3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES

Review Responsibilities

Primary - Branch responsible for materials and chemical engineering
Secondary - Branch responsible for mechanical engineering

3.2.1 Areas of Review

This review plan section addresses the aging management review (AMR) of the engineered safety features. For a recent vintage plant, the information related to the engineered safety features is contained in Chapter 6, "Engineered Safety Features," of the plant's FSAR, consistent with the "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (NUREG-0800) (Ref. 1). The engineered safety features contained in this review plan section are generally consistent with those contained in NUREG-0800 except for the refueling water, control room habitability, and residual heat removal systems. For older plants, the location of applicable information is plant-specific because their FSAR may have predated NUREG-0800. The engineered safety features consist of containment spray, standby gas treatment (BWRs), containment isolation components, and emergency core cooling systems.

The staff has issued a GALL report addressing aging management for license renewal (Ref. 2). The GALL report documents the staff's basis for determining whether generic existing programs are adequate to manage aging without change, or generic existing programs should be augmented for license renewal. The GALL report may be referenced in a license renewal application, and should be treated in the same manner as an approved topical report.

Because a license renewal applicant may or may not be able to reference the GALL report as explained below, the following areas are reviewed:

3.2.1.1 Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

The applicant may reference the GALL report in a license renewal application to demonstrate that the applicant's programs at its facility correspond to those reviewed and approved in the report, and that no further staff review is required. If the material presented in the GALL report is applicable to the applicant's facility, the staff should find the applicant's reference to the report acceptable. In making this determination, the staff should consider whether the applicant has identified specific programs described and evaluated in the GALL report. The staff, however, should not repeat its review of the substance of the matters described in the report. Rather, the staff should ensure that the applicant verifies that the approvals set forth in the GALL report for generic programs apply to the applicant's programs.

3.2.1.2 Further Evaluation of Aging Management as Recommended by the GALL Report

The GALL report provides the basis for identifying those programs that warrant further evaluation during the staff review of a license renewal application. The staff review should focus on augmented programs for license renewal.

3.2.1.3 Aging Management Evaluations that Are Different from or Not Addressed in the GALL Report

The GALL report provides a generic staff evaluation of certain aging management programs. If the applicant does not rely on a particular program for license renewal, or if the applicant indicates that the generic staff evaluation of the elements of a particular program does not apply to its plant, the staff should review each such aging management program to which the GALL report does not apply.

The GALL report provides a generic staff evaluation of programs for certain components and aging effects. If the applicant has identified particular components subject to AMR for its plant that are not addressed in the GALL report, or particular aging effects for a component that are not addressed in the GALL report, the staff should review the applicant's aging management programs applicable to these particular components and aging effects.

3.2.1.4 FSAR Supplement

The FSAR supplement summarizing the programs and activities for managing the effects of aging for the period of extended operation is reviewed.

3.2.2 Acceptance Criteria

The acceptance criteria for the areas of review describe methods for determining whether the applicant has met the requirements of the NRC's regulations in 10 CFR 54.21.

3.2.2.1 Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Acceptable methods for managing aging of the engineered safety features are described and evaluated in Chapter V of the GALL report (Ref. 2). In referencing this report, the applicant should indicate that the material presented in the GALL report is applicable to the specific plant involved, and provide the information necessary to adopt the finding of program acceptability as described and evaluated in the report. The applicant should also verify that the approvals set forth in the GALL report for generic programs apply to the applicant's programs. The applicant may reference appropriate programs as described and evaluated in the GALL report.

3.2.2.2 Further Evaluation of Aging Management as Recommended by the GALL Report

The GALL report indicates that further evaluation should be performed for the following.

3.2.2.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4.3 of this standard review plan.

3.2.2.2.2 Loss of Material due to General Corrosion

1. The management of loss of material due to general corrosion of pumps, valves, piping, and fittings associated with some of the BWR emergency core cooling systems [high pressure coolant injection, reactor core isolation cooling, high pressure core spray, low pressure core

spray, low pressure coolant injection (residual heat removal)] and with lines to the suppression chamber and to the drywell and suppression chamber spray system should be further evaluated. The existing aging management program relies on monitoring and control of primary water chemistry based on EPRI guidelines of TR-105714 for PWRs (Ref. 3) and BWRVIP 29 (EPRI TR-103515) for BWRs (Ref. 4) to mitigate degradation. However, control of primary water chemistry does not preclude loss of material due to general corrosion at locations of stagnant flow conditions. Therefore, verification of the effectiveness of the chemistry control program should be performed to ensure that corrosion is not occurring. The GALL report recommends further evaluation of programs to manage loss of material due to general corrosion to verify the effectiveness of the chemistry control program.). A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly such that the component's intended function will be maintained during the period of extended operation.

