contain all of the system components which contribute to each intended SBO function.

The equipment in the system MEL which is designated in Q-List documentation as SR category "Q" also requires further analysis during the scoping process. The documentation which supports the classification of these type components is reviewed to determine why the equipment has been designated as SR category Q. If the SR-Q components perform an intended function, the components are included in the corresponding function catalog. Otherwise, the components are categorized as not within the scope of LR.

For the ATWS, PTS and DBE functions contained in the System Functions Table, one function catalog is created for each listed function. The reference information used to create the associated screening tool is consulted, as needed, along with plant drawings to determine exactly which system components contribute to the performance of each listed function. Components which perform exactly the same function to support one of these criteria as they perform to support a SR function, are not repeated again in these function catalogs to avoid redundancy. For example, if a pump is required to start during a severe fire to ensure plant shutdown and the same pump must start to provide cooling water to SR equipment to mitigate the consequences of a DBE, that pump would not be repeated in the FP function catalog.

All of the function catalogs discussed above are created using the LCMEVAL software system which contains data loaded directly from a controlled site database (NETD) where possible. For the functions where no source of direct component data is available in software format, the individual components are entered one at a time into the function catalog. The software ensures that only valid components (i.e., in the MEL for the system being scoped) are added to function catalogs. It also facilitates the recording of reference documents which justify that a component supports a given function.

4.1.4 Generation of Scoping Results Table

In the next step of the component level scoping process for systems, the function catalogs that were developed in Section 4.1.3 are resorted by LCMEVAL to produce a list of system components and the intended functions associated with each component. Components not associated with any intended function are designated as not within the scope of LR by the LCMEVAL software system. The table of in-scope components and the intended functions that they contribute to is designated as the Component Level Scoping Results Table.

4.2 Component Level Scoping for Structures

The component level scoping process described above for systems can also be applied to structures. However, this process is somewhat different because of the unique features of structures and how they are documented on site. As with systems, the scoping process is implemented by determining which structural components are required for the performance of the intended functions of the structure. Details of the methodology implementing the structural component scoping are presented below.

4.2.1 Unique Identifiers for Structural Components

The components of structures have not generally been identified and listed in an MEL. Consequently, the component level scoping for structures cannot use a comprehensive equipment listing as an input.

For certain site structures, such as the containment, specific component types have been identified in the site equipment database. For these structures, a partial MEL is available and the structural component scoping process is divided into two parts:

1) The components documented in an MEL for the structure are scoped using the process described in Section 4.1, above, if it is determined that they do not perform a structural-type function. Components such as the containment personnel hatch, the personnel hatch limit switches and the containment penetrations are scoped using this process because they are designated as components of the containment system in the NETD.

2) The remaining portions of the structure such as beams, columns and walls are scoped using the process described in this section.

The results are then merged when both procedures are complete to present a combined scoping result for the entire structure.

4.2.2 Function Identification

The SS scoping process identifies some structures as within the scope of LR because they are designed to Class 1 criteria or because they are required for DBE purposes. Unlike the scoping results for systems, the Class 1 structure in-scope determination does not actually reveal a great deal about the intended functions of the structure. Therefore, during the component level scoping, the evaluator reviews Chapters 5 and 5A of the UFSAR to determine specific structure design basis information such as which external events the structure is designed to withstand, and which structural components contribute to these intended functions.

By their nature, structures perform mostly passive functions and are constructed in accordance with predetermined design requirements. Therefore, civil engineers experienced with nuclear plant structures determined that a structure, or components of the structure, are designed to perform one or more of the following functions in support of the §54.4 criteria:

1. Provide structural and/or functional support to SR equipment;

2. Provide shelter/protection to SR equipment. (This function includes radiation protection for EQ equipment and high energy line break-related protection equipment.);

3. Serve as a PB or a fission product retention barrier to protect public health and safety in the event of any postulated DBEs;

4. Serve as a missile barrier (internal or external);

5. Provide structural and/or functional support to NSR equipment whose failure could directly prevent satisfactory accomplishment of any of the required SR functions (Example: seismic Category II over I design considerations);

6. Provide flood protection barrier (internal[5] flooding event); and

7. Provide a rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant.

This listing allows an evaluator with a specific civil engineering background to determine which of the generic structure functions apply to the structure being evaluated without being an expert on DBEs.

Functions 1-4 are associated with Class 1 structures. Class 1 design requirements are the structure level equivalent of SR components specified in §54.4 Criterion 1. In a similar fashion, functions 5 and 6 apply to non-Class 1 structural components which could, if they fail, prevent a SR function from occurring. This is the structural equivalent for §54.4 Criterion 2. Function 7 is the equivalent for the portion of §54.4 Criterion 3 which is applicable to structures.

The applicability of each function to the structure is determined by a review of various source documents. If the structure is a Class 1 structure, the UFSAR and the System and Structure Scoping Results must be referenced to determine which of functions 1-4 apply. The applicability of functions 5 and 6 to the structure being scoped cannot be made based only on the UFSAR and the System and Structure Scoping Results. Therefore, the determination of the applicability of these criteria to the structure is deferred until Section 4.2.4. To determine whether the structure being evaluated performs function 7 (DBE), the System and Structure Scoping Results are consulted.

Regardless of their applicability to the structure being evaluated, the seven functions are assigned generic ID numbers that can be used with any structure being scoped. Therefore, the Structure Intended Functions Table has the same basic format for every structure. The functions that apply to the structure are identified by indicating "YES" in the "Applicable to This Structure?" column of the Structure Intended Functions Table.

---

5 External flooding events were considered during the design process for CCNPP structures. It was determined that a probable maximum hurricane would cause the worst-case flooding conditions at the site. The resulting surge and wave action was analyzed as the basis of plant flood protection. The effects of possible wave action were studied using a hydraulic model.

4.2.3 Structural Component Type Listing for the Structure

In the structural component scoping process, components that are structural in nature are not uniquely identified during the scoping process. For example, each wall in the structure is not identified, named, and listed. Rather than using an MEL of named structural components, the scoping is conducted on a generic listing of structural component types. This generic list was developed by experts in the field of nuclear Class 1 structures. The generic list started with structural component types contained in the Containment Industry Technical Report and the Class 1 Structures Industry Technical Report. Other structural component types were added to the list to ensure completeness. (e.g., The Industry Technical Reports considered only SR functions. Therefore, several fire- and flooding-related component types were not considered in these reports.)

The evaluator uses this generic component listing and determines which of the component types on the list are actually contained in the structure being scoped. This step is performed by reviewing plant architectural drawings and identifying the specific structural types. Additionally, any structural component types which are unique to the particular structure being scoped, such as the prestressed tendons in the containment and the sluice gates in the intake structure, are noted. These unique structural component types are then added to the list of applicable structural component types. This list serves as the equivalent of an MEL for structural component scoping task.

4.2.4 Structural Components Which Contribute to Intended Functions

This section describes the process used to determine which component types of a structure contribute to the intended functions which the structure performs. For every function listed in the Structure Intended Functions Table that has a "YES" in its "Applicable to This Structure?" column, a review is made of the UFSAR, the Q-List Manual, or the System and Structure Scoping Results (including documents referenced by these results). The component types which contribute to each intended function are recorded on the "Structural Components Which Contribute to Intended Functions" table.

Additionally, the supports for large SR equipment within the structure are identified by reviewing a listing of the SR equipment installed in the structure that might affect the design of the structure (such as tanks, heat exchangers, or vessels filled with fluid and pumps which require a pedestal as a foundation.). These SR equipment supports are also included in the "Structural Components Which Contribute to Intended Functions" table.

Q-List documentation and the Flooding Design Guidelines Manual are reviewed to determine if structural component types in the structure being scoped are relied on to contribute to the functions of providing structural and/or functional support to NSR equipment whose failure could ~~directly~~ prevent satisfactory accomplishment of any of the required SR functions or providing flood protection barriers. If structural component types in the structure being scoped are determined to contribute to these functions, then this information is captured by recording "YES" in the "Applicable to This Structure?" column of the Structural Intended Functions Table. The components that contribute to these functions are then recorded on the "Structural Components Which Contribute to Intended Functions" table, with a reference to the appropriate intended structure function.

When completed, the "Structural Components which contribute to Intended Functions" table provides the correlation between component types in the structure and their intended function(s). Each component type necessary for an intended function is designated as within the scope of LR.

4.3 Commodity Evaluations that Include Scoping Sections

For certain systems or groups of components, an alternate IPA process was chosen to accomplish the same results as the process described in the first six sections of this methodology. Each of these situations, where commodity approaches were chosen, are shown in Table 4-1, and described in more detail in Section 7 of this methodology. For two of the commodity evaluations, the scoping and pre-evaluation steps are performed using the techniques described in Sections 3 and 4. In the other four commodity evaluation processes, the revised approach replaces the component level scoping, pre-evaluation and AMR. Therefore, for the systems covered by these commodity evaluations, the description of the component level scoping is included in Section 7.

TABLE 4-1

Commodity Evaluation	Scoping Part of Commodity Evaluation?
EPs & Related Equipment	No
Instrument Lines (ILs)	No
Cables	Yes
Cranes and Fuel Handling Equipment	Yes
Component Supports	Yes
FP Systems	Yes

4.4 Results

As a result of the component level scoping process, components are assigned to one of two categories: (1) those that are within the scope of LR; and (2) those that are not. Only components that are within the scope of LR are included in the IPA process. These components proceed to the pre-evaluation task introduced in the next section of this methodology.

5.0 PRE-EVALUATION

This section describes the Pre-Evaluation task. The purpose of this task is to determine which plant SCs are "subject to AMR" in the IPA process.

The Pre-Evaluation task is performed on a system-by-system or structure-by-structure basis (except for equipment covered by the commodity evaluations which replace the entire IPA process, as described in Section 4.3). The description provided in Sections 5.1 through 5.3 of the methodology applies primarily to systems. Section 5.4 describes the differences in the process as it is applied to structures.

The input to this task is the results of the component level scoping step, described in Section 4, for the system being evaluated. These results consist of the intended functions of the system or structure being evaluated and a designation of which portions of the system or structure contribute to the intended functions. From these inputs, the criteria in the LR Rule for "SCs subject to AMR" are applied to determine which SCs in the system or structure must be further evaluated for the effects of aging. The SCs or groups of SCs determined not to be subject to AMR require no further evaluation in the IPA process.

The output of the Pre-Evaluation task is the list of SCs which need to be evaluated further for the effects of aging in the AMR task.

The Pre-Evaluation task is governed by §54.21(a)(1) of the LR Rule.

> *54.21(a)(1) For those systems and structures within the scope of this part, as delineated in §54.4, identify and list those structures and components subject to an AMR. Structures and components subject to an aging management review shall encompass those structures and components --*
>
> *(i) That perform an intended function, as described in §54.4 without moving parts or without a change in configuration or properties. These structures and components include, but are not limited to, pressure retaining boundaries, component supports, reactor coolant pressure boundaries, the reactor vessel, core support structures, containment, seismic category I structures, electrical cables and connections, and electrical penetrations, excluding but not limited to, pumps (except casing), valves (except body), motors, batteries, relays, breakers, and transistors; and*
>
> *(ii) That are not subject to periodic replacement based on a qualified life or specified time period.*

Figure 5-1 provides a flow chart of the Pre-Evaluation task.

Pre-Evaluation Process

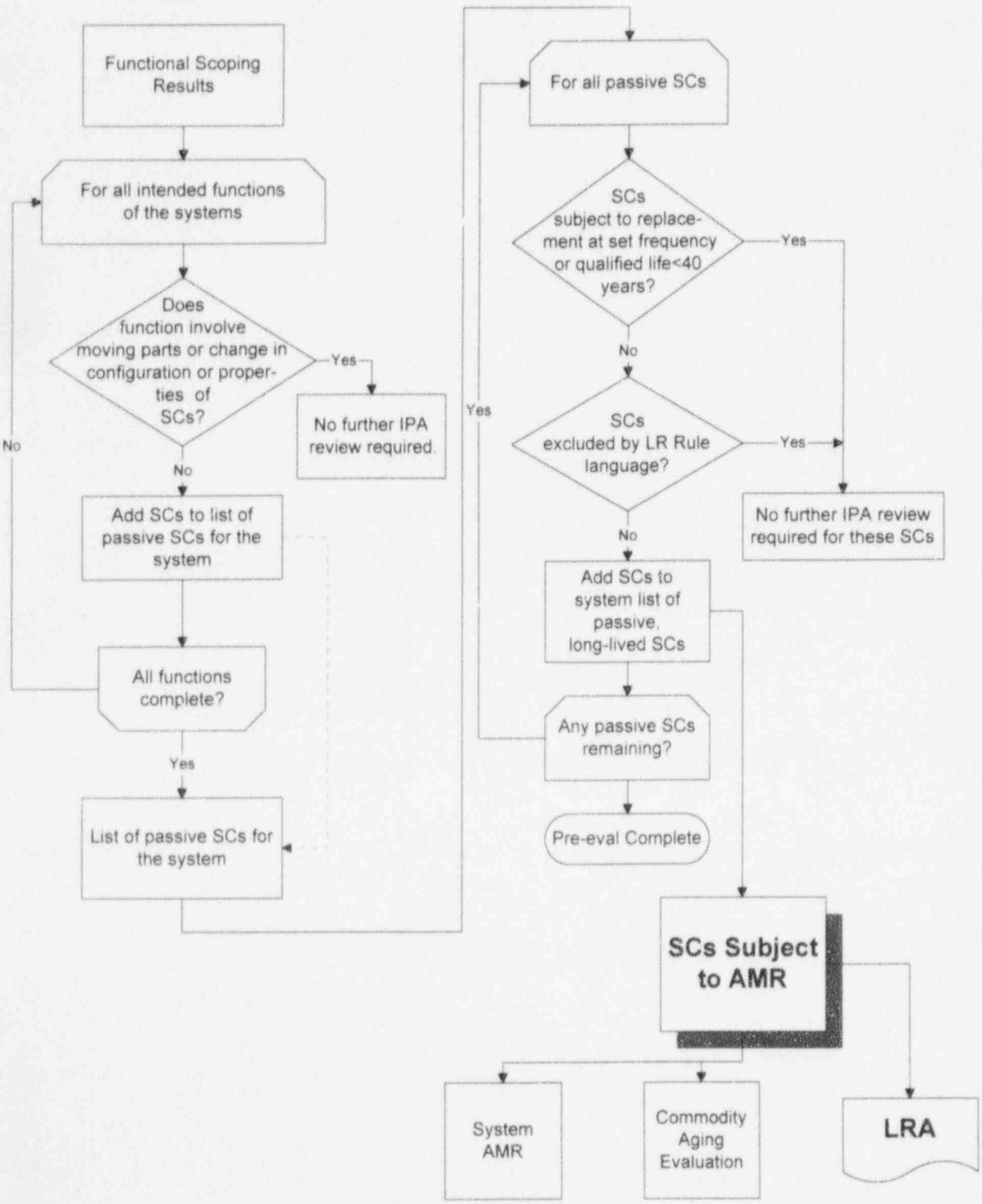

Figure 5-1

5.1 Categorize Intended System Functions as Active or Passive

The first step of the Pre-Evaluation task is to review the list of intended functions for the system being evaluated and characterize each as either active or passive. When a function is determined to be passive, all components which contribute to the passive function are categorized as passive components, even though some of these components may also contribute to an active function. If such components are determined to be subject to AMR, the subsequent AMR task considers only the effects of aging on the passive intended function to which these components contribute. The components' contribution to active functions need not be considered in this evaluation.

