Abstract

The Generic Aging Lessons Learned (GALL) report contains the staff's generic evaluation of the existing plant programs and documents the technical basis for determining where existing programs are adequate without modification and where existing programs should be augmented for the extended period of operation. The evaluation results documented in the GALL report indicate that many of the existing programs are adequate to manage the aging effects for particular structures or components for license renewal without change. The GALL report also contains recommendations on specific areas for which existing programs should be augmented for license renewal. An applicant may reference the GALL report in a license renewal application to demonstrate that the programs at the applicant's facility correspond to those reviewed and approved in the GALL report and that no further staff review is required. The focus of the staff review is on the augmented existing programs for license renewal. The incorporation of the GALL report information into NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," as directed by the Commission, should improve the efficiency of the license renewal process.

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ABBREVIATIONS

ADS	automatic depressurization system
AFW	auxiliary feedwater
AMP	aging management program
ASME	American Society of Mechanical Engineers
B&W	Babcock & Wilcox
BWR	boiling water reactor
BWRVIP	boiling water reactor vessel internals project
CASS	cast austenitic stainless steel
CE	Combustion Engineering
CEA	control element assembly
CFR	Code of Federal Regulations
CFS	core flood system
CLB	current licensing basis
CRD	control rod drive
CRGT	control rod guide tube
CS	carbon steel
CVCS	chemical and volume control system
DHR	decay heat removal
DSCSS	drywell and suppression chamber spray system
ECCS	emergency core cooling system
EDG	emergency diesel generator
EQ	environmental qualification
FW	feedwater
GALL	generic aging lessons learned
HP	high pressure
HPCI	high-pressure coolant injection
HPCS	high-pressure core spray
HPSI	high-pressure safety injection
HVAC	heating, ventilation, and air conditioning
IASCC	irradiation-assisted stress corrosion cracking
IGA	intergranular attack
IGSCC	intergranular stress corrosion cracking
IR	insulation resistance
IRM	intermediate range monitor
ISI	inservice inspection
LER	licensee event report
LG	lower grid
LP	low pressure
LPCI	low-pressure coolant injection
LPCS	low-pressure core spray

ABBREVIATIONS (continued)

LPRM	low-power range monitor
LPSI	low-pressure safety injection
MIC	microbiologically influenced corrosion
MSR	moisture separator/reheater
NEI	Nuclear Energy Institute
NPAR	Nuclear Plant Aging Research
NPS	nominal pipe size
NRC	Nuclear Regulatory Commission
NSSS	nuclear steam supply system
NUMARC	Nuclear Management and Resources Council
ODSCC	outside diameter stress corrosion cracking
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RCCA	rod control cluster assembly
RCIC	reactor core isolation cooling
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RG	Regulatory Guide
RHR	residual heat removal
RWC	reactor water cleanup
RWT	refueling water tank
SC	suppression chamber
SCC	stress corrosion cracking
SDC	shutdown cooling
SFP	spent fuel pool
SG	steam generator
SLC	standby liquid control
SRM	source range monitor
SRM	staff requirement memorandum
SRP-LR	Standard Review Plan for License Renewal
TLAA	time-limited aging analysis
UCS	Union of Concerned Scientists
UV	ultraviolet

INTRODUCTION

TBD

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~~By letter dated March 3, 1999, the Nuclear Energy Institute (NEI) documented the industry's views on how existing plant programs and activities should be credited for license renewal. The issue can be summarized as follows: To what extent should the staff review existing programs relied on for license renewal in determining whether an applicant has demonstrated reasonable assurance that such programs will be effective in managing the effects of aging on the functionality of structures and components in the period of extended operation? In a staff paper, SECY-99-148, "Credit for Existing Programs for License Renewal," dated June 3, 1999, the staff described options for crediting existing programs and recommended one option that the staff believed would improve the efficiency of the license renewal process.~~

~~By staff requirements memorandum (SRM), dated August 27, 1999, the Commission approved the staff's recommendation and directed the staff to focus the staff review guidance in the Standard Review Plan for License Renewal (SRP-LR) on areas where existing programs should be augmented for license renewal. The staff would develop a "Generic Aging Lessons Learned (GALL)" report to document the staff's evaluation of generic existing programs. The GALL report would document the staff's basis for determining which existing programs are adequate without modification and which existing programs should be augmented for license renewal. The GALL report would be referenced in the SRP-LR as a basis for determining the adequacy of existing programs.~~