2. Loss of material due to general corrosion could occur in the containment spray (PWR) and drywell and suppression chamber spray (BWR) systems header and spray nozzle components, standby gas treatment system components (BWR), containment isolation valves and associated piping, the automatic depressurization system piping and fittings (BWR), emergency core cooling system header piping and fittings and spray nozzles (BWR), and the external surfaces of PWR and BWR carbon steel components. The GALL report recommends further evaluation on a plant specific basis to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this standard review plan).

3.2.2.2.3 Local Loss of Material due to Pitting and Crevice Corrosion

1. The management of local loss of material due to pitting and crevice corrosion of pumps, valves, piping, and fittings associated with some of the BWR emergency core cooling system piping and fittings [high pressure coolant injection, reactor core isolation cooling, high pressure core spray, low pressure core spray, low pressure coolant injection (residual heat removal)] and with lines to the suppression chamber and to the drywell and suppression chamber spray system should be evaluated further. The existing aging management program relies on monitoring and control of primary water chemistry based on EPRI guidelines of TR-105714 for PWRs (Ref. 3) and BWRVIP 29 (EPRI TR-103515) for BWRs (Ref. 4) to mitigate degradation. However, control of coolant water chemistry does not preclude loss of material due to crevice and pitting corrosion at locations of stagnant flow conditions. Therefore, verification of the effectiveness of the chemistry control program should be performed to ensure that corrosion is not occurring. The GALL report recommends further evaluation of programs to manage the loss of material due to pitting and crevice corrosion to verify the effectiveness of the chemistry control program). A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly so that the component's intended function will be maintained during the period of extended operation.

2. Local loss of material from pitting and crevice corrosion could occur in the containment spray (PWR) components, containment isolation valves and associated piping, the buried portion of the refueling water tank external surface (PWRs), and automatic depressurization system piping and fittings (BWR). The GALL report recommends further evaluation to

ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this standard review plan).

3.2.2.2.4 Local Loss of Material due to Microbiologically Influenced Corrosion

Local loss of material due to microbiologically influenced corrosion (MIC) could occur in BWR and PWR containment isolation valves and associated piping in systems that are not addressed in other chapters of the GALL report. The GALL report recommends further evaluation to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this standard review plan).

3.2.2.2.5 Changes in Properties due to Elastomer Degradation

Changes in properties due to elastomer degradation could occur in seals associated with the standby gas treatment system ductwork and filters. The GALL report recommends further evaluation to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this standard review plan)**.**

3.2.2.2.6 Local Loss of Material due to Erosion

Local loss of material due to erosion could occur in the high pressure safety injection pump miniflow orifice. This aging mechanism and effect will apply only to pumps that are normally used as charging pumps in the chemical and volume control systems (PWRs). The GALL report recommends further evaluation to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this standard review plan).

3.2.2.2.7 Buildup of Deposits due to Corrosion

The plugging of components due to general corrosion could occur in the spray nozzles and flow orifices of the drywell and suppression chamber spray system. This aging mechanism and effect will apply since the spray nozzles and flow orifices are occasionally wetted, even though the majority of the time this system is on standby. The wetting and drying of these components can aid in the acceleration of this particular corrosion. The GALL report recommends further evaluation to ensure that the aging effect is adequately managed. Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this standard review plan).

3.2.2.2.8 Quality Assurance for Aging Management of Nonsafety-Related Components

Acceptance criteria are described in Branch Technical Position IQMB-1 (Appendix A.2 of this standard review plan.)

3.2.2.3 Aging Management Evaluations that Are Different from or Not Addressed in the GALL Report

Acceptance criteria are described in Branch Technical Position RSLB-1 (Appendix A.1 of this standard review plan).

3.2.2.4 FSAR Supplement

The summary description of the programs and activities for managing the effects of aging for the period of extended operation in the FSAR supplement should be appropriate such that later changes can be controlled by 10 CFR 50.59. The description should contain information associated with the bases for determining that aging effects will be managed during the period of extended operation.

3.2.3 Review Procedures

For each area of review, the following review procedures are to be followed.