5.1.1 Passive Functions

Passive functions are those which require no moving parts ~~motion~~ or change in SC configuration or properties to carry out the requirements of the function. Such functions generally do not result in plant parameters changing in a measurable manner during normal plant operations. Examples of passive functions are listed below:

- Maintain the pressure-retaining boundary ~~PB~~ of a fluid system.
- Provide structural support or shelter to equipment.
- Provide missile protection.
- Provide shielding against radiation.
- Provide shielding against high energy line breaks.
- Provide flood protection.
- Prevent or isolate faults in an electrical circuit when such protection or isolation does not involve moving parts~~motion~~ or a change in properties or configuration. (e.g., cable insulation).

Any function which is determined to be passive is evaluated in Section 5.2~~-of the methodology~~.

5.1.2 Active Functions

Active functions require moving parts~~motion~~ or a change in SC properties or configuration to carry out the intended function. For such functions, plant parameters change in a measurable manner during normal plant operation. Performance of this equipment may be assessed by observing, measuring or trending these parameters. Examples of active functions are:

- Provide required flow to a heat exchanger.
- Provide electrical signals to a device.
- Provide electrical power to a bus or load.
- Provide indication of a plant condition.
- Remove decay heat.
- Provide fault isolation where moving parts~~motion~~ or a change in properties or configuration is involved. (e.g., circuit breakers, fuses)

Active functions require no further evaluation in the IPA process. Any components which contribute to active intended functions would not be included in the list of SCs subject to AMR, unless warranted by their contribution to other intended functions which are passive.

5.2 Determine Whether Components Are Long-Lived or Short-Lived

In this step of the Pre-Evaluation task, all passive SCs are reviewed to determine if they are subject to replacement based on qualified life or~~,~~ specified time period~~ or a properly justified condition-based replacement program~~. SCs which are not subject to such replacement are classified as long-lived.

~~The case of replacement based on a specified time period is straightforward. Such r~~Replacement programs may be based on vendor recommendations, plant experience, or any means which establish a specific replacement frequency. Often, replacement based on qualified life will also be replacement at a specific time period (i.e., the time period dictated by the qualified life). However, in some instances the qualified life of an SC may be based on variables other than calendar time. ~~For example, run time rather than actual calendar time may dictate replacement for some components.~~ In either case (calendar time replacement or qualified life replacement), the SCs subject to such replacement would not be included in the list of SCs subject to AMR.

~~A related replacement program is one where SCs are replaced based on performance or condition. The SOCs accompanying the LR Rule state that --~~

> ~~*. . . the Commission has decided not to generically exclude components that are replaced based on performance or condition from an aging management review. The Commission does not intend to preclude a license renewal applicant from providing site specific justification in a license renewal application that a replacement program based on performance or condition for a passive component provides reasonable assurance that functionality will be maintained in the period of extended operations. (60 FR 22478)*~~

~~There are instances where an indication of SC condition can be used as the basis for replacement of a passive SC and that such replacement would preclude the need for an AMR. For example, the copper-nickel tubes of a heat exchanger may have an intended pressure retaining function. This function is passive since there are no moving parts or changes in configuration or properties involved in performing the function. Normally such tubes are not replaced based on a specific time period or qualified life. Instead, they are subject to eddy current testing which dictates when tubes must be plugged and a tube plugging limit which dictates when the tube bundle must be replaced. Plant experience shows that these heat exchangers are retubed every 10 to 15 years. In cases such as this one, where a plant parameter for a passive SC can be clearly linked to the ability of the SC to perform its intended function, and where plant operating experience has shown that the component is replaced frequently, the SC need not be included on the list of SCs subject to AMR.~~

~~Other components subject to condition monitoring include rubber/synthetic parts and parts specifically designed and maintained for wear. Such parts are periodically monitored and are normally replaced several times over the normal life of the plant when wear or other degradation is observed. Such SCs need not be included on the list of SCs subject to AMR.~~
The remaining components which contribute to the passive function will be subject to aging management review unless the component type has been specifically excluded from the review by the language of the Rule.

~~In these cases, justification will be provided in the LRA to demonstrate that such SCs are replaced frequently, and therefore require no specific AMR. Table 5-1 shows the criteria which are covered in each justification. For these cases, controlled plant programs dictate the conditions which govern the replacement of the SC. However, these programs are not described in the LRA or summarized in the FSAR Supplement, as would be required for programs which manage the effects of aging for SCs subject to AMR. Instead, the LRA justification would contain a demonstration that the criteria of Table 5-1 have been satisfied for the program. The level of control which exists for such replacement programs and activities under the CLB will continue into the period of extended operation and is sufficient to ensure continued replacement of the SC.~~

5.3 Assignment of System Components to Commodity Evaluations

As discussed in Section 4.3, there are several categories of equipment which are more efficiently evaluated across system boundaries as members of commodity groups. Commodity groups are components which are present in a number of systems, but which perform the same function regardless of the system to which they are assigned. Commodities such as cables were not scoped as part of a specific system because these components are not assigned to systems in the CCNPP equipment database. As will be discussed in Section 7 of this methodology, the commodity evaluation process for these components covers ~~replaces~~ all IPA steps, and this pre-evaluation discussion would not apply to such components. For the EP and IL commodities, some or all of the components are assigned equipment identifiers in the CCNPP equipment database. For these components, the pre-evaluation process includes an administrative step to remove these components from the scope of the AMR of the assigned system, and to bin these components for the commodity evaluation of the appropriate commodity group. These two cases are discussed below.

5.3.1 EPs

Electrical panels are assigned to a number of systems in the CCNPP equipment database because they are functionally related to the system components. In all cases, the passive intended function of such panels is to provide structural support to active system components contained in the panel and/or to ensure electrical continuity of power, control or instrumentation signals. Electrical panels include switchboards, motor control centers, control panels and instrumentation panels.

At this point in the pre-evaluation process, such panels are excluded from the AMR of their parent system and are instead administratively included with the EPs commodity evaluation. As will be described in Section 7 of this methodology, the commodity evaluation produces the same results as the AMR process described in Section 6 but the process is adjusted to be more efficient for a particular component type.

5.3.2 ILs and Tubing

Many fluid systems contain a number of small ILs which are part of the systems' pressure-retaining boundary. Such small branch lines contribute to the passive intended function of maintaining the system PB and most are not subject to periodic replacement. Consequently, these ILs are subject to AMR. Instrument lines are subject to common environments, are made of common materials and perform the same passive intended function regardless of the system to which they are assigned. Therefore, the BGE IPA process identifies such ILs during the pre-evaluation process and excludes them from the AMR of the parent system. The commodity evaluation of ILs includes 1~~includes: 1) pressure-retaining portions of instruments, such as pressure transmitters, pressure indications, level transmitters, etc.; 2~~) 1) small bore piping, tubing and fittings from the root~~first~~ isolation valve ~~connected~~ to the instrument~~system piping~~; ~~and~~ 2~~3~~) hand valves which are part of the instrument~~small branch~~ lines (such as equalization, instrument isolation and vent valves for pressure differential transmitters); and 3) any other components in the instrument line which contribute substantially to maintaining the pressure retaining function of the instrument line.

5.4 How the Pre-Evaluation Process Applies to Structures

For plant structures, a modified process is used to determine which SCs are subject to AMR.

5.4.1 Passive Versus Active

Section 4 of the IPA Methodology describes the seven intended structural functions which may cause a structure to be included within the scope of LR per §54.4 of the LR Rule. From reviewing these functions and the description of passive functions in Section 5.1.1, it is clear that all of the intended structural functions are passive. Therefore, the steps of the Pre-Evaluation task to characterize functions as active or passive are not needed for structures.

5.4.2 Short-Lived Versus Long-Lived

Plant structural components are not normally subject to periodic replacement programs. Therefore, structural components are considered to be long-lived unless specific justification is provided to the contrary. Such justification would be included in the LRA.

5.4.3 Structures Which are Also Designated as Systems

In two instances, plant structures are also characterized as systems in the CCNPP site documentation system and system-type components are associated with these "systems." For example, the primary containment structure is also designated as the containment system. All penetration seals, as well as several position switches and access doors, are listed as individual components of the containment system with unique equipment identifiers.

As discussed in Section 4 ~~of the IPA Methodology~~, the techniques for scoping of a structure as well as those for scoping a system are applied to such a structure. Two distinct sets of scoping results are produced — one for the system components and one for the structural components. In this case, the pre-evaluation process described in the previous steps of Section 5 would be applied to the system scoping results. For the structural scoping results, pre-evaluation steps would not be performed for the reasons described in Sections 5.4.1 and 5.4.2.

5.5 Pre-Evaluation Results and Documentation

The Pre-Evaluation task produces results which serve as input to the AMR task and to specific commodity evaluations. These results and the documentation of the results are discussed below.

5.5.1 Pre-Evaluation Results

Section 5 identifies the SCs which are subject to AMR. This list of SCs and their intended passive functions serve as the input to the AMR task described in Section 6. Section 5 also removes certain passive, long-lived SCs from the scope of their parent system AMR, and includes them instead in the commodity evaluation for a specific commodity type.

5.5.2 Pre-Evaluation Documentation

The Pre-Evaluation task produces a list of the SCs which are subject to AMR for inclusion in the LRA. ~~For system components excluded from the AMR because of a replacement program based on condition, the LRA will include justification that the program has led to frequent replacement of the component.~~

~~TABLE 5-1~~

~~**CRITERIA FOR REPLACEMENT ON CONDITION PROGRAMS**~~

~~**Criterion 1 - Replacement programs based on condition or performance must ensure that the SCs identified as within the scope of LR will be replaced before degradation would result in loss of intended system function(s). For example --**~~

- ~~Is the discovery activity frequency interval less than the shortest time between failures of intended system function(s)?~~
- ~~Based on the condition or performance trait monitored by this program, is the component replaced at intervals that are short relative to the life of the plant and is the component replaced before its contribution to intended system functions is prevented?~~
- ~~Historically, have all maintenance preventable functional failures of intended system functions been detected by the activity?~~

~~**Criterion 2 - Replacement programs based on condition or performance must contain appropriate acceptance criteria which ensure timely replacement of the SCs.**~~

- ~~Does the activity have an action or alert value or condition parameter to determine the need for replacement of the SC?~~
- ~~Does the action value or condition provide an appropriate means of assuring replacement of the component before the effects of aging would prevent any intended system functions?~~

~~**Criterion 3 - Replacement programs based on condition or performance must be implemented by the facility operating procedures.**~~

- ~~Is the activity controlled by a site review process which includes controls over subsequent revisions?~~

6.0 AMR

This Section of the IPA Methodology describes how the components which were determined in Section 5 to be subject to AMR are evaluated for the effects of age-related degradation. It also describes the approach used to identify and evaluate aging management alternatives to determine which adequately manage the effects of aging. Figure 6-1 is a flow chart which represents the AMR process.

The AMR task fulfills the requirements of 10 CFR 54.21(a)(3)of the LR Rule:

> *For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.*

The input to the AMR task is the list of SCs subject to AMR along with the intended, passive functions for those SCs. The results of this task demonstrate the following for each input SC or group of SCs:

- Management of the effects of aging is not required because these effects are not detrimental to the ability of the SC to perform its intended function consistent with the CLB;
- Existing programs or activities will adequately[7] manage the effects of aging; or
- New programs or activities or the modifications to existing programs or activities will need to be implemented to adequately manage the effects of aging.

Like the Pre-Evaluation task, the AMR task is usually performed on a system-by-system and structure-by-structure basis. The process described in this Section applies to SCs of both systems and structures with very few exceptions. These exceptions are described in the steps where they occur.

The AMR can be performed in one of two general ways. In some circumstances, it is possible to demonstrate that existing plant programs adequately manage the effects of aging without an explicit evaluation of the aging mechanisms. This approach is described in Section 6.1. In other instances; however, it is most efficient to evaluate the effects of specific aging mechanisms on the intended functions. Section 6.2 describes this approach.

Where the approach described in Section 6.2 is followed, several alternatives for managing the aging effects may be viable and it is necessary to select from those alternatives. In addition, technological developments may produce additional viable alternatives in the future for either

7 See Section 2.1 for the definition of "adequately manage."

AMR Process

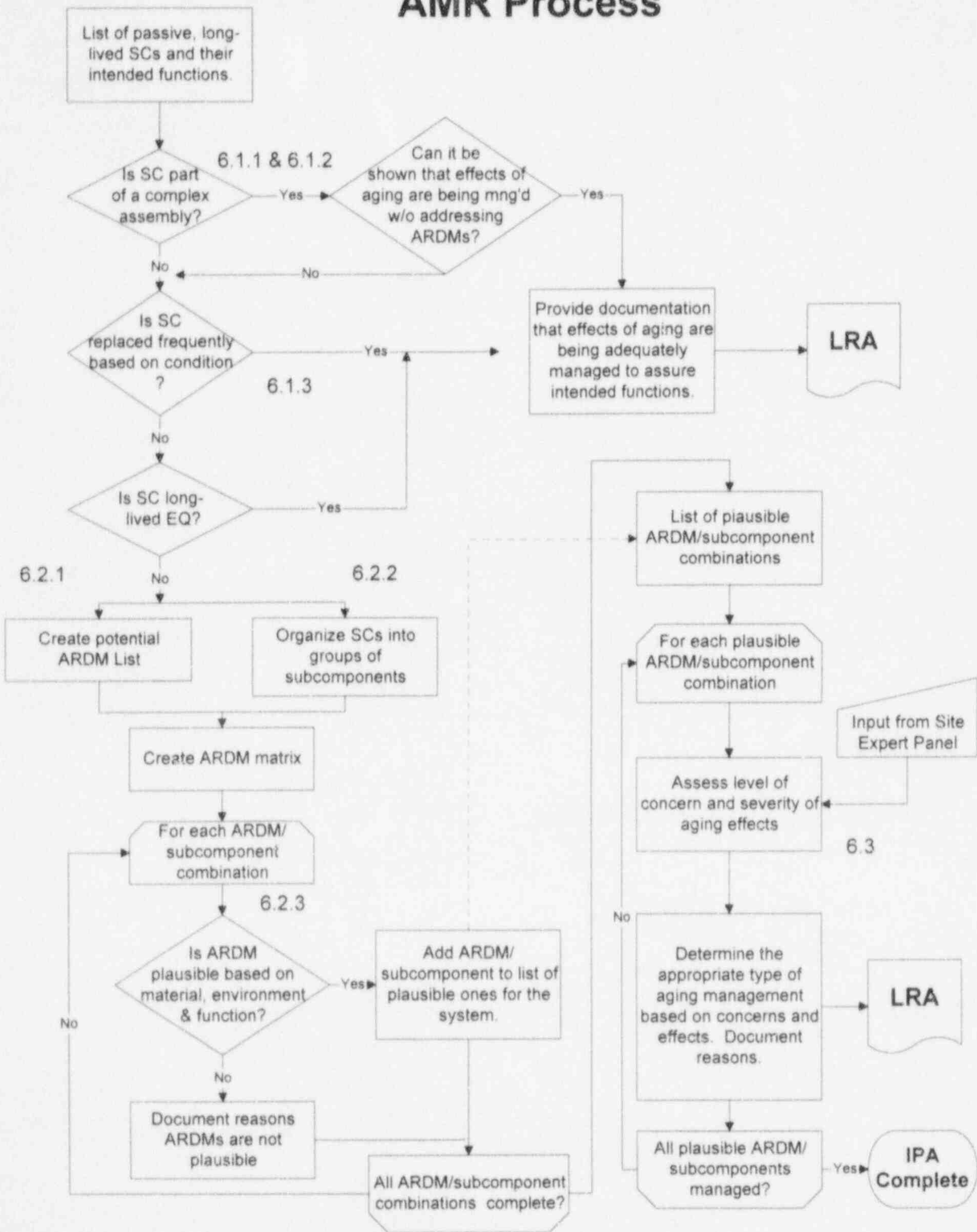

Figure 6-1

approach. Section 6.3 describes the CCNPP approach for evaluating and selecting aging management~~from these~~ alternatives during the IPA process.