~~GALL REPORT EVALUATION PROCESS~~

~~This report builds on a previous report, NUREG/CR-6490, "Nuclear Power Plant Generic Aging Lessons Learned (GALL)," which is a systematic compilation of plant aging information. This report extends the information in NUREG/CR-6490 to provide an evaluation of the adequacy of aging management programs for license renewal. The NUREG/CR-6490 report was based on information in over 500 documents: Nuclear Plant Aging Research (NPAR) program reports sponsored by the Office of Nuclear Regulatory Research, Nuclear Management and Resources Council (NUMARC, now NEI) industry reports addressing license renewal, licensee event~~

reports (LERs), information notices, generic letters, and bulletins. The staff has also considered information contained in the reports provided by the Union of Concerned Scientists (UCS) in a letter dated May 5, 2000.

Following the general format of NUREG-0800 for major plant sections except for refueling water, chilled water, residual heat removal, condenser circulating water, and condensate storage system in pressurized water reactor (PWR) and boiling water reactor (BWR) power plants, the staff has reviewed the aging effects on components and structures, identified the relevant existing programs, and evaluated program attributes to manage aging effects for license renewal. This report was prepared with the technical assistance of Argonne National Laboratory and Brookhaven National Laboratory. As directed in the SRM, this report has the benefit of the experience of the staff members who conducted the review of the initial license renewal applications. Also, as directed in the SRM, the staff has sought stakeholders' participation in the development of this report. The staff held many public meetings and workshops to solicit input from the public. The staff also issued the draft improved license renewal guidance documents, including the GALL report, for public comments in the Federal Register Notice, Vol. 65, No. 170, August 31, 2000. The staff's analysis of stakeholder comments is documented in NUREG-1739.

The results of the GALL effort are presented in a table format in the GALL report, Volume 2. The table column headings are: Item, Structure and/or Component, Material, Environment, Aging Effect/Mechanism, Aging Management Program (AMP), and Further Evaluation. The staff's evaluation of the adequacy of each generic aging management program in managing certain aging effects for particular structures and components is based on the review of the following 10 program attributes (or elements):

Element	Description
1. Scope of the program	The scope of the program should include the specific structures and components subject to an aging management review.
2. Preventive actions	Preventive actions should mitigate or prevent the applicable aging effects.
3. Parameters monitored or inspected	Parameters monitored or inspected should be linked to the effects of aging on the intended functions of the particular structure and component.
4. Detection of aging effects	Detection of aging effects should occur before there is a loss of any structure and component intended function. This includes aspects such as method or technique (i.e., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new/one-time inspections to ensure timely detection of aging effects.
5. Monitoring and trending	Monitoring and trending should provide for prediction of the extent of the effects of aging and timely corrective or mitigative actions.
6. Acceptance criteria	Acceptance criteria, against which the need for corrective action will be evaluated, should ensure that the particular structure and component intended functions are maintained under all current licensing basis (CLB) design conditions during the period of

	extended operation.
7. Corrective actions	Corrective actions, including root cause determination and prevention of recurrence, should be timely.
8. Confirmation process	The confirmation process should ensure that preventive actions are adequate and appropriate corrective actions have been completed and are effective.
9. Administrative controls	Administrative controls should provide a formal review and approval process.
10. Operating experience	Operating experience involving the aging management program, including past corrective actions resulting in program enhancements or additional programs, should provide objective evidence to support a determination that the effects of aging will be adequately managed so that the structure and component intended functions will be maintained during the period of extended operation.

If, on the basis of its evaluation, the staff determines that a program is adequate to manage certain aging effects for a particular structure or component without change, the "Further Evaluation" entry would indicate that no further staff evaluation is recommended for license renewal. Otherwise, the entry would recommend areas in which the staff should focus its review. The Commission's regulations in 10 CFR 54.21(c) require an evaluation of time-limited aging analyses (TLAAs). Examples of TLAAs are applicant analyses of metal fatigue and environmental qualification (EQ) of electric equipment. The GALL report in general refers the reader to the SRP-LR for guidance on how TLAAs should be evaluated. However, 10 CFR 54.21(c)(1)(iii) allows a TLAA-associated aging effect to be managed by an aging management program. The GALL report, Volume 2, Chapter X, provides the staff's evaluation of several TLAAs under 10 CFR 54.21(c)(1)(iii) based on the initial license renewal reviews.