3.2.3.1 Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

The applicant may reference the GALL report in its license renewal application, as appropriate. The staff should not repeat its review of the substance of the matters described in the report. If the applicant has provided the information necessary to adopt the finding of program acceptability as described and evaluated in the GALL report, the staff should find the applicant's reference to the report in a license renewal application acceptable. In making this determination, the reviewer verifies that the applicant has provided a brief description of the system, components, materials, and environment. The reviewer also verifies that the applicant has stated that the applicable aging effects and industry and plant-specific operating experience have been reviewed by the applicant and are evaluated in the GALL report. The reviewer verifies that the applicant has identified those aging effects for the engineered safety features components that are contained in the report as applicable to its plant. In addition, the reviewer ensures that the applicant has stated that the plant programs covered by the applicant's reference contain the same program elements that the staff evaluated and relied upon in approving the corresponding generic program in the GALL report.

The reviewer should verify that the applicant has stated that certain of its aging management programs contain the same program elements as the corresponding generic program described in the GALL report, and upon which the staff relied in its evaluation. The reviewer should also verify that the applicant has stated that the GALL report is applicable to its plant with respect to these programs. The reviewer verifies that the applicant has identified the appropriate programs as described and evaluated in the GALL report. Programs evaluated in the report regarding the engineered safety features components are summarized in Table 3.2-1 of this review plan section. No further staff evaluation is necessary if so recommended in the GALL report.

3.2.3.2 Further Evaluation of Aging Management as Recommended by the GALL Report

3.2.3.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The staff reviews the evaluation of this TLAA separately, following the guidance in Section 4.3 of this standard review plan.

3.2.3.2.2 Loss of Material due to General Corrosion

1. The GALL report recommends further evaluation of programs to manage the loss of material due to general corrosion of piping and fittings associated with some of the BWR emergency

core cooling systems [high pressure coolant injection, reactor core isolation cooling, high pressure core spray, low pressure core spray, low pressure coolant injection (residual heat removal)] and with lines to the suppression chamber and to the drywell and suppression chamber spray system to verify the effectiveness of the chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly such that the component's intended function will be maintained during the period of extended operation.

The reviewer reviews the applicant's proposed program to determine whether corrosion is not occurring or the corrosion is progressing very slowly so that the component's intended function will be maintained during the period of extended operation. If an applicant proposes a one-time inspection of select components at susceptible locations to ensure that corrosion is not occurring, the reviewer verifies that the applicant's selection of susceptible locations is based on severity of conditions, time of service, and lowest design margin. The inspection techniques may include visual, ultrasonic, and surface examination techniques. Follow-up actions are to be based on the inspection results.

2. The GALL report recommends further evaluation of programs to manage the loss of material due to general corrosion of containment spray (PWR) and drywell and suppression chamber spray (BWR) systems header and spray nozzle components, standby gas treatment system components (BWR), containment isolation valves and associated piping, the automatic depressurization system piping and fittings (BWR), emergency core cooling system header piping and fittings and spray nozzles (BWR), and the external surfaces of PWR and BWR carbon steel components. The reviewer reviews the applicant's proposed programs on a case-by-case basis to ensure that an adequate program will be in place for the management of general corrosion of these components.

3.2.3.2.3 Local Loss of Material due to Pitting and Crevice Corrosion

1. The GALL report recommends further evaluation of programs to manage the loss of material due to pitting and crevice corrosion of piping and fittings associated with some of the BWR emergency core cooling system piping and fittings [high pressure coolant injection, reactor core isolation cooling, high pressure core spray, low pressure core spray, low pressure coolant injection (residual heat removal)] and with lines to the suppression chamber and to the drywell and suppression chamber spray system to verify the effectiveness of the chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly such that the component's intended function will be maintained during the period of extended operation.

   The reviewer reviews the applicant's proposed program to determine whether corrosion is not occurring or the corrosion is progressing very slowly so that the component's intended function will be maintained during the period of extended operation. If an applicant proposes a one-time inspection of select components at susceptible locations to ensure that corrosion is not occurring, the reviewer verifies that the applicant's selection of susceptible locations is based on severity of conditions, time of service, and lowest design margin. The inspection techniques may include visual, ultrasonic, and surface examination techniques. Follow-up actions are to be based on the inspection results.