6.1 Justification that Effects of Aging are Being Managed Without Specifically Evaluating ARDMs

In several instances, a specific evaluation of the ARDMs is not required in order to justify that the effects of aging are being adequately managed by existing plant programs. These approaches are based on the Commission conclusion stated in the SOC accompanying the LR Rule.

> *As a plant ages, a variety of aging mechanisms are operative, including erosion, corrosion, wear, thermal and radiation embrittlement, microbiologically induced aging effects, creep, shrinkage, and possibly others yet to be identified or fully understood. However, the detrimental effects of aging mechanisms can be observed by detrimental changes in the performance characteristics or condition of systems, structures, and components if they are properly monitored. (60 FR 22474)*

Four~~Three~~ cases are described in this Section. For three~~two~~ of these cases, the AMR demonstrates 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 SCs. Therefore, by adequately monitoring these performance or condition characteristics, the effects of aging on the passive intended function are also adequately managed. In the other~~third~~ case, described in Section 6.1.3, the SCs are subject to a TLAA . The resolution of the TLAA will be provided by one of three methods described in Section 8. ~~an existing CLB program is already managing the effects of aging for a defined time period~~.

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

For some complex assemblies of SCs, the principal intended function is an active function. Some of their components are subject to AMR because the components contribute to a passive pressure-retaining function to support the active functions of the entire assembly.

An example is the diesel generator supporting equipment. The pressure-retaining components of the diesel starting air, lube oil, fuel oil, cooling water and scavenging air system are subject to AMR because they contribute to a passive pressure-retaining function. However, there would be a readily observable affect on the diesel generator performance if the pressure-retaining components deteriorated significantly. For example, significant cooling water or lube oil piping leakage would result in increased bearing temperatures, and significant starting air leakage would affect diesel start times. Additionally, experience has shown that even minor leakage from any of these supporting subsystems is observed by operators conducting routine testing well before they result in actual performance degradation. These effects would be observed during routine testing, before the deterioration of the pressure-retaining components could affect the diesel's ability to perform its active intended function. Corrective actions to restore the passive function from its degraded condition are required by the performance testing program and by the normal site corrective action processes.

Because of the readily observable effects of passive function degradation on active performance, a sufficient method of managing the effects of all types of aging could be ~~is~~ to subject the assembly of components to a rigorous performance and condition monitoring program. In the cited example, the diesel generator support systems are subject to surveillance requirements to demonstrate operability in accordance with the Technical Specifications and to a comprehensive reliability program required by other regulations. The conclusion of the AMR using this technique could be that ~~C~~continuing these types of performance and condition monitoring programs would ensures that the intended functions of the assembly will be adequately managed.

In some cases, the conclusion of the AMR using this approach may be that the discovery techniques available through the performance and condition monitoring programs are not timely enough to ensure intended functions as required by the CLB. For example, the discovery techniques used in a particular performance and condition monitoring program may only provide reasonable assurance that the intended function can be performed under normal loading conditions. Additional evaluation and/or inspection may be required to ensure the ability to perform intended functions under certain more severe loading conditions which are part of the CCNPP CLB. In this case, additional evaluations may be performed to demonstrate that the aging mechanisms which may affect the ability of SCs to perform under more severe loading conditions are not plausible for the SCs. Alternately, age-related degradation inspections, as described in Section 6.3.3.4, may be performed to determine whether there are aging effects of concern for the SCs being evaluated.

Because there may not generally be a close tie between degradation of passive SCs and the active performance of a train of equipment, ~~T~~the performance and condition monitoring ~~his~~ AMR technique is used only in selected circumstances. The conditions listed below represent the ~~following~~ circumstances where this approach should be followed rather than using one of the other AMR approaches. These conditions do not constitute a part of the AMR demonstration itself. The demonstration that these conditions are met would not be submitted as part of the LRA but would be maintained on site.~~:~~

- A complex assembly of components where the pressure-retaining function directly supports active performance of the assembly;
- The passive function is the pressure-retaining function and is not a fission product boundary function;
- The active intended functions are performed by redundant trains;
- Performance testing is well documented with verification that corrective actions assure the continued performance of all intended active functions; and

- The complex assembly is covered by the Maintenance Rule.

6.1.2 Component Assemblies Subject to Complete Refurbishment

For some complex assemblies of SCs, the entire assembly is subject to a program which requires complete refurbishment at periodic intervals. Components of such assemblies may be subject to AMR because their pressure-retaining function supports the active functions of the entire 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.

An example is the main steam isolation valve operator. This assembly contributes primarily to the active function of closing the main steam isolation valve in a specified amount of time. Because the valve operator uses a combination of hydraulic fluid pressure and compressed nitrogen to operate the valve, several components of this operator assembly provide a passive pressure-retaining function. The entire valve operator is removed from the system at regular intervals and refurbished. Some of the pressure-retaining components and subcomponents are replaced every refurbishment interval. Others are inspected and replaced if they meet certain described conditions. The entire assembly is re-assembled and tested to ensure satisfactory performance and then re-installed in the system. Such a refurbishment program manages all plausible aging effects to ensure that the intended function of the valve operator is maintained in accordance with the CLB. Therefore, this program may be credited as an adequate aging management program without considering specific aging mechanisms.

This approach is restricted to refurbishment programs that meet the following criteria:

- The refurbishment is conducted at regular intervals on a complex assembly of components where the pressure-retaining function only directly supports the active intended function of the assembly;

- The passive function is the pressure-retaining function and is not a fission product boundary function;

- The program requires complete removal of the component assembly from the system;

- The assembly components and subcomponents, including pressure boundaries, are inspected for signs of aging and other degraded conditions;

- The refurbishment directs replacement of components and subcomponents that are deteriorated excessively due to aging or other degradation; and

- The refurbishment includes post maintenance testing consistent with current industry practices and the CLB ~~component assembly's intended functions are tested after the refurbishment~~.

6.1.3 Long-Lived EQ Components

Components subject to EQ which have qualified lives less than 40 years are short-lived and would be excluded from the aging management review during the pre-evaluation step of the process. Components subject to EQ which have qualified lives of 40 years or greater are subject to a time-limited aging analysis (TLAA). The options for resolving TLAAs are described in Section 8. Completing one of these TLAA options for long-lived EQ equipment will also serve to provide the required IPA demonstration. ~~are already adequately managed for the effects of aging. This program ensures that the effects of aging will not prevent the qualified component from performing its intended function, in accordance with the CLB, at any time during the qualified life of the component.~~

Some portions of passive EQ SCs may not be covered by the EQ program. For example, the EQ program only qualifies the organic material of a solenoid valve. A separate AMR evaluation using the technique described in Section 6.2, will be performed to provide the required demonstration for those portions of passive EQ SCs which are not covered by the EQ program.

~~Prior to exceeding the qualified life of any component, the EQ program requires that the component be reanalyzed to extend the qualified life or that the component be replaced. Therefore, the combination of the qualified life and the requirement to take appropriate action prior to exceeding this qualification will adequately manage the effects of aging on equipment covered by this program.~~

~~Any component in the scope of LR which has a qualified life of less than 40 years would not be subject to AMR since this component is replaced based on its qualified life. For any component with a qualified life greater than 40 years, the EQ Program is credited as the adequate aging management program for LR, with no specific evaluation of aging mechanisms.~~

6.1.4 SCs Subject to Replacement on Condition

In the case of certain SCs, an indication of SC condition is used as the basis for replacement of a passive SC. For example, the copper-nickel tubes of a heat exchanger may have an intended pressure-retaining function. This function is passive since there are no moving parts or changes in configuration or properties involved in performing the function. Such tubes are not replaced based on a specific time period or qualified life so they would be included in the aging management review. However, they are subject to eddy current testing which dictates when tubes must be plugged and a tube plugging limit which dictates when the tube bundle must be replaced. Plant experience shows that these heat exchangers are retubed every 10 to 15 years. In cases such as this one, where a plant parameter for a passive SC is linked to the ability of the SC to perform its intended function, and where plant operating experience has shown that the component is replaced frequently, the condition-based replacement program would be credited as the aging management program for the SCs.

Table 6-1 shows the criteria which are covered in the detailed demonstration for each SC or group of SCs subject to this AMR method. These detailed results are maintained on site in an auditable format. The justification provided in the LRA to demonstrate that the effects of aging are adequately managed would include a summary of the detailed justification.

TABLE 6-1

CRITERIA FOR REPLACEMENT ON CONDITION PROGRAMS

Criterion 1 - Replacement programs based on condition or performance must ensure that the SCs identified as within the scope of LR will be replaced before degradation would result in loss of the SC intended function(s). For example --

- Is the discovery activity frequency interval less than the shortest time between failures of the SC intended function(s)?
- Based on the condition or performance trait monitored by this program, is the component replaced at intervals that are short relative to the life of the plant?
- Historically, have all maintenance preventable functional failures of SC intended functions been detected by the activity?

Criterion 2 - Replacement programs based on condition or performance must contain appropriate acceptance criteria which ensure timely replacement of the SCs.

- Does the activity have an action or alert value or condition parameter to determine the need for replacement of the SC?
- Does the action value or condition provide an appropriate means of assuring replacement of the component before the effects of aging would prevent any intended system functions?

Criterion 3 - Replacement programs based on condition or performance must be implemented by the facility operating procedures.

- Is the activity controlled by a site review process which includes controls over subsequent revisions?

6.2 Performing an AMR by Evaluating Aging Mechanisms

In some circumstances, the most efficient manner[8] to show that the effects of aging are being adequately managed is to evaluate the effects of specific aging mechanisms on the intended functions and to demonstrate that those effects are being managed. This Section describes this method of performing an AMR.

6.2.1 Creating a Potential ARDM List

The first step of the specific evaluation of ARDMs is to determine which ARDMs must be evaluated. For system components, the list of such ARDMs is referred to as the "Potential ARDM List" for a given ET.

When an ET is encountered in an aging evaluation and the ET has not been evaluated as part of a previous evaluation, a new Potential ARDM List is created. Industry documents are reviewed to identify the aging mechanisms which need to be considered. From reference materials, a list of all of the ARDMs which might affect any SC of the given ET is compiled. The list also includes a discussion of the various stressors which cause or exacerbate the ARDMs. It also includes a list of any characteristics of selected SCs which might prevent the ARDMs. This Potential ARDM List is the list of ARDMs that will be considered for subsequent evaluations of SCs of this ET. The Potential ARDM List is updated as each SC of the same ET is evaluated.

The next step is to eliminate those ARDMs which are not applicable to any of the SCs in the system being evaluated. For example, creep is an ARDM which is included on the initial list for the ET for piping. However, when finalizing the Potential ARDM List for the Service Water System, this ARDM is eliminated as not applicable because the temperatures throughout the Service Water System are too low to warrant consideration of this mechanism. The basis for marking an ARDM as not potential is recorded on the Potential ARDM List for the system.

Structural components are not associated with a particular ET in the site equipment database, and therefore a modification to this step is needed for structural components. Instead of creating the Potential ARDM List for each ET, structural component types are divided into two categories: 1) concrete/architectural components; and 2) steel components; and a Potential ARDM List is created for each of these categories.

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8 Unlike the methods described in Subsection 6.1, this method of performing the AMR could have been used for all SCs subject to AMR. However, this method is not always the most efficient method. For some SCs, even if one of the more efficient methods described in Subsection 6.1 would have been sufficient to demonstrate adequate aging management, BGE chose to use a more mechanistic approach due to other benefits derived from performing this approach.

6.2.2 SC Grouping

If a system contains several SCs with similar characteristics, the evaluation process can be made more efficient by grouping these SCs together for a common evaluation.

All components of systems are classified in the site equipment database with a particular DT code. Examples of such DTs are hand valves, check valves, pressure transmitters and heat exchangers. The DT can be further divided to facilitate the evaluation process. For example, if the check valves of a particular system are made of two distinctly different materials, two separate groups may be formed. Other possible examples are listed below:

Internal Environment - All system piping which carries saltwater could be in one group while the instrument air piping which controls valves in the system would be in another.

External Environment - All system underground piping could be included in one group, while the above ground piping would be in another.

Design - Other design parameters besides material could be selected as grouping attributes. For example, plate and frame heat exchangers may be grouped separately from shell and tube heat exchangers.

The grouping attributes and the component IDs are recorded and each group is assigned a unique identifier.

Groups may be further subdivided into the individual subcomponents which make up the components in the group if this facilitates the subsequent evaluation. If certain subcomponents are not required for the SC to perform its intended, passive function, they are identified and excluded from further evaluation. For example, a group of air-operated valves may have an intended pressure-retaining function but may not have to reposition for any intended function. Therefore, the discs, seats and air operators of the valves in this group would not be subject to AMR because they do not contribute to an intended passive function. Whenever subcomponents are eliminated from further evaluation because they do not contribute to the intended, passive functions, the bases for these decisions are also documented.