Chapter XI of the GALL report, Volume 2, contains the staff's evaluation of generic aging management programs that are relied on in the GALL report, such as the ASME Section XI inservice inspection, water chemistry, or structures monitoring program.

APPLICATION OF THE GALL REPORT

The GALL report is a technical basis document to the SRP-LR, which provides the staff with guidance in reviewing a license renewal application. The GALL report should be treated in the same manner as an approved topical report that is generically applicable. An applicant may reference the GALL report in a license renewal application to demonstrate that the programs at the applicant's facility correspond to those reviewed and approved in the GALL report and that no further staff review is required, as described in the next paragraph. 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 GALL 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 conduct a re-review of the substance of the matters described in the GALL 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. The focus of the staff review should be on augmented programs for license renewal. The staff

should also review information that is not addressed in the GALL report or is otherwise different from that in the GALL report.

If an applicant takes credit for a program in GALL, it is incumbent on the applicant to ensure that the plant program contains all the elements of the referenced GALL program. In addition, the conditions at the plant must be bounded by the conditions for which the GALL program was evaluated. The above verifications must be documented on-site in an auditable form. The applicant must include a certification in the license renewal application that the verifications have been completed and are documented on-site in an auditable form.

The GALL report contains one acceptable way to manage aging effects for license renewal. An applicant may propose alternatives for staff review in its plant-specific license renewal application. Use of the GALL report is not required, but its use should facilitate both preparation of a license renewal application by an applicant and timely, uniform review by the NRC staff.

In addition, the GALL report does not address scoping of structures and components for license renewal. Scoping is plant specific, and the results depend on the plant design and current licensing basis. The inclusion of a certain structure or component in the GALL report does not mean that this particular structure or component is within the scope of license renewal for all plants. Conversely, the omission of a certain structure or component in the GALL report does not mean that this particular structure or component is not within the scope of license renewal for any plants.

SUMMARY AND RECOMMENDATIONS

The GALL report contains an evaluation of a large number of structures and components. The evaluation results documented in the GALL report indicate that many of the generic existing programs are adequate to manage aging effects for particular structures or components for license renewal without change. The GALL report also contains recommendations on specific areas for which generic existing programs should be augmented for license renewal and documents the technical basis for each such determination.

In the GALL report, Volume 1, Tables 1 through 6 are summaries of the aging management review. These tables are the same as Tables 3.1-1 to 3.6-1, respectively, in the SRP-LR, except for an additional sixth column in Tables 1 to 6 that identifies the specific item numbers assigned to each structure and/or component (i.e., each row in the section tables contained in Volume 2 of the GALL report). Descriptions of the specific item numbers used in the GALL report, Volume 2, Chapters II through VIII, are given in the Appendix of Volume 1. A locator for the plant systems evaluated in Volume 2 is also provided in the Appendix of Volume 1. The specific item number and associated aging effect serve as a pointer to the technical evaluation for the specific structure and component addressed in Volume 2 (Tabulation of Results).

The Appendix of Volume 2 of the GALL report addresses quality assurance (QA) for aging management programs. Those aspects of the aging management review process that affect the quality of safety-related structures, systems, and components are subject to the QA requirements of Appendix B to 10 CFR Part 50. For nonsafety-related structures and components subject to an aging management review, the existing 10 CFR Part 50, Appendix B, QA program may be used by an applicant to address the elements of the corrective actions, confirmation process, and administrative controls for an aging management program for license renewal.

~~The GALL report provides a technical basis for crediting existing plant programs and recommending areas for program augmentation and further evaluation. The incorporation of the GALL report information into the SRP-LR, as directed by the Commission, should improve the efficiency of the license renewal process and better focus staff resources.~~