2. The GALL report recommends further evaluation of programs to manage the local loss of material due to pitting and crevice corrosion of containment spray (PWR) components, containment isolation valves and associated piping, the outer buried surface of the refueling water tank (PWR), and the automatic depressurization system piping and fittings (BWR). The reviewer reviews the applicant's proposed programs on a case-by-case basis to ensure that an adequate program will be in place for the management of local loss of material due to pitting and crevice corrosion of these components.

3.2.3.2.4 Local Loss of Material due to Microbiologically Influenced Corrosion

The GALL report recommends further evaluation of programs to manage the local loss of material due to MIC of the BWR and PWR containment isolation valves and associated piping. The reviewer reviews the applicant's proposed programs on a case-by-case basis to ensure that an adequate program will be in place for the management of local loss of material due to MIC of the BWR and PWR containment isolation barriers.

3.2.3.2.5 Changes in Properties due to Elastomer Degradation

The GALL report recommends further evaluation of programs to manage changes in properties due to degradation of elastomer seals associated with BWR standby gas treatment system ductwork and filters. The reviewer reviews the applicant's proposed programs on a case-by-case basis to ensure that an adequate program will be in place to manage changes in properties due to degradation of elastomer seals in the standby gas treatment system.

3.2.3.2.6 Local loss of Material due to Erosion

The GALL report recommends further evaluation of programs to manage local loss of material due to erosion of the high pressure safety injection pump miniflow orifice. The reviewer reviews the applicant's proposed programs on a case-by-case basis to ensure that an adequate program will be in place to manage this aging effect.

3.2.3.2.7 Buildup of Deposits due to Corrosion

The GALL report recommends further evaluation of programs to manage the plugging of spray nozzles and spargers of the drywell and suppression chamber spray system. The reviewer reviews the applicant's proposed programs on a case-by-case basis to ensure that an adequate program will be in place to manage this aging effect.

3.2.3.2.8 Quality Assurance for Aging Management of Nonsafety-Related Components

The applicant's aging management programs for license renewal should contain the elements of corrective actions, the confirmation process, and administrative controls. Safety-related components are covered by 10 CFR Part 50 Appendix B, which is adequate to address these program elements. However, Appendix B does not apply to nonsafety-related components that are subject to an AMR for license renewal. Nevertheless, the applicant has the option to expand the scope of its 10 CFR Part 50 Appendix B program to include these components and address the associated program elements. If the applicant chooses this option, the reviewer verifies that the applicant has documented such a commitment in the FSAR supplement. If the applicant chooses alternative means, the branch responsible for quality assurance should be requested to review the applicant's proposal on a case-by-case basis.

3.2.3.3 Aging Management Evaluations that Are Different from or Not Addressed in the GALL Report

Review procedures are described in Branch Technical Position RSLB-1 (Appendix A.1 of this standard review plan).

3.2.3.4 FSAR Supplement

The reviewer verifies that the applicant has provided information, equivalent to that in Table 3.2-2, in the FSAR supplement for aging management of the engineered safety features for license renewal. The reviewer also verifies that the applicant has provided information, equivalent to that in Table 3.2-2, in the FSAR supplement for Subsection 3.2.3.3, "Aging Management Evaluations that Are Different from or Not Addressed in the GALL Report."

The staff expects to impose a license condition on any renewed license to require the applicant to update its FSAR to include this FSAR supplement at the next update required pursuant to 10 CFR 50.71(e)(4). As part of the license condition, until the FSAR update is complete, the applicant may make changes to the programs described in its FSAR supplement without prior NRC approval, provided that the applicant evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59.

As noted in Table 3.2-2, an applicant need not incorporate the implementation schedule into its FSAR. However, the reviewer should verify that the applicant has identified and committed in the license renewal application to any future aging management activities to be completed before the period of extended operation. The staff expects to impose a license condition on any renewed license to ensure that the applicant will complete these activities no later than the committed date.

3.2.4 Evaluation Findings

The reviewer verifies that the applicant has provided information sufficient to satisfy the provisions of this review plan section, and the staff's evaluation supports conclusions of the following type, to be included in the staff's safety evaluation report:

> The staff concludes that the applicant has demonstrated that the aging effects associated with the engineered safety features will be adequately managed so that there is reasonable assurance that these systems will perform their intended functions in accordance with the current licensing basis during the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the programs and activities for managing the effects of aging for the engineered safety features as reflected in the license conditions.