Again, because of site documentation differences for structural components, the structural component type is used to establish the initial level of grouping in the same manner as DT is used for system components.

6.2.3 Create and Resolve the ARDM Matrix.

After completion of the system Potential ARDM List and after SCs are grouped and subdivided, an ARDM matrix is created and evaluated. The ARDM matrix consists of all potential ARDMs along one axis and all remaining subcomponents for a particular

SC group along the other. Each ARDM/subcomponent intersection must be reviewed during this step.

For each ARDM/subcomponent combination, the following is considered: 1) the material of the subcomponents in the group; 2) the operating environment; and 3) the passive intended functions. If the ARDM 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 ARDM is designated as not plausible for the subcomponent. Although material, environment and function are mentioned separately above, when evaluating ARDM plausibility, all of the factors are ~~also~~ considered together.

Integrated Plant Assessment documentation for this step consists of the list of the ARDMs that are plausible for each group of SCs subject to AMR and ~~. T~~the rationale for designating each ARDM. This information is recorded in evaluation reports and maintained onsite. A list of the potential ARDMs that were evaluated for each group of SCs in the system is provided in the LRA.

6.3 Methods to Manage the Effects of Aging

This Section describes how the aging management methods are chosen and justified for the period of extended operations. Methods chosen for managing the effects of aging will be consistent with site strategies for maintenance of equipment material condition. 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. Consequently, each phase of the maintenance strategy discussed below takes this goal into consideration when determining the adequacy of an existing or proposed program or activity.

6.3.1 Phases of a Maintenance Strategy

An adequate maintenance strategy consists of four phases: Discovery, Assessment/ Analysis, Corrective Action, and Confirmation/Documentation

(1) **Discovery** - The first phase of a maintenance strategy is identification that detrimental effects of aging are or could be occurring. As stated in the SOC for the LR Rule:

> *The Commission believes that, regardless of the specific aging mechanisms, only age-related degradation that leads to degraded performance or condition (i.e. detrimental effects) during the period of extended operation is of principal concern for license renewal. Because the detrimental effects of aging are manifested in degraded performance or condition, an appropriate license renewal review would ensure that licensee programs adequately monitor performance or condition in a manner that allows for timely identification and correction of degraded conditions. (60 FR 22469)*

Aging can be self revealing or identified through specific diagnostic techniques. Current ~~E~~examples of discovery methods include visual observation of external conditions, eddy current examination for flaws, and ultrasonic testing for detecting wall thinning. As discussed in Section 6.1.1, these 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. Some plant programs may use specific detection techniques to detect and monitor aging while others rely on walkdowns by plant personnel to observe and document degraded conditions or performance. Monitoring and evaluating industry experience also serves as a discovery activity for currently unknown or theorized ~~managing~~ aging mechanisms since other plants may discover aging effects before CCNPP.

(2) **Assessment/Analysis** - Once performance or condition degradation is discovered, its progress must be compared to criteria or other guidance to determine the degree of the degradation and the need for specific and generic corrective and preventive action. These criteria and guidance will depend on the characteristics of the degradation and the effects on the intended function. For example, a safety or safety support system must be capable of performing its specific safety function for accident prevention and/or mitigation as described in the CLB. Likewise a system providing a function for a regulated event must be capable of performing that function under the conditions described in the CLB evaluation of the regulated event. The assessment/analysis phase incorporates such requirements in determining the need for and nature of corrective actions after abnormal or degraded conditions are discovered. One possible result of such assessment/analysis would be to repeat the discovery phase using an expanded sample size or using an augmented or improved technique for discovering and quantifying the extent of a particular aging effect.

(3) **Corrective Action** - With the degree of degradation known, specific corrective action can be taken to ensure that the equipment performance or condition is restored and the intended function is maintained. Site procedures currently exist which require root cause analysis and actions to prevent recurrence to be included with corrective actions when appropriate.

(4) **Confirmation/Documentation** - After the corrective action is performed, post maintenance verification or testing confirms that maintenance was performed correctly and the equipment is capable of performing its intended function. The corrective action and testing are documented as part of plant records for future reference.

In combination, these four phases provide a complete maintenance strategy. Sections 6.3.2 and 6.3.3 describe how discovery activities are identified and selected. Section 6.3.4 describes how the latter 3 phases are implemented.

6.3.2 Site Expert Panel Input

The selection of the appropriate method for detecting aging effects is performed through an expert panel review of each plausible ARDM/subgroup combination. The review is conducted on a system or commodity basis and, typically, consists of following plant representatives:

- The system or commodity aging evaluation engineer;
- The cognizant system engineer;
- Appropriate plant program managers/technical area specialists; and
- The aging management implementation engineer.

Each member brings specific focus and talent to the expert panel.

The aging evaluation engineer presents the results of the system aging evaluations highlighting the intended functions of the systems, the components subject to AMR, and the plausible aging effects. The aging evaluation engineer also proposes the methods by which the effects of aging can be managed.

The system engineer brings his knowledge of the system and functional requirements, knowledge of the plant and industry experience with the system, and familiarity with system inspection, surveillance, testing and maintenance results. The system engineer also provides site technical concurrence to execute the aging management methods for his system under a renewed license.

Each plant program manager/technical area specialist brings his expertise in a specialized area (such as non-destructive examination, EQ, chemistry, materials, fatigue) and provides a perspective in determination of program applicability and feasibility. These individuals also provide technical concurrence that their program methods will effectively detect and monitor the specified aging effects and are presently the preferred methods.

The aging management implementation engineer facilitates the panel meetings, provides consistency between system and commodity technical discussions, ensures involvement of the appropriate plant personnel, and ensures closure of open items.

The panel as a team determines the appropriate methods to manage the effects of aging for the given system or commodity considering two main factors:

- The likelihood the ARDM will occur for the specific application; and
- How the effects of the mechanism progress.

If the panel determines that the ARDM occurs and progresses relatively rapidly, then prescriptive plant programs or system modifications may be warranted. ~~One time~~ Age-related degradation inspections and/or performance or condition monitoring may be warranted if:

- The mechanism has not been seen yet in operating plants;

- Present knowledge indicates progression is gradual; and

- The known characteristics of the ARDM indicate a potentially severe impact on the system intended function.

Continuing to monitor and evaluate industry experience may be appropriate if:

- There is little or no experience with a particular mechanism occurring for the system environment;

- Current knowledge indicates the ARDM progresses relatively slowly; and

- The potential consequences to the system intended function are not significant.

6.3.3 Selection of Aging Management Alternatives for Discovery

Once degradation is discovered, the process described in Section 6.3.4 will ensure that the appropriate Assessment/Analysis, Corrective Action, and Confirmation/ Documentation occur for all SCs. Therefore, for the purposes of the IPA, it is only necessary to establish how the degradation will be discovered on a system-by-system basis.

Appropriate methods for discovering the effects of aging are selected for all of the SCs subject to the AMR based on the expert panel approach. Each of the methods can be categorized into one of the following groups.

6.3.3.1 Plant Programs

Plant programs are often the most direct and systematic method of detecting and mitigating the effects of aging. They already exist to meet regulatory requirements or recommendations, warranty requirements, or to preserve economic investment based on site experience. They are typically selected as the method of discovering aging when they exist and can discover the effects of the plausible mechanism.

The plant programs applicable to the system are identified and reviewed to determine if they may serve to discover aging effects for the long lived passive components. In some cases, existing condition monitoring or functional testing may be sufficient; existing focused inspections may be sufficient in others. Programs adequate to detect or monitor the effects of aging during the period of extended operations are credited without modification.

Whenever an activity required by an existing industry code such as ASME Section XI is credited as an aging management program, the specific version of the code to which BGE is currently committed should be noted in the AMR report and LRA documentation.

Existing plant programs can also be modified to ensure the discovery phase of the maintenance strategy is adequate for the period of extended operation. Examples of modifications to an existing program include, but are not limited to, the following:

- Adding components to inspection procedures for specific aging effects;
- Adding specific aging effects mitigation procedures; and
- Tailoring of record keeping and trending requirements.

If no existing plant program can be adapted to address the aging effects for the given group of SCs, new programs may need to be implemented.

Some modifications to existing programs and new programs may be implemented prior to submittal or approval of the LRA. Alternately, the LRA may include a commitment to implement the program or modification at an appropriate future date before or, with appropriate justification, during the period of extended operation.

Examples of existing plant programs are shown in Table 6-1.

TABLE 6-1

Examples of Existing Plant Programs	
Maintenance (Preventive)	Materials Testing and Evaluation
Maintenance (Corrective)	Motor-Operated Valve Program
Maintenance Standards Program	Performance Evaluation Program
Check Valve Reliability	Performance Evaluation Program (Operations)
Eddy Current Testing	Plant Lay-up and Equipment Preservation
Electronic Cable Degradation	Post-Maintenance Testing
Engineering Test Procedures	Pressure Test Procedures
Surveillance Test Procedures	Plant Tours
Fatigue Monitoring	Protective Coating and Painting
Functional Testing	System Walkdowns
Environmental Qualification	Thermography
Inservice Inspection	Vibration Monitoring
Loose Parts Monitoring	Thermal Performance Monitoring
Lube Oil Analysis	Operator Rounds

6.3.3.2 Site Issue Reporting (IR) and Corrective Action Program

In cases where the effects of aging are observed in less formal activities or as a result of work in the vicinity, the IR and corrective action program is relied on for discovery. Examples of less formal activities are:

- Plant tours by supervisors and managers;
- Management and supervisory job observations;

- Maintenance planning walkdowns;
- Walkdowns of planned and completed modifications;
- Fire watches; and
- Personnel safety equipment inspections.

Any observed or suspected condition that requires significant corrective action, whether related to the purpose of a specific activity being performed or not, is documented via an IR. These methods for discovery are normally complementary to other, more formal activities such as age-related degradation inspections. If such activities are relied on as the principal means of discovery, appropriate justification would be provided in the LRA.

6.3.3.3 Plant Modifications

Plant modifications may be appropriate where:

- Plant programs cannot effectively discover the effects of aging;
- Experience indicates that the mechanism is occurring; and
- The progression is relatively rapid.

Modifications will occur as part of the normal site modification process which currently exists for improving and updating plant response, performance and reliability.

Examples of modifications which might result from the aging evaluations include, but are not limited to, the following:

- Relocation of equipment to a less aggressive environment;
- Change of material to improve resistance to the aging mechanism; and
- Change in the equipment operation.

Modifications to plant equipment may be implemented prior to submittal of the LRA. Alternately, the LRA may commit to implement a modification at an appropriate future date. With justification, this date may be during the period of extended operations.

6.3.3.4 Age-Related Degradation ~~One-Time~~ Inspections

Two distinct cases of age-related degradation inspections are discussed below. Others may also be possible.

Case 1: Inspection to Support a Non-Plausible Determination

In some cases aging mechanisms are possible but the effects of the aging are expected to have minimal consequences due to the equipment material and operating conditions. For example:

- A structure may have been built with a concrete mix that provides maximum resistance to freeze-thaw.

- A tank may have been built of stainless steel using strict welding controls to minimize the~~any~~ chance of stress corrosion cracking.

- ~~Instrument taps made with Alloy 600 may have been installed to minimize corrosion.~~

In this ~~these~~ cases, an ~~one-time~~ inspection could be conducted to provide additional assurance ~~conc~~lude that significant degradation is not occurring or that the rate is sufficiently slow to preclude concern during the period of extended operation. Alternatively, the inspection might conclude that additional inspections are needed during the period of extended operation.

The scope of such ~~one-time and additional~~ inspections would typically be a ~~statistically~~ representative sample of the population. Where practicable and prudent, the sample would~~will~~ be biased to focus on bounding or leading components. For example:

- The portion of a structure more likely to experience the ARDM; or
- A statistically representative sample of the valves made of a particular material; ~~or~~
- ~~Several of the Alloy 600 components that are predicted to be more susceptible to Primary Water Stress Corrosion Cracking.~~

If the ~~sample~~ inspection indicates little or no degradation, the conclusion could be reached that the degradation will not result in loss of component function during the period of extended operation and therefore, no additional aging management activities or programs would be required. ~~aging mechanism would be adequately managed by the one-time inspection for the component group or structure.~~ Significant degradation, on the other hand, would trigger action under the existing corrective action program and the need for additional inspections would be evaluated.

~~In cases w~~Where the ~~sample~~ inspection demonstrates that there is no significant degradation and no program is needed to manage the effects of aging, resolution of the aging mechanism would be documented by describing:

- The ~~one-time~~ inspection process and results; and
- Why it is an adequate approach to disposition the ARDM for the SC group.

Case 2: Inspection to Validate an ARDM Mitigation Program

In other cases, programs may be in place which prevent or mitigate the effects of aging. These aging effects could, if left unmanaged, degrade the capability of SCs to perform their passive intended functions. In these cases, relying upon the mitigation program may not provide the necessary level of assurance that the passive intended function will be maintained during the period of extended operation. For example:

- An underground piping system may be wrapped with a protective material to prevent contact with moisture and may also be subject to an impressed current cathodic protection system designed to prevent corrosion. However, because the piping is buried and the consequences of failure would be significant, a decision might be made to perform an inspection of a representative sample of the piping exterior to confirm that the mitigation measures have been effective in controlling aging.

- A fluid system may be subject to chemistry controls which minimize impurities and maintain a basic pH to limit corrosion of carbon steel components. However, because of the large amount of piping and other components subject to such treatment throughout the plant and the range of environmental factors, an inspection of a representative sample of components could be conducted to confirm that the chemistry controls in place have been effective in controlling the effects of aging.

In these cases, inspections could be conducted to confirm that the mitigation programs are effective in preventing or mitigating the aging effects which they were designed to control.

Again, the scope of such inspections would typically be a representative sample of the population of components of concern. Where practicable and prudent, the sample would be biased to focus on bounding or leading components. For example:

- The underground piping system which is closest to the water table and therefore, most likely to have been subjected to moisture.
- The piping system which has experienced the worst history of chemistry transients and/or has the most susceptible locations;

If these inspections reveal little or no degradation, the conclusion could be reached that the mitigation programs are sufficient to manage the effects of aging during the period of extended operations. Significant degradation, on the other hand, would trigger action under the existing corrective action program and the need for additional inspections would be evaluated.

Where the inspection demonstrates there is no significant degradation and the existing program is adequate to manage the effects of aging, this would be documented by describing:

- The attributes of the program which prevents or mitigates the aging effect; and
- The inspection process and results;

For both of the cases described above, the inspection technique would need to be capable of detecting the effects of aging identified by the AMR. Acceptance criteria for these inspections would be consistent with current practices which account for the SC's ability to perform intended functions in accordance with the CLB.