3.2.5 Implementation

Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the NRC's regulations, the method described herein will be used by the staff in its evaluation of conformance with NRC regulations.

3.2.6 References

1. NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, July 1981.

2. NUREG-1801, “Generic Aging Lessons Learned (GALL),” U.S. Nuclear Regulatory Commission, April 2001.

3. EPRI TR-105714, PWR primary Water Chemistry Guidelines-Revision 3, Electric Power Research Institute, Palo Alto, CA, Nov. 1995.

4. EPRI TR-103515, BWR Water Chemistry Guidelines-Revision 1, Normal and Hydrogen Water Chemistry, Electric Power Research Institute, Palo Alto, CA, February 1994.

Table 3.2-1. Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL Report

Type	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended
BWR/PWR	Piping, fittings, and valves in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA (see Subsection 3.2.2.2.1)
BWR	Piping, fittings, pumps, and valves in emergency core cooling system	Loss of material due to general corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated (see Subsection 3.2.2.2.2.1)
BWR/PWR	Components in containment spray (PWR only), standby gas treatment (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to general corrosion	Plant specific	Yes, plant specific (see Subsection 3.2.2.2.2.2)
BWR	Piping, fittings, pumps, and valves in emergency core cooling system	Loss of material due to pitting and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated (see Subsection 3.2.2.2.3.1)
BWR/PWR	Components in containment spray (PWR only), standby gas treatment (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific (see Subsection 3.2.2.2.3.2)
BWR/PWR	Containment isolation valves and associated piping	Loss of material due to microbiologically influenced corrosion	Plant specific	Yes, plant specific (see Subsection 3.2.2.2.4)
BWR	Seals in standby gas treatment system	Changes in properties due to elastomer degradation	Plant specific	Yes, plant specific (see Subsection 3.2.2.2.5)
PWR	High pressure safety injection (charging) pump miniflow orifice	Loss of material due to erosion	Plant specific	Yes, plant specific (see Subsection 3.2.2.2.6)

Table 3.2-1. Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL Report (continued)

Type	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended
BWR	Drywell and suppression chamber spray system nozzles and flow orifices	Plugging of nozzles and flow orifices due to general corrosion	Plant specific	Yes, plant specific (see Subsection 3.2.2.2.7)
BWR/PWR	Piping and fittings of CASS in emergency core cooling system	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	No
BWR/PWR	Components serviced by open-cycle cooling system	Local loss of material due to corrosion and/or buildup of deposit due to biofouling	Open-cycle cooling water system	No
BWR/PWR	Components serviced by closed-cycle cooling system	Loss of material due to general, pitting, and crevice corrosion	Closed-cycle cooling water system	No
BWR	Emergency core cooling system valves and lines to and from HPCI and RCIC pump turbines	Wall thinning due to flow-accelerated corrosion	Flow-accelerated corrosion	No
PWR	Pumps, valves, piping, and fittings in containment spray and emergency core cooling systems	Crack initiation and growth due to SCC	Water chemistry	No
BWR	Pumps, valves, piping, and fittings in emergency core cooling systems	Crack initiation and growth due to SCC and IGSCC	Water chemistry and BWR stress corrosion cracking	No
PWR	Carbon steel components	Loss of material due to boric acid corrosion	Boric acid corrosion	No
BWR/PWR	Closure bolting in high pressure or high temperature systems	Loss of material due to general corrosion, loss of preload due to stress relaxation, and crack initiation and growth due to cyclic loading or SCC	Bolting integrity	No