For both cases, the~~A particular one-time~~ inspections described above may be completed before submittal of the LRA. When such an early inspection detects no signs of significant aging as expected, there is no need to extrapolate the results of the inspection. If, on the other hand, the inspection reveals significant degradation or unexpected conditions, the results would either be conservatively extrapolated through the end of the period of extended operation or future inspections would be conducted to track the progress of the unexpected degradation. The frequency of such future inspections would be commensurate with the safety significance of the SCs being inspected as well as consistent with the results discovered during the initial inspection.

Alternately~~In other cases~~, the LRA may commit to conduct the ~~one-time~~ inspection prior to the period of extended operation or, with justification, during the period of extended operation. If industry experience resolves the aging issue in the interim, the commitment to perform the inspection could be canceled using existing site commitment management procedures.

6.3.3.5 Industry Operating Experience

Monitoring plant and industry experience provides the principal ~~for~~ discovery means for~~of~~ unknown and~~,~~ theorized~~, and emerging~~ aging mechanisms. Additionally, monitoring industry experience may be included as one feature of a multi-feature aging management approach when appropriate.

The materials used at CCNPP are common to nuclear plants and to many non-nuclear power~~, operating~~ plants that have long~~er~~ operating histories. Monitoring plant and industry experience therefore provides timely information related to ~~reasonable assurance that~~ unknown and theorized ~~these~~ ARDMs so that there is reasonable assurance that such ARDMs would~~will~~ be discovered before they severely affect intended functions at CCNPP. It also provides assurance that appropriate changes are made to existing programs.

Industry information is distributed across the nuclear industry via Institute of Nuclear Power Operation's Significant Event Evaluation Information Network program, which is a small part of Industry's response to NUREG-0737. The plant program for industry experience reviews problems and events across the industry and evaluates the significance and applicability to CCNPP.

Examples of information that the program captures are:

- Part 21 Notices;
- NRC Bulletins;
- NRC Information Notices;
- NRC Generic Letters;
- Vendor Information Letters;
- Operating Experience Information;
- Significant Event Reports:
- Operations and Maintenance Reminders; and
- Significant Operating Experience Reports.

In some cases, the aging evaluation may be based on ~~emerging industry~~ information from the nuclear power industry or other industries that indicates unexpected deterioration may occur. Although the aging effects may not have ~~not~~ been detected ~~yet~~ at CCNPP or most other plants with similar equipment, similarities in materials and environments may make it possible for the aging effects to occur at Calvert Cliffs. In these cases, discovery has already occurred through notification from NRC, Nuclear Energy Institute, Institute of Nuclear Power Operations, Owners Groups, or vendors.

The site issue reporting ~~IR~~ and corrective action process requires review and evaluation of the industry experience, and comparison to conditions at CCNPP to determine if additional action is needed here. If resolution of the issue is in progress, it will not necessarily be completed prior to LRA submittal or approval. The site issue reporting~~IR~~ and corrective action process ensures that assessment/analysis occurs and appropriate action is taken.

For example, a current industry issue is Primary Water Stress Corrosion Cracking (PWSCC) of Alloy 600. BGE has been closely involved in the industry and owner's group efforts to resolve Alloy 600 issues. BGE has established a multi-disciplined internal working group to evaluate implications of alloy 600 aging for CCNPP. The working group used ~~Based on~~ current industry knowledge and~~, BGE has determined from~~ material and environmental properties to determine the susceptibility of~~that~~ alloy 600 pressure boundary components to PWSCC~~Primary Water Stress Corrosion Cracking for~~. For some components, where PWSCC was determined to be more likely, more proactive steps have been taken or are being considered, such as replacement, nickel plating or destructive testing. For -reactor vessel head penetrations -at CCNPP, the alloy 600 working group determined that PWSCC -will initiate and propagate much slower than at many other plants. Inspection results from other plants continue to be reviewed by BGE and continue to suggest no immediate concern for CCNPP. Additional plants are planning inspections. At this time, BGE cannot conclude that inspections will be needed at CCNPP. However, the processes are in place to ensure appropriate future decisions are made based on accumulated industry knowledge.

6.3.4 Implementing the Assessment/Analysis, Corrective Action and Confirmation/ Documentation Phases of the Maintenance Strategy

The last three phases of the maintenance strategy are required by the CLB and are provided by the site IR and corrective action process. Any observed or suspected condition that requires significant corrective action, whether related to the purpose of the specific activity being performed or not, is documented via an IR. Initiation of an IR causes the degraded condition or performance to be evaluated for immediate personnel or nuclear safety concerns, operability concerns, and reportability. The IR is screened and classified to ensure that timely corrective action is taken.

Actions necessary to resolve the IR are assigned to the responsible organization. The IR remains open until appropriate actions have been completed and documented. For significant events and issues, an event investigation and root cause analysis is conducted to aid in preventing reoccurrence.

Therefore there is reasonable assurance that timely discovery of aging issues and effects will result in ~~timely and~~ appropriate action to evaluate, correct, document, and report them.

6.3.5 Aging Management for Aging Issues Associated with a Generic Safety Issue (GSI) or Unresolved Safety Issue (USI)

If there is an outstanding generic issue (GSI or USI) associated with an identified aging effect or aging management practice, the SOC to the Rule (FR 22484) provides three options (1) If the issue is resolved before LRA submittal, the applicant can incorporate the resolution into the LRA, (2) An applicant can justify that the CLB will be maintained until a point in time when one or more reasonable options would be available to adequately manage the effects of aging. (For this alternative, the applicant would have to describe how the CLB would be maintained until the chosen point in time and generally describe the options available in the future.) (3) An applicant could develop a plant specific program that incorporates a resolution to the aging issue.

In determining the appropriate aging management practice for SCs affected by GSIs and USIs, these options should be considered throughout the steps of Section 6.3 and one of the options chosen as appropriate.

For example, the effects of a particular aging mechanism on a specific material may be designated by the NRC as a GSI. BGE may choose option (2) above to address this issue in the IPA. Analysis could be used to demonstrate that other plants are more susceptible to the particular aging effects than CCNPP. Based on this analysis, reliance on continued participation in owner's group activities or other industry activities, including review of inspection results from the more limiting plants, could be used to demonstrate that the SC intended functions will be maintained consistent with the CLB. Alternate actions could also be developed as contingencies, depending on the results discovered at the limiting plants. In this manner, the aging issue associated with the GSI could be managed for the purposes of the IPA. Ultimately, resolution of the GSI would include actions, if necessary, which would be implemented under the current licensing basis.

6.4 Plant Program Documentation

Documentation in the LRA for this step consists of a demonstration that the effects of aging are adequately managed as well as a description of the programs and activities which were identified during the AMR and are relied upon to manage the effects of aging. ~~Additionally, any p~~Program modifications or new programs which need to be implemented in order to adequately manage the effects of aging for the period of extended operation would be described briefly. A summary description of these existing programs and activities, program modifications and new programs are included in the FSAR Supplement. Detailed justification of the adequacy of the programs will be maintained onsite to serve as the basis for the demonstration~~description~~ provided in the LRA and the summary description provided in the FSAR Supplement.

6.5 IPA SUMMARY

The completion of the AMR task concludes the IPA required by the LR Rule. This process demonstrates that the effects of aging have been identified and are being or will be adequately managed. The next section of this methodology describes several specific cases where a slightly different process is used to provide the demonstration required for the IPA. ~~arrive at equivalent results.~~

7.0 COMMODITY APPROACHES TO AMR

As discussed briefly in Section 1 and 4 of this methodology, the approach described in the first six sections of the methodology was followed for all plant SSCs with only a few exceptions. These six exceptions are described in this section.

The intent of a commodity evaluation is identical to the normal IPA approach, i.e., to demonstrate that the effects of aging are adequately managed. For each case discussed in this section, increased efficiency was the primary motivation in adopting an alternate~~, but equivalent,~~ approach. ~~In addition to describing the steps of the alternate process, this section demonstrates that each of these processes are equivalent to the process described in the first six sections of the methodology.~~

For the purposes of discussion, the six commodity evaluations are divided into two groups: 1) those that ~~are equivalent to and~~ replace only the AMR step of the IPA (Section 7.1) and 2) those that ~~are equivalent to and~~ replace the entire IPA process (Section 7.2). Table 7-1 shows the six commodity evaluations and which belong to each of the categories described above.

TABLE 7-1

Commodity Evaluation	Equivalent to Entire IPA or Just AMR?
EPs	AMR
ILs	AMR
Cables	IPA
Cranes and Fuel Handling Equipment	IPA
Component Supports	IPA
FP Equipment	IPA

7.1 Commodity Evaluations Which Cover Only~~Equivalent to~~ the AMR Step

For the EPs evaluation and the ILs evaluation, the IPA steps of system level scoping, component level scoping and pre-evaluation are performed as described in Sections 3, 4 and 5 respectively. The output of these steps for the many systems which contain one of these two commodities is a list of the SCs subject to AMR. The performance of the AMR is split into the system AMR and commodity AMRs. The system AMR is conducted as described in Section 6. The commodity AMRs are conducted as described below.

7.1.1 EP Commodity Evaluation

For many fluid systems, the list of SCs subject to AMR includes many pressure-retaining fluid system components and a relatively few EPs which provide structural support to active electrical equipment. All of these components could have been evaluated as part of the system AMR. However, the expertise of the evaluator and the type of reference materials and plant documentation needed to perform the AMR for these two types of equipment is substantially different. Furthermore, the AMR of the EPs requires a level of expertise, reference material and plant documentation similar to that needed for other SCs in electrical distribution and instrumentation systems. Therefore, for efficiency reasons, the EPs are removed from the scope of each system AMR and all EPs (electrical distribution, instrumentation and panels supporting mechanical system operation) are grouped into a common commodity evaluation.

The first step of the EP commodity evaluation is to review the scope of all of the pre-evaluation results and to include all EPs subject to AMR in the~~a~~ commodity evaluation, regardless of the system the panel is assigned to in the site equipment technical database. Performing this step maintains the link between the scoping and pre-evaluation results, which are done system-by-system, and the scope of the commodity evaluation. For some systems, the only components in the system which were subject to AMR were those included in the scope of the EP commodity evaluation. For these systems, no system AMR was performed at all since the EP commodity evaluation addressed all system components requiring an AMR.

After the scope of the commodity evaluation is established, the IPA process for conducting an AMR described in Section 6.2 is applied to the newly formed scope of EPs in exactly the same manner as it is applied to a plant system. Panels are grouped by common material, function and environment. Potential ARDMs are listed. Age-related degradation mechanisms matrices are created and resolved, and aging management alternatives are evaluated.

~~For the following reasons, the EP commodity evaluation process is equivalent to the standard IPA process: 1) The scoping and pre-evaluation are done per the standard process; and 2) The AMR is conducted per one of the methods described in the standard process. The only difference is that this process is applied to equipment which is not designated as a system in the site technical database. This difference is accounted for by two factors -~~

- ~~An extra step in the commodity evaluation which specifies the scope of the commodity evaluation; and~~

- ~~A step in the pre-evaluation which ensures that every SC subject to AMR is targeted for either the system AMR or a commodity evaluation.~~

~~Therefore, the EP commodity evaluation produces a result that is equivalent to the standard IPA process described in Section 4 - 6.~~

7.1.2 IL Commodity Evaluation

For many fluid systems, the list of SCs subject to AMR includes many pressure-retaining ~~fluid~~ components which are part of small branch ILs. Regardless of which system these ILs are part of~~assigned to~~, ~~they share~~ certain common characteristics are shared with respect to aging management.

- All consist of piping and/or tubing which contribute to only one passive intended ~~passive~~ function, i.e., the pressure-retaining boundary of the system;

- All include~~contain~~ instrumentation which would be affected to some extent by significant PB leakage; and

- ~~All are designed in accordance with standard practices outlined in a specification for ILs at CCNPP; and~~

- All system piping to which ~~attached to~~ these ILs are attached is also subject to AMR.

Because of these common characteristics, the BGE IPA process includes an IL commodity.

Again, the scoping and pre-evaluation steps of the IPA are performed using the IPA approach described in Sections 3 - 5. During the Pre-evaluation task, the IL components are separated from the remainder of the system pressure-retaining boundary and are targeted for a commodity evaluation. Similar to the EP commodity evaluation, the first step of the IL commodity evaluation specifies the scope of the evaluation. For every fluid system subject to AMR, pre-evaluation results are reviewed. ~~and~~ Tubing, fittings, hand valves and any other in-line components which are associated with the instrument and contribute substantially to the pressure-retaining function ~~the system pressure-retaining instrumentation (including associated valves) is~~are included in the scope of this commodity evaluation. ~~The list of these components, plus the associated tubing and fittings (which do not have unique identifiers in the site equipment database), form the scope of this commodity evaluation.~~

~~The next step of the evaluation establishes the combinations of materials and environments that exist in the population of instruments, valves, tubing and fittings that are in the scope of this evaluation. The range of materials and environments is determined from a review of plant design basis information such as the instrumentation specification. Table 7-2 shows the combinations and materials and fluid environments identified for ILs at CCNPP.~~ At this point, one or more of the ~~a generic~~ AMR methods described in Section 6.1 and 6.2 are ~~evaluation of~~ performed on ILs in the scope of this evaluation. ~~materials and environments is performed to determine which combinations within the population are subject to plausible age-related degradation using the same criteria described in Section 6.2. If plausible ARDMs are discovered for a generic combination of materials and environments, the equipment within the scope of this evaluation are reviewed to determine which ILs actually contain these combinations.~~ Appropriate aging management alternatives are then selected ~~for these ARDMs~~ using the techniques described in Section 6.3.

~~TABLE 7-2~~

~~MATERIALS AND FLUID ENVIRONMENTS FOR INSTRUMENT LINES~~

~~Materials~~ / ~~Fluid Environments~~	~~Beryl-Copper~~	~~Brass~~	~~Bronze/Brass~~	~~Buna-N~~	~~B25~~	~~Pb Bronze~~	~~Monel~~	~~Monel Teflon Steel~~	~~Porcelain~~	~~Steel~~	~~Steel and Stainless Steel~~	~~Stainless Steel~~	~~304 SS~~	~~316 SS~~	~~17-7 PH SS~~
~~Acid or Caustic~~			~~X~~												
~~Air~~	~~X~~		~~X~~		~~X~~			~~X~~				~~X~~		~~X~~	
~~Ammonia~~														~~X~~	
~~Borated Water~~			~~X~~		~~X~~		~~X~~					~~X~~	~~X~~	~~X~~	~~X~~
~~Carbon Dioxide~~			~~X~~												
~~Fuel Oil~~										~~X~~	~~X~~			~~X~~	
~~Fyrequel 220~~														~~X~~	
~~Hydrazine~~														~~X~~	
~~Hydrogen~~							~~X~~							~~X~~	
~~Gas~~												~~X~~			~~X~~
~~Lube Oil~~					~~X~~				~~X~~				~~X~~		
~~Nitrogen~~		~~X~~	~~X~~	~~X~~											
~~Oil~~			~~X~~									~~X~~		~~X~~	
~~Saltwater~~			~~X~~		~~X~~		~~X~~					~~X~~			~~X~~
~~Steam~~										~~X~~		~~X~~		~~X~~	~~X~~
~~Water~~	~~X~~	~~X~~	~~X~~		~~X~~	~~X~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~		~~X~~	~~X~~

~~Again, this commodity approach produces results which are equivalent to results produced by the standard IPA process described in Sections 4 - 6. The scoping and pre-evaluation steps are performed using the standard IPA process. The AMR step is slightly different in that the evaluation of the effects of aging is done for generic combinations of materials and environments rather than actual specified groups of components. For material/ environment combinations which are subject to plausible ARDMs, appropriate aging management alternatives are determined and the SCs to which these methods need to be applied are identified. The results are the justification that the effects of aging will be adequately managed. This result is precisely the same as that produced by the standard IPA process. Therefore, this IL commodity evaluation process is equivalent to the standard IPA process described in Sections 4 - 6.~~

7.2 Commodity Evaluations Which Cover All~~Equivalent to the Entire~~ Scoping and IPA Steps

For the cables, structural supports, FP equipment and cranes/fuel handling commodity evaluations, the process described in this section covers~~is equivalent to~~ the component level scoping, the pre-evaluation and the AMR steps. ~~The following discussion will provide the justification that the process described is equivalent to the standard IPA process described in Sections 4 - 6.~~

7.2.1 Cables Commodity Evaluation

The CCNPP equipment database does not contain specific equipment connectivity for individual cables. Instead, a separate Circuit and Raceway database contains information on cables, their service function (power, control or instrumentation), their materials and their from and to locations. Correlation of cable schemes to individual raceways, equipment and rooms is then possible using the information in this Circuit and Raceway database and design drawings. Because of these differences in site documentation techniques, the BGE IPA process does not include cables within any of the system AMRs, but instead evaluates cables as a separate commodity.

7.2.1.1 Elimination of Cables Subject to ~~Already Adequately Managed by~~ the EQ Program

The cable commodity evaluation process starts with all site cables, regardless of whether they support any of the intended functions described in §54.4. The first screening step in this process is to set aside~~eliminate~~ all cables covered by the EQ Program. As ~~D~~discuss~~ion~~ed in Section 6.1.4, SCs subject to ~~justifies that~~ the EQ program are associated with ~~is~~ a TLAA that will be evaluated using the process described in Section 8. ~~an adequate program for managing the effects of aging for all SCs within the scope of this program.~~ Therefore, no further review of EQ cables is performed during the cables commodity evaluation.

7.2.1.2 AMR for Cables ~~Determination that There is Only One Potential ARDM~~

For the remaining~~all non-EQ~~ cables, the potential ARDMs which could affect CCNPP cables are considered as discussed in Section 6.2.1. Cables are grouped by common material characteristics as described in Section 6.2.2 and the potential ARDM(s) are evaluated to determine which are plausible for the groups of cables as described in Section 6.2.3. - At this point in the process, the component level scoping step is performed, applying the principles described in Section 4, to determine which of the cables which are subject to plausible ARDMs are within the scope of license renewal. The Pre-evaluation step is not performed during this commodity evaluation since all cables are passive and long-lived.

For those cables subject to plausible ARDMs which are within the scope of license renewal, aging management alternatives are selected using the process described in Section 6.3

~~During the development of the commodity evaluation process, all of these mechanisms except thermal aging were determined to be "not potential" for the reasons specified in Table 7-3. Therefore, the remainder of the cables commodity evaluation focuses on the question, "Are any of the cables which are in-scope for LR subject to dielectric failure due to thermal aging at normal service temperatures in less than 60 years?"~~

~~Table 7-3~~

~~AGING MECHANISM~~	~~JUSTIFICATION WHY NOT POTENTIAL~~
~~Radiation Stress~~	~~For polymers used in fabricating cables installed at CCNPP, the radiation threshold above which changes in mechanical and electrical properties becomes noticeable is 1E06[9] Rads. This would require that a cable be exposed to an average 2 R/hr dose for 60 years. BGE EQ Cable Reports record the maximum non accident plant dose to be 0.35E6 Rads over 40 years. Extrapolating to 60 years results in a dose of 0.525E6 Rads. Since this value is less than the stated threshold the effects of radiation on non-EQ cables at CCNPP over 60 years is considered insignificant.~~
~~Mechanical Stress and Installation Damage~~	~~BGE cable installation damage is precluded by installation standard practices which include limitations on cable pulling tension and bend radius. It is not BGE's practice to oversize conduits for pulling of additional cables through occupied conduits. Cables are tested after installation and before operation. Installation damage induced failures generally occur within a short time after the damaged cable is energized. Therefore, aging penalties to account for potential installation damage are considered unnecessary for cables installed at CCNPP. Mechanical stress due to forces associated with electrical faults are not considered to be a concern at Calvert Cliffs. This is due to the fast action of circuit protective devices at high currents (which cause large magnetic forces) and the fact that all cables are fully supported.~~
~~Electrical Stress~~	~~Normal electrical (voltage) stress is not significant due to the overrating of cable insulation. For example, 600V and 1000V cable is operated on a 480V system. Similarly, 5kV cable and 15kV rated cables are operated on 4160V and 13.8kV systems, respectively. Overvoltages are limited in duration and amplitude due to the fact that the only portions of the plant distribution system exposed to lightning are the primaries of the 500-13kV service transformers, and these are protected by arrestors. All other portions are metal enclosed, underground or indoors.~~
~~Water Treeing~~	~~This phenomenon is limited to High and Medium voltage Cross-Linked Polyethylene insulated cable in a wet environment. Electrical stress is not sufficient to create water trees in cables operated below 4 kV. All cables used in 4 kV and 13 kV service at CCNPP are Ethylene Propylene Rubber. Therefore, water treeing is not an aging concern at CCNPP.~~

9 Aging Management Guideline for Electrical Cable and Terminations prepared by Ogden for DOE, Section 4.1.4, p.4-19.

~~7.2.1.3 Grouping of Cables and Calculation of Service Limiting Temperatures~~

~~Thermal aging is a function of insulation material and service temperature. The cables are designated with a cable code which depends upon cable characteristics, such as insulation and jacket material, number and size of conductors, application (power, control, instrumentation), etc. The next step in the cable evaluation process is to group the cable codes according to insulation material. (Note that no credit is taken for cable jackets in the cable evaluation to add additional conservatism to the approach.) A 60-year service limiting temperature is then determined for each group based on information contained in the System 1000 industry material database[10]. This step includes all scheduled cables whether they are "in-scope for LR," or not.~~

~~7.2.1.4 Comparison of Service Limiting Temperatures to Actual Service Temperatures~~

~~The next step in the commodity evaluation process is to determine service temperatures for the cables by considering the ambient temperature of the spaces containing the cables and any ohmic heating effects. The cable installation standard requires separating instrumentation cable from power and control cables. Instrumentation cables are not subject to any significant ohmic heating since they are operated well below their ampacity limits and are separated from other cabling which may serve as heat sources. The highest (non accident) annual temperature of any area that contains cabling is the Main Steam Penetration Room. Its levelized annual temperature is 160°F. Therefore, if instrumentation cable has a service limiting temperature of 160°F or higher, then the cable is not expected to have dielectric failure during 60 years of service at CCNPP.~~

~~Power and control cabling has an insulation temperature rating of 194°F (90°C), or higher. The combination of ambient space temperature plus ohmic heating effects are not expected to exceed 194°F at any time during normal operations[11]. Therefore, if the 60-year service limiting temperature exceeds 194°F (90°C), then no further evaluation for LR is required since such cable is not expected to experience dielectric failure during 60 years of service.~~

~~7.2.1.5 Determination of Which of the Limiting Cables are Within the Scope of LR~~

~~Those instrumentation cables with a 60-year service limiting temperature less than 160°F, and those power and control cables with a 60-year service limiting temperature less than 194°F (90°C), could potentially be subject to excessive dielectric degradation~~

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[10] System 1000 is a database managed by United Energy Services Corporation under a 10 CFR Part 50, Appendix B program. For mineral insulated cable, CE Report 93383-CCE-SR80-1 was consulted since no data was found in System 1000 for this material. The System 1000 database contains time to failure versus temperature data for many organic materials. An Arrhenius analysis is used, based on this data, to determine the temperature which results in a time to failure of 60 years.

[11] This is based on BGE cable design practices using Insulated Power Cable Engineers Association Standards, and the fact that Thermolag-type wrappings are not used at Calvert Cliffs.

~~during the period of extended operations. The next step of the commodity evaluation is to determine which of the limiting cables are within the scope of LR to determine which cables require aging management action. This final screen is performed by applying the following rules:~~

- ~~Any cable associated with a SR load or a load whose failure could prevent operation of a SR function is within the scope of LR.~~

- ~~Any cable associated with equipment relied upon for response to the regulated events listed in §54.4(a)(3) is within the scope of LR if the plant-specific evaluation for these events requires such cables to supply power to the load as part of the event response. For example, cables supplying power to a load which is turned off during the response to an SBO would not be included within the scope of LR. Cables providing diverse scram or diverse turbine trip signals in accordance with the ATWS Rule would be within the scope of LR.~~

~~7.2.1.6 Determination of Adequate Aging Management Practices~~

~~This final step of the cables commodity evaluation uses the techniques discussed in Section 6.3. Aging management alternatives are identified for the limiting cable within the scope of LR. Input from the site expert panel is obtained, and methods which will adequately manage the effects of thermal aging are developed and documented. Aging management practices being considered include temperature monitoring of the hottest cables using the 60-year service limiting temperature or the insulation rated temperature as critical alert values.~~

~~7.2.1.7 Justification that the Cables Commodity Evaluation Process is Equivalent to the Standard IPA Process~~

~~The process described above for evaluating cables performs all of the steps included in the standard IPA process. However, these steps are performed in a different order. The scoping step is deferred until after plausible aging mechanisms are identified for specific groups of cables. The pre-evaluation step is trivial since all non-EQ cables are passive and long-lived and, therefore, all are determined to be subject to AMR. Therefore, the process begins with the method of performing an AMR discussed in Section 6.2. The AMR demonstrates that the effects of aging would not prevent the intended function for a number of cable groups. For the remaining groups, aging management alternatives are identified. The scope of the required aging management program is then determined by performing the component level scoping step on only those cables which need to be managed for the effects of aging.~~

Therefore, the result of the commodity evaluation is the justification that for all cables within the scope of LR, the effects of aging will be adequately managed by plant programs or activities, or the effects will not prevent the intended functions of the cables during the period of extended operations. ~~This result is identical to the result produced by the standard IPA process described in Sections 4 - 6. Therefore, these processes are equivalent.~~

7.2.2 Cranes/Fuel Handling Equipment Commodity Evaluation

The system level scoping results identify five systems within the scope of LR which are related to cranes and fuel handling. Because the only intended function of these five systems are structural in nature, these five systems are included in a commodity evaluation instead of being addressed individually in the standard IPA process. The five systems are listed below:

- Spent Fuel Storage
- Refueling Pool
- New Fuel Storage and Elevator
- Fuel Handling
- Cranes

The first step of this commodity evaluation is to determine which components in these systems contribute to the intended functions. The UFSAR and Q-List documentation is consulted in much the same manner as described in Section 4.2 to determine which components of these systems contribute to the intended structural functions and are therefore within the scope of LR.

Once the components within the scope of LR are defined, the next step is to determine which of these components have already been addressed for their intended, structural type function as part of another AMR (e.g. the AMR of the building which houses the component[12] or the commodity evaluation of structural supports). Any such components are eliminated from the scope of this commodity review. For example, the refueling pool structural concrete, stainless steel liner and the fuel transfer tube are addressed in the AMR of the containment. The spent fuel racks and the spent fuel pool structural concrete and liner are already addressed in the AMR of the Auxiliary Building. These components are therefore eliminated from the scope of the crane and fuel handling commodity evaluation.

~~After eliminating the intended functions and components already addressed by the AMR of the enclosing structure (building), only the seismic II/I[13] intended function remains as being not completely addressed by the enclosing structure's AMR. For most plant equipment, this function is completely addressed by the combination of the AMR of the enclosing structure and the commodity evaluation of component supports (Section 7.2.3). However, for cranes and fuel handling equipment, portions of the components~~

[12] Because the scoping process for structures addresses all structural support functions for equipment housed by the structure, it is expected that the majority of these components would have already been addressed; however, this step of the commodity evaluation is intended to confirm the process.

[13] Provide structural and/or functional support to NSR equipment whose failure could directly prevent satisfactory accomplishment of any SR functions (referred to a seismic II over I or II/I).

~~other than the component supports and structural foundations could contribute to the II/I function if such equipment is used to lift and carry heavy loads over SR equipment. Therefore, further review of this function is conducted in this commodity evaluation.~~

~~Only designated load handling equipment at CCNPP is allowed to lift heavy loads over SR equipment. This designated load handling equipment is controlled in accordance with NUREG-0612 "Control of Heavy Loads," which was issued to document the results of Unresolved Safety Issue A-36. This NUREG provides a set of guidelines intended to minimize the possibility of load drops on safe shutdown equipment or decay heat removal equipment.~~

~~The control of heavy loads is addressed in the CCNPP UFSAR in Section 5.7 which lists the cranes subject to the guidelines of NUREG-0612. This section of the UFSAR concludes that the remaining overhead handling systems are excluded from NUREG-0612 controls because (1) lift points and safe shutdown equipment are sufficiently separated; or (2) the largest load lifted is not a heavy load. Therefore, only the designated heavy load handling equipment requires AMR to address the II/I function (beyond the AMR of the enclosing structure and the commodity evaluation of the structural supports).~~

The next step of the commodity evaluation is to determine which portions of the cranes/fuel~~heavy load~~ handling equipment listed above are subject to AMR. This is accomplished by reviewing the ~~heavy load handling~~ equipment using a process similar to Section 5 Pre-evaluation and determining those components and subcomponents which contribute to the intended ~~II/I~~ functions through moving parts~~motion~~ or a change in configuration or properties. These components ~~and subcomponents~~ are active and, therefore, are eliminated from the AMR[14].

The remaining passive components ~~and subcomponents~~ are evaluated for the effects of aging using the techniques described in Section 6.2. Potential ARDM lists are documented for the structural component types. The effects of the potential ARDMs are evaluated to determine if they could prevent the performance of the intended function. The periodic inspections and testing programs for designated heavy load handling equipment, as well as other plant programs and activities, are reviewed to determine whether they adequately manage the effects of the plausible ARDMs. The process described in Section 6.3 is used to determine the appropriate aging management alternatives and these decisions are documented.