Table 3.2-2. FSAR Supplement for Aging Management of Engineered Safety Features

Program	Description of Program	Implementation Schedule*
Bolting integrity (BWR/PWR)	This program includes periodic inspection of closure bolting for Indication of potential problems including loss of reload, cracking, and loss of material. This program consists of guidelines on materials selection, strength and hardness properties, installation procedures, lubricants and sealants, corrosion considerations in the selection and installation of pressure-retaining bolting for nuclear applications, and enhanced inspection techniques. This program relies on the bolting integrity program delineated in NUREG-1339 and industry's recommendations delineated in EPRI NP-5769, with the exceptions noted in NUREG-1339 for safety-related bolting, and EPRI TR-104213 for pressure retaining bolting and structural bolting.	Existing program
Boric acid corrosion (PWR)	The program consists of (1) visual inspection of external surfaces that are potentially exposed to borated water leakage, (2) timely discovery of leak path and removal of the boric acid residues, (3) assessment of the damage, and (4) follow up inspection for adequacy. This program is implemented in response to GL 88-05.	Existing program
Closed-cycle cooling water system (BWR/PWR)	The program relies on preventive measures to minimize corrosion by maintaining inhibitors and by performing non-chemistry monitoring consisting of inspection and nondestructive evaluations based on the guidelines of EPRI-TR-107396 for closed–cycle cooling water systems.	Existing program
Flow-accelerated corrosion (FAC) (BWR/PWR)	The program consists of (1) conduct appropriate analysis and baseline inspection, (2) determine extent of thinning, and replace/repair components, and (3) perform follow-up inspections to confirm or quantify and take longer-term corrective actions. The program relies on implementation of EPRI guidelines of NSAC-202L-R2.	Existing program
One-time inspection	To verify the effectiveness of the water chemistry control program by determining if the aging effect is not occurring or the aging effect is progressing so slowly that the intended function will be maintained during the period of extended operation, a one-time inspection of pumps, valves, piping, and fittings associated with certain BWR emergency core cooling systems [high pressure coolant injection, reactor core isolation cooling, high pressure core spray, low pressure core spray, low pressure coolant injection (residual heat removal)]; and with pipe lines in a BWR plant to the suppression chamber and to the drywell and suppression chamber spray system is performed.	The inspection should be completed before the period of extended operation

Table 3.2-2. FSAR Supplement for Aging Management of Engineered Safety Features (continued)

Program	Description of Program	Implementation Schedule*
Open-cycle cooling water system (BWR/PWR)	The program includes (a) surveillance and control of biofouling, (b) tests to verify heat transfer, (c) routine inspection and maintenance program, (d) system walk down inspection, and (e) review of maintenance, operating, and training practices and procedures. The program provides assurance that the open-cycle cooling water system is in compliance with General Design Criteria and Quality Assurance to ensure that the open-cycle cooling water (or service water) system can be managed for an extended period of operation. This program is in response to NRC GL 89-13.	Existing program
Plant-specific AMP	The description should contain information associated with the basis for determining that aging effects will be managed during the period of extended operation.	Program should be implemented before the period of extended operation
Quality assurance	The 10 CFR Part 50 Appendix B program provides for corrective actions, the confirmation process, and administrative controls for aging management programs for license renewal. The scope of this existing program will be expanded to include nonsafety-related structures and components that are subject to an AMR for license renewal.	Program should be implemented before the period of extended operation
Thermal aging embrittlement of CASS AMP (BWR/PWR)	The program consists of the determination of the susceptibility of CASS piping and fittings in PWR ECCS systems including interfacing pipe lines to the chemical and volume control system and to the spent fuel pool; and in BWR ECCS systems including interfacing pipe lines to the suppression chamber and to the drywell and suppression chamber spray system in regard to thermal aging embrittlement based on the casting method, Mo content, and ferrite percentage. For potentially susceptible piping, aging management is accomplished either through enhanced volumetric examination or component-specific flaw tolerance evaluation.	Existing program
Water chemistry (BWR/PWR)	To mitigate aging effects on component surfaces that are exposed to water as a process fluid, chemistry programs are used to control water impurities (e.g., chloride, fluoride, sulfate) that accelerate corrosion. This program relies on monitoring and control of water chemistry to keep peak levels of various contaminants below the system-specific limits based on EPRI guidelines of TR-103515 for water chemistry in BWRs, and TR-105714 for primary water chemistry in PWRs.	Existing program

Table 3.2-2. FSAR Supplement for Aging Management of Engineered Safety Features (continued)

Program	Description of Program	Implementation Schedule*
BWR Stress Corrosion Cracking	The program to manage intergranular stress corrosion cracking (IGSCC) in boiling water reactor (BWR) coolant pressure boundary piping made of stainless steel (SS) is delineated, in part, in NUREG-0313, Rev. 2, and Nuclear Regulatory Commission (NRC) Generic Letter (GL) 88-01 and its Supplement 1. The program includes (a) preventive measures to mitigate IGSCC and (b) inspections to monitor IGSCC and its effects	Existing Program

* An applicant need not incorporate the implementation schedule into its FSAR. However, the reviewer should verify that the applicant has identified and committed in the license renewal application to any future aging management activities to be completed before the period of extended operation. The staff expects to impose a license condition on any renewed license to ensure that the applicant will complete these activities no later than the committed date.