~~The crane and fuel handling commodity evaluation is equivalent to the standard IPA process described in Sections 4 - 6. The component level scoping task is performed by reviewing the same documents that would be reviewed during the component level scoping task described in Section 4. Eliminating components already covered by other structural evaluations avoids duplication of effort. This step has no impact on the completeness of the IPA results. Eliminating components and subcomponents which contribute to intended functions through motion or a change in configuration or properties is consistent with the process described in Section 5, Pre-evaluation. Finally, the remaining heavy load handling equipment is evaluated using the same process as that~~

14 It is conservatively assumed that no components or subcomponents are replaced based on time or qualified life.

~~described in Section 6.2, and aging management alternatives are evaluated using the Section 6.3 process. Therefore, based on the above discussion, the crane and fuel handling commodity evaluation is equivalent to the standard IPA process described in Sections 4 - 6.~~

7.2.3 Component Supports Commodity Evaluation

Component supports are associated with equipment in almost every plant system. They perform the same basic function, regardless of the system with which they are associated. For this reason, it was determined that a commodity evaluation of component supports would be more efficient to address these supports than evaluating them as part of the system AMR.

This commodity evaluation begins with the grouping step described in Section 6.2.2. Component supports are grouped together by type of support and equipment supported as well as by the environment where the support is located. The next step performed is the component level scoping. This step uses the principles described in Section 4 to determine which systems within the scope of license renewal contain each of the component support types in the identified groupings. The component support groups are then evaluated using the steps of Section 6.2.1 (Identify Potential ARDMs) and Section 6.2.3 (Create and Resolve the ARDM Matrix). Once the plausible aging mechanisms are determined for each component support group, the steps of Section 6.3 are performed to choose appropriate aging management alternatives for adequately managing the effects of aging for these supports.

~~Two plant programs govern inspection of component supports and form the foundation for any needed aging management program. The elements of these programs are described in the following Sections.~~

~~7.2.3.1 Seismic Verification Project (SVP)~~

~~The SVP is implementing the requirements of Unresolved Safety Issue A-46 to verify the seismic adequacy of mechanical and electrical equipment, including equipment supports and anchorage. To meet the requirements of Unreviewd Safety Issue A-46, the scope of equipment covered to date by the SVP is limited to equipment required for safe shutdown following a seismic event and to electrical raceway supports[15]. The seismic adequacy criteria were defined by the Seismic Qualification Utility Group (SQUG) and are documented in the NRC approved Generic Implementation Procedure (GIP). The criteria are based on inspections of equipment structural and functional condition following 19 strong motion earthquakes at over 80 industrial facilities. At the time of the post-earthquake inspections, the average age of these facilities was 22 years,~~

15 The CCNPP Individual Plant Examination for External Events is essentially "extending" the scope of the original GIP requirements by conducting walkdowns on other equipment to support the seismic aspect of the probabilistic risk assessment. These walkdowns use criteria similar but not identical to the GIP checklists.

~~including at least 11 facilities (or units within a facility) over 40 years[16]. The SVP equipment walkdowns have been conducted by SQUG-trained Seismic Capability Engineers, who evaluated and documented the condition of each equipment item in accordance with the GIP walkdown checklists. These walkdown checklists require evaluations of equipment anchorage and support load path, including assessments of concrete condition and any other factors that might lessen the seismic adequacy of the equipment's support. The walkdown checklists also require a vicinity check to ensure that NSR equipment installed near the equipment being evaluated is adequately secured and does not pose a credible threat to the equipment being evaluated. The component support commodity evaluation relies on these walkdowns as a key element for managing the aging of structural supports for all equipment in the scope of the SVP.~~

~~Since the SQUG walkdowns under the SVP are a one time occurrence, additional discovery and assessment activities are required in order to rely on this program as an on-going activity to manage the effects of aging for the LR term. Calvert Cliffs intends to commit to the GIP as an alternate method to verify the seismic adequacy of new and replacement equipment. When the GIP procedure is adopted, the associated process requires maintaining the availability of SQUG expertise after the A-46 walkdowns are complete. With SQUG expertise available onsite, any component support types that are subject to ARDMs could be re-evaluated as appropriate. Commitment to the GIP ensures adequate assessment of any degraded conditions that are discovered during the period of extended operations.~~

~~System engineers frequently conduct general walkdowns on their systems in accordance with site guidelines. The site IR and corrective action process requires all plant personnel (including system engineers) to formally document any discrepancy they observe in the plant, including any potential structural support deficiency. Because of these required walkdowns, operator rounds, and other walkdowns performed by personnel familiar with the plant, significant deterioration of the material condition of the structural supports would be discovered and reported for evaluation by qualified individuals.~~

~~7.2.3.2 Component Supports in Service Inspection~~

~~The Component Support Inservice Inspection (ISI) Program requires inspection of equipment supports for components such as piping that are subject to ASME Code requirements. The Code requirements are specified in ASME Section XI, Article IWF. The scope of the Component Support ISI Program includes all ASME Class 1, 2 and 3 piping supports except those excluded by Article IWF-1230. Supports are inspected at regular frequencies on a prescribed sampling of all piping supports as specified in Table IWF-2500-1. The Component Support ISI Program requires inspection of supports for the effects of aging, contains acceptance criteria and requires specific~~

16 EPRI Report NP-7149-D, "Summary of Seismic Adequacy of 20 Classes of Equipment Required for the Safe Shutdown of Nuclear Plants"

~~actions when the criteria are not met. Therefore, it would serve as the aging management program for all supports in the ISI Program.~~

~~7.2.3.3 Determining the Scope Differences Between Component Support Programs and LR~~

~~Based on the above discussion, the first step of the commodity evaluation of component supports is designed to determine the scope differences between these two programs, and the component supports within the scope of LR. This step reviews the requirements for including supports in these programs and compares them to the §54.4 requirements for inclusion within the scope of LR. Scoping requirements which are common to LR and to either one of these programs would narrow the evaluation for the applicable component supports to a determination of what, if any, modifications would be needed to the program to credit the program as an adequate aging management program. Any LR scoping requirements which do not correspond to requirements for inclusion in ISI or SVP would define the scope of component supports which may have to be addressed by modifying the scope of one of the above programs or by a different program. Such program changes would only be necessary if it is determined that the effects of aging would be detrimental to the intended function of the component supports.~~

~~7.2.3.4 Determining What Enhancements, If Any, are Needed to Justify that the SVP Program Adequately Manages the Effects of Aging~~

~~The next step of this task is an evaluation of the effects of aging on the various materials which are used for component supports and the various environments in which they are found in the plant. The observed condition of the component supports during the SVP walkdowns is used as one of the inputs during this review of aging effects. If any combination of materials and environments is susceptible to significant aging effects then further aging management is needed for LR. The threshold for significance in this evaluation takes into consideration the observed condition of the equipment supports during the initial SVP walkdown as a key factor in determining whether a more focused aging management program is needed. Component supports which were found to be in good condition after almost 20 years of plant operation are not expected to be subject to any new aging during the LR period and, therefore, could be effectively managed by the routine walkdown and IR process. Component supports found to be degraded during the SVP walkdowns may, in addition to outlier resolution activities required under the GIP, require additional aging management activities at some point in the future.~~

~~7.2.3.5 Determining Enhancements, If Any, Needed to Justify that the ISI Program Adequately Manages the Effects of Aging~~

~~Similar to the step described in 7.2.3.4, the ISI program is reviewed to ensure that it adequately manages the effects of aging. Again this step includes a review of the aging effects of the various materials used for component supports covered by this program, and the various environments where these supports are located. Again, any material and environment combination which is particularly susceptible to significant aging effects would be singled out for potential enhancements to the ISI program. The threshold for "significant aging effects" would again consider the results of past inspections to determine whether ISI has proven to be adequate in identifying and resolving aging issues for component supports in the past.~~

~~7.2.3.6 Determining Appropriate Aging Management for Component Supports Not Covered by ISI or SVP~~

~~If any component supports are determined not to be covered by ISI or the SVP (including Individual Plant Examination for External Events walkdowns, see footnote 7), the commodity evaluation will determine the most appropriate method to manage the effects of aging for these supports. Several possibilities are listed below and others could be developed during the performance of the evaluation:~~

- ~~Add the component supports to an augmented ISI program.~~
- ~~Add the component supports to the scope of equipment covered by the SVP.~~
- ~~Demonstrate that the aging effects on the component support are bounded by supports already included in the scope of one of the credited aging management programs.~~

~~7.2.3.7 Component Support Commodity Process Equivalent to Standard IPA Process~~

~~The commodity evaluation of component supports produces the same results as the standard IPA process described in Section 4 - 6. The major difference in this commodity evaluation is the initial premise that the ultimate aging management program for these supports will be based on one of two existing programs that perform inspection of component supports. Components in the scope of LR but not covered by the SVP or ISI Program are identified. The "identified" component supports may be added to either program. Optionally, the effect of aging on the supports will be assessed to identify plausible aging mechanisms and appropriate aging management alternatives.~~

~~The next two steps of the evaluation are focused on providing the justification that the two programs do adequately address the effects of aging and/or identifying any enhancements needed to the programs. The only difference between this step and Section 6.3 is that the review in the commodity evaluation only considers these two programs, where the 6.3 review could credit a broader range of site activities. This difference does not affect the technical results in that justification of program adequacy is still provided.~~

~~Based on the above discussion, the conclusion can be reached that the justifications provided by this commodity evaluation are equivalent to those produced under the standard IPA process described in Sections 4 - 6.~~

7.2.4 FP Equipment Commodity Evaluation

Over half of the systems which are included in the scope of LR contribute to one or more FP functions. These functions include both fire suppression/detection functions and functions related to equipment used to demonstrate alternate safe shutdown paths in the event of a severe fire (10 CFR 50 Appendix R). For the vast majority of these systems, the normal component level scoping process described in Section 4 of this methodology is performed. However, there are seven systems which are in scope for LR primarily because of FP functions[17]. For these systems, the alternate scoping process described in Section 7.2.4.1 is used.

Some passive intended FP functions are performed by fluid systems which are not SR. For the SCs which are subject to AMR only because of such passive intended functions, an alternate AMR technique is described in Section 7.2.4.2.

[17] i.e., The only intended functions of three of the seven systems is a FP function. The other four systems have a FP function and a containment isolation function.

7.2.4.1 Scoping of Systems with Primarily[18] FP Intended Functions

The seven systems, which are in scope for LR primarily because of FP functions, are listed below.

- Well and Pre-treated water
- FP
- Plant Heating
- Condensate
- Plant Drains
- Liquid Waste
- Fire and Smoke Detection

Due to similarity of function, and the fact that most of the FP intended functions are active, an alternate approach is used for conducting the component level scoping of these systems. For these seven systems, identification of detailed system functions is performed as described in Section 4.1.1 of this methodology. However, after performance of this step, the intended functions are reviewed in the pre-evaluation step described in Section 5.1 to determine if the functions should be categorized as active or passive. The subsequent steps of the component level scoping process (review of MEL, development of function catalogs and generation of scoping results table) are then conducted on only the passive intended functions of the system and the remainder of the pre-evaluation (short-lived versus long-lived) is completed on only these scoping results.

The avoided steps in this modified process are the creation and further consideration of function catalogs for the active functions. Had the active function catalogs been created during the component level scoping process, the components in these function catalogs would have been excluded from the AMR in Section 5.1 because they contribute to only active functions. Therefore, ~~T~~this process produces the same~~a~~ list of SCs subject to AMR as~~which is equivalent to the list which~~ would have been produced by the process described in Sections 4.1 and 5.~~ Had the active function catalogs been created during the component level scoping process, the components in these function catalogs would have been excluded from the AMR in Section 5.1 because they contribute to only active functions.~~

For all of the remaining systems and structures with FP functions, the component level scoping is performed as described previously in Section 4.

7.2.4.2 AMR of FP Pressure-retaining Components

The pressure-retaining SCs of fluid systems, which are in the scope of LR only because of their contribution to a FP intended function, are addressed in this Section.

18 See previous footnote.

The SOC accompanying the LR rule justifies exclusion of SCs associated with active fire suppression/detection functions from the scope of AMR based on the plant's FP Program.

> *The FPP* [Fire Protection Program] *is part of the CLB and contains maintenance and testing criteria that provide reasonable assurance that fire protection systems, structures and components are capable of performing their intended function. The Commission concludes that it is appropriate to allow license renewal applicants to take credit for the FPP as an existing program that manages the detrimental effects of aging. The Commission concludes that installed fire protection components that perform active functions can be generically excluded from an aging management review on the basis of performance or condition-monitoring programs afforded by the FPP that are capable of detecting and subsequently mitigating the detrimental effects of aging. (60 FR 22472)*

Although the SOC specifically refers only to SCs which contribute to active functions, the justification could apply equally to "installed FP components that perform *passive* functions." Therefore, for the fire suppression/detection systems, the AMR applies the principles of Section 6.1.1 and consists of demonstrating that the performance and condition monitoring programs required by the CCNPP FP Program address~~es~~ the pressure-retaining portions of these fluid system so that the effects of aging are adequately managed.

For the pressure-retaining components in fluid systems credited as alternate safe shutdown equipment for Appendix R, the AMR is performed in accordance with Section 6.2 of this methodology~~, except when the conditions described below apply~~.

~~In some cases, the alternate safe shutdown function required of the system is fully tested during normal plant operation because the alternate safe shutdown function is subsumed by its power production function. Any degradation sufficient to prevent a system from performing its alternate safe shutdown function would be detected and corrected during normal plant operations. The site IR and corrective action program can be relied upon to document and correct the degradation to the power production system before it affects the system's ability to perform its alternate safe shutdown function.~~

~~An example is the condensate system's intended function of providing make-up water to the service water and component cooling water head tanks during a fire scenario that removes the normal make-up source. The normal source of water to fill these head tanks is the demineralized water system. The pressure retaining SCs of the demineralized water system that contribute to its intended function are evaluated in accordance with the process described in Section 6. If the normal source is rendered inoperable by a severe fire, the Appendix R evaluation credits the condensate system for providing this make-up supply of water.~~

~~The pressure retaining SCs of a large portion of the condensate system contribute to this alternate safe shutdown function. However, it is not conceivable that the condensate system would ever be capable of performing its normal power production function, but incapable of supplying a small amount of water to the head tanks. Therefore, documentation and correction of a degraded power production function under the site IR and corrective action program would assure that the effects of aging would not impact the intended alternate safe shutdown function.~~

~~7.2.4.3 FP Commodity Evaluation is Equivalent to Standard IPA~~

~~The commodity evaluation described above produces results which are equivalent to the results produced by the standard IPA process described in Sections 4 – 6. While an interim list of SCs in the scope of LR is not produced, the modified scoping and pre-evaluation process produces the identical list of SCs subject to AMR as the standard process.~~

~~The commodity evaluation of FP SCs applies the same concepts described in Section 6.1 where degradation of passive SCs may be readily managed by active performance and condition monitoring. The focus of this approach is the justification that the CCNPP FP Program ensures both the active and passive fire suppression/detection functions through maintenance and system monitoring. This justification will demonstrate that the effects of aging are adequately managed. This result is equivalent to that produced in Section 6 of this methodology.~~

~~The AMR approach described for certain alternate safe shutdown SCs allows for the demonstration that maintenance of the alternate safe shutdown pressure-retaining boundary is subsumed by maintenance of the plant power production function. With this demonstration, the approach would then conclude that the effects of aging can be adequately managed by the normal site IR and corrective action program. Therefore, this method provides justifications and conclusions equivalent to the Section 6 AMR process.~~

~~In all other cases, the standard AMR process is followed for the SCs associated with pressure-retaining FP functions. Therefore, following this commodity approach for FP equipment will produce an equivalent level of documentation to justify that the effects of aging will be managed for the period of extended operations.~~

7.3 Commodity Evaluation Results And Documentation

Integrated Plant Assessment documentation for commodity evaluations ~~would~~ consists of a demonstration that the effects of aging are adequately managed for the commodity groups being evaluated and a description of the programs identified during the evaluation which are relied upon to manage the effects of aging. ~~Additionally, any p~~Program modifications or new programs which need to be implemented in order to adequately manage the effects of aging for the period of extended operation would be described. A summary description of the existing programs and activities, program modifications and new programs would also be included in the FSAR Supplement.

8.0 TLAA REVIEW

This section of the IPA methodology describes the process for reviewing analyses which may only be valid during the original 40-year license. This task is performed for the entire plant, whereas the Pre-evaluation and AMR steps are performed for each system and structure in the scope of license renewal.

In 10 CFR 54.3, TLAAs are defined as:

Time-limited aging analyses, for the purposes of this part, are those licensee calculations and analyses that:

(1) Involve systems, structures, and components within the scope of license renewal, as delineated in §54.4(a);

(2) Consider the effects of aging;

(3) Involve time-limited assumptions defined by the current operating term, for example, 40 years;

(4) Were determined to be relevant by the licensee in making a safety determination;

(5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in §54.4(b); and

(6) Are contained or incorporated by reference in the CLB.

The SOC accompanying the LR Rule clarifies the definition of TLAA by explaining that an analysis is relevant if it "provides the basis for the licensee's safety determination and, in the absence of the analysis, the licensee may have reached a different safety conclusion." (60 FR 22480) The LR Rule requires that a list of TLAAs (as defined above) be provided in the LRA, as well as a demonstration that one of the following is true for each TLAA~~TLA~~:

(i) The analyses remain valid for the period of extended operation;

(ii) The analyses have been projected to the end of the period of extended operation; or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The TLAA Review task produces the required list of the TLAAs which are subject to LR review, and demonstrates that these analyses will meet one of the three conditions listed above. Figure 8-1 is a flow diagram which shows the TLAA review process.

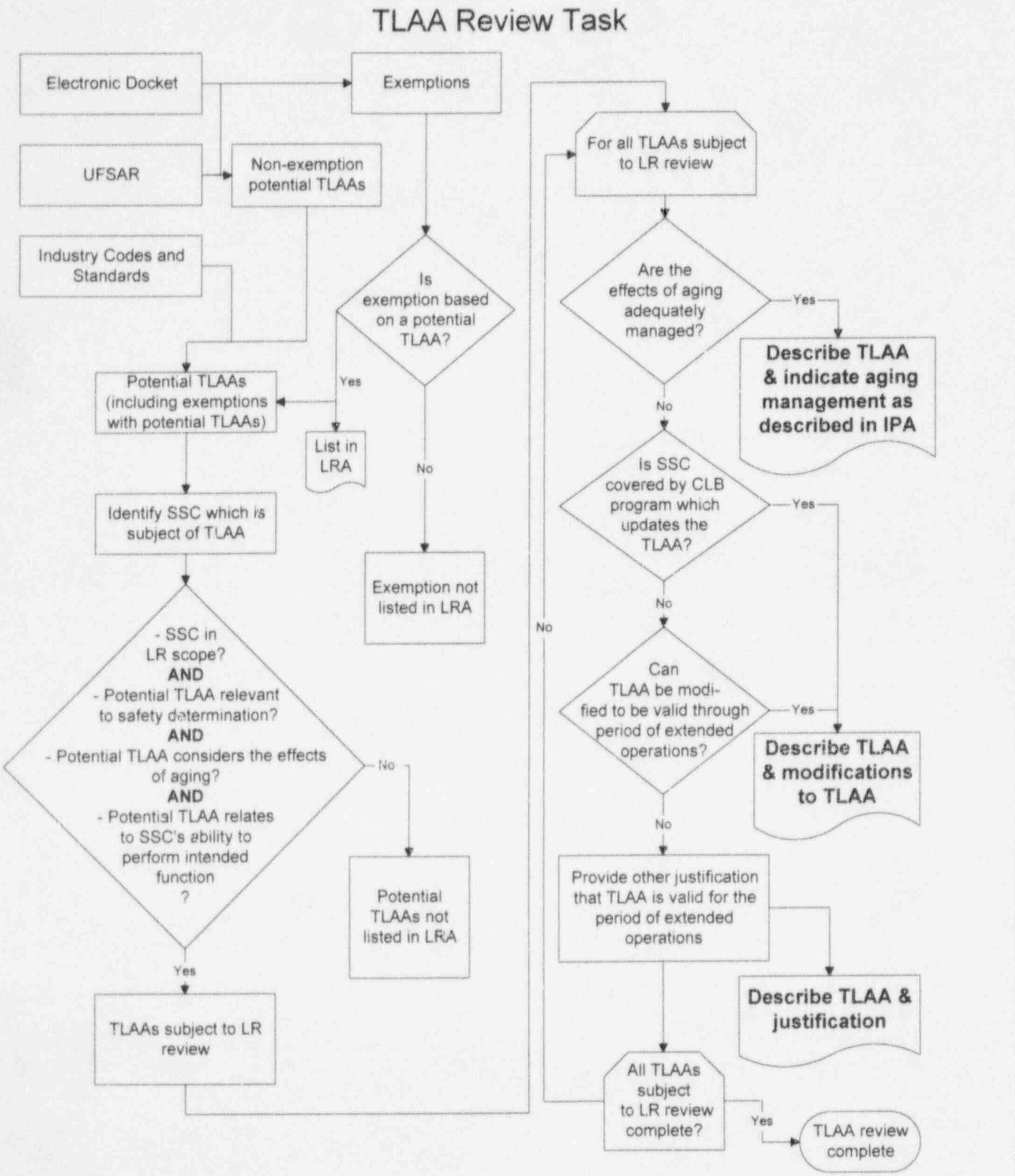
TLAA Review Task
Electronic Docket
Exemptions
UFSAR
Non-exemption potential TLAAs
Industry Codes and Standards
Is exemption based on a potential TLAA?
Yes
No
Potential TLAAs (including exemptions with potential TLAAs)
List in LRA
Identify SSC which is subject of TLAA
Exemption not listed in LRA
- SSC in LR scope?
AND
- Potential TLAA relevant to safety determination?
AND
- Potential TLAA considers the effects of aging?
AND
- Potential TLAA relates to SSC's ability to perform intended function
?
Potential TLAAs not listed in LRA
TLAAs subject to LR review
For all TLAAs subject to LR review
Are the effects of aging adequately managed?
Describe TLAA & indicate aging management as described in IPA
Is SSC covered by CLB program which updates the TLAA?
Can TLAA be modified to be valid through period of extended operations?
Describe TLAA & modifications to TLAA
Provide other justification that TLAA is valid for the period of extended operations
Describe TLAA & justification
All TLAAs subject to LR review complete?
TLAA review complete

Figure 8-1

Section 54.21(c)(2) of the LR Rule also requires a list of all exemptions granted under 10 CFR 50.12 which are determined to be based on a TLAA. These exemptions must be evaluated and justification provided for the continuation of the exemption during the period of extended operation.

> *(2) A list must be provided of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on time-limited aging analyses as defined in §54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.*

The TLAA Review task also fulfills this requirement.

8.1 Identify Analyses to be Included in the Review

The first step in the TLAA Review task is a search of the CLB to identify potential TLAAs and exemptions. The CLB search is done by reviewing the CCNPP electronic docket and the UFSAR. The electronic docket contains the complete record of docketed correspondence between the NRC and BGE in an easily accessible computer format. The UFSAR is also searchable in the same format. Potential TLAAs, such as the aging analyses supporting the EQ Program, are identified by phrases indicative of time constraints such as "40 years," "32 EFPY" [effective full power years], and "qualified life." Exemptions are identified by using phrases such as "50.12," and "exemption." Specific examples of potential TLAAs contained in regulatory literature such as SECY 94-140 are reviewed in advance of the electronic search to help focus the search for potential TLAAs.

The potential TLAAs identified above are supplemented by a further search of the electronic docket. Codes and standards which govern design of SSCs at nuclear power plants were reviewed as part of a joint industry effort to determine those that might contain some form of TLAA. An additional search of the CCNPP electronic docket and UFSAR is performed using this list of codes and standards as the input queries. Any commitments to or reliance on one of the codes and standards with potential time dependencies are also included on the list of potential TLAAs.

Exemptions that are based on time limited aging analyses, the potential TLAAs identified through time related queries and the potential TLAAs identified through codes/standards queries comprise the complete set of potential TLAAs identified in this step.

8.2 Review of Potential TLAAs

The potential TLAAs are reviewed to determine if they affect an SSC in the IPA scope, to determine whether the analyses are relevant to a safety determination, to determine whether the analyses consider the effects of aging and to determine whether the analyses relate to the ability of the SSC to perform its intended function(s). ~~Potential TLAAs which meet these four~~

~~criteria are then reviewed to determine whether the analysis is governed by a CLB program which will update the analysis. The EQ Program is such a program.~~ The potential TLAAs which meet the first four criteria[19]~~, and which do not meet the last criterion,~~ are the TLAAs subject to LR review; i.e., those which must be listed in the LRA.

8.3 Disposition of TLAAs Which are Subject to LR Review

This step in the TLAA Review task compiles the TLAA~~TLA~~-related information for the LRA. Because of the definition of TLAA~~first check performed in Section 8.2 above~~ and the requirements of 54.21(c), ~~all TLAAs subject to LR review must necessarily affect SSCs which are in the scope of LR, per §54.4.~~ there is a definite relationship between a TLAA and the IPA results for the same SCs.

8.3.1 Relationship Between the IPA and TLAAs

In some cases, it may be possible to credit the same aging management programs and activities in the TLAA evaluation as were credited in the IPA. The IPA requires a demonstration that the effects of aging are adequately managed for all SCs within the scope of license renewal that are passive and long lived. 54.21(c) allows three options for addressing TLAAs, one being a demonstration that the effects of aging are adequately managed for the SCs affected by the TLAA. The definition of TLAA provides that only analyses affecting SCs within the scope of license renewal are defined as TLAAs. Therefore, if the IPA is able to demonstrate that the effects of aging associated with the TLAA are adequately managed during the period of extended operations for a set of SCs, it follows that the requirement under 54.21(c) would also be satisfied. (The requirements are identical.)

If, on the other hand, certain aging effects associated with a TLAA are difficult or impossible to monitor directly, the IPA process may have demonstrated that the effects of aging would not prevent the intended function of the SC using an analytical approach. This approach may have involved extending the existing time-related analysis or substituting an alternate analysis, to demonstrate that the effects of aging would not prevent performance of the intended function during the period of extended operation. In either case, the requirements of 54.21(c) are still satisfied, since 54.21(c) allows extending the TLAA or justifying by analysis that the current analysis remains valid for the period of extended operation.

Therefore, for long-lived components supporting passive functions, the IPA process required by §54.21(a) will have documented that the effects of aging on these SSCs will be adequately managed. Thus, the only remaining step is to review the IPA results ~~need~~

[19] The definition of a TLAA contains six criteria. The two criteria not addressed in this step were already addressed in the initial search technique. The fact that the electronic search was performed against the CCNPP electronic docket and UFSAR implements the criterion that TLAAs be included in or incorporated by reference in the CLB. The time-related queries and the evaluations of codes and standards account for the criterion that TLAAs be related to assumptions regarding the period of the initial license, i.e., 40 years.

~~only check~~ to ensure that the TLAA evaluation requirements are met~~they also address the effects of aging associated with the TLAAs~~.

8.3.2 Methods for Extending or Re-evaluating TLAAs

Where the process described above chooses to extend an existing analysis or justify that the existing analysis remains valid, the techniques used to perform these tasks is specific to each time dependent issue. Where there is already a widely accepted practice (such as 10 CFR 50.61, 10 CFR 50.49 or ASME Code) which governs the TLAA, that process is used to re-evaluate or extend the analysis. For example, 10 CFR 50.61 describes the requirements associated with Pressurized Thermal Shock. These requirements would be implemented to account for PTS during the period of extended operations.

Similar to the discussion in Section 6.3.5, if there is an outstanding generic issue associated with the re-analysis process, the SOC to the Rule (FR 22484) provides three options (1) If the issue is resolved before LRA submittal, the resolution can be incorporated into the LRA, (2) A justification can be developed that the CLB will be maintained until a point in time when one or more reasonable options would be available to adequately manage the effects of aging. For this alternative, a description would be provided for how the CLB would be maintained until the chosen point in time and the options available in the future would be described in general terms. (3) A plant specific program could be developed that incorporates a resolution to the aging issue.

~~As noted above, for SCs subject to AMR, the programs listed are those already identified in the IPA. For active or short lived SCs not subject to AMR, there are three options:~~

- ~~Management of the effects of aging relating to the TLAAs must be demonstrated;~~
- ~~The TLAA must be modified to project its applicability to the end of the period of extended operation; or~~
- ~~Justification that the TLAA remains valid for the period of extended operation must be provided.~~

8.4 TLAA Results and Documentation~~Summary~~

The results of the TLAA Review task are:

- The list of TLAAs subject to LR review;
- The list of exemptions in effect that are based on TLAAs; and
- Either:
  - The evaluations ~~analyses~~ which demonstrate ~~justify~~ that ~~the~~ TLAAs remains valid or could be modified to remain valid for the period of extended operation, or
  - The demonstration that the effects of aging considered by the TLAAs are being managed.

These results are~~is information is~~ described ~~included as a part of~~in the LRA. Since the programs credited in this section will normally be identical to those credited in the IPA, little, if any, new information is expected to be added to the FSAR Supplement. More detailed records of the TLAA Review task are maintained onsite.