Table 1. Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Reactor coolant pressure boundary components, closure bolting, support skirts, steam generator components, and reactor vessel internals	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	R-04 R-13 R-18 R-189 R-28 R-33 R-45 R-46 R-53 R-54 R-70 R-73 R-91
PWR	Steam generator shell assembly	Loss of material due to General, pitting and crevice corrosion	Inservice inspection, and water chemistry	Yes, detection of aging effects is to be evaluated	R-34
BWR	Isolation condenser tube side components	Loss of material due to General, pitting and crevice corrosion	Inservice inspection; water chemistry, and plant-specific verification program	Yes, plant specific	R-16
BWR/ PWR	Reactor vessel beltline shell, nozzles, and welds	Loss of fracture toughness due to Neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99	Yes, TLAA	R-62 R-67 R-81 R-84
BWR/ PWR	Reactor vessel beltline shell and welds	Loss of fracture toughness due to Neutron irradiation embrittlement	Reactor vessel surveillance	Yes, plant specific	R-63 R-82 R-86
PWR	Westinghouse and Babcock & Wilcox (B&W) baffle/ former bolts and screws	Loss of fracture toughness due to Neutron irradiation embrittlement	Plant specific	Yes, plant specific	R-128
		Loss of fracture toughness due to Neutron irradiation embrittlement, void swelling	Plant specific	Yes, plant specific	R-200
BWR/ PWR	Small-bore reactor coolant system and connected systems piping	Cracking due to Stress corrosion cracking and intergranular stress corrosion cracking	Inservice Inspection, Water chemistry, and a plant specific examination	Yes, parameters monitored/inspected and detection of aging effects are to be further evaluated	R-02 R-03

Table 1. Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Small-bore reactor coolant system and connected systems piping	Cracking due to thermal and mechanical loading	Inservice Inspection and a plant specific examination (one-time inspection)	Yes, parameters monitored/inspected and detection of aging effects are to be further evaluated	R-55 R-57
BWR/ PWR	Jet pump sensing line and reactor vessel flange leak detection line	Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking	Plant specific	Yes, plant specific	R-61
BWR/ PWR	Isolation condenser tube side components	Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking	Inservice inspection; water chemistry, and plant-specific verification program	Yes, plant specific	R-15
BWR/ PWR	Jet pump sensing line and reactor vessel flange leak detection line	Cracking due to Cyclic loading	Plant specific	Yes, plant specific	R-102
PWR	Vessel shell fabricated of SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process	Crack growth due to Cyclic loading	TLAA	Yes, TLAA	R-85

Table 1. Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
PWR	Vessel internals (except Westinghouse and B&W baffle former bolts)	Cracking due to Stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water chemistry and RVI program commitment	No but Licensee commitment to be confirmed.	R-106 R-109 R-116 R-120 R-123 R-130 R-138 R-143 R-146 R-149 R-155 R-159 R-166 R-172 R-173 R-175 R-176 R-180 R-181 R-185 R-186 R-193 R-194 R-202 R-203 R-209 R-210 R-214
		Cracking due to Stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water chemistry and RVI program commitment	No but Licensee commitment to be confirmed.	R-112 R-118 R-133 R-150 R-162 R-167

Table 1. Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
PWR	Vessel internals (except Westinghouse and B&W baffle former bolts)	Changes in dimensions due to Void swelling	RVI program commitment	No but Licensee commitment to be confirmed.	R-107 R-110 R-113 R-117 R-119 R-121 R-124 R-126 R-131 R-134 R-139 R-144 R-147 R-151 R-158 R-160 R-163 R-168 R-174 R-177 R-182 R-187 R-195 R-199 R-204 R-211 R-215
		Loss of fracture toughness due to Neutron irradiation embrittlement, void swelling	RVI program commitment	No but Licensee commitment to be confirmed.	R-122 R-127 R-132 R-135 R-141 R-157 R-161 R-164 R-169 R-178 R-188 R-196 R-205 R-212 R-216

Table 1. Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
PWR	Vessel internals (except Westinghouse and B&W baffle former bolts)	Loss of preload due to Stress relaxation	RVI program commitment	No but Licensee commitment to be confirmed.	R-108 R-114 R-136 R-137 R-154 R-165 R-184 R-192 R-197 R-207 R-213
	Westinghouse and B&W baffle former bolts	Cracking due to Stress corrosion cracking, irradiation-assisted stress corrosion cracking	RVI program commitment	No but Licensee commitment to be confirmed.	R-125
PWR	Steam Generator secondary side nozzles and penetrations and Reactor vessel flange leak detection line	Cracking due to Stress corrosion cracking	Plant specific	Yes, plant specific	R-36 R-74
PWR	Cast austenitic stainless steel (CASS) reactor coolant system piping, piping components, and piping elements	Cracking due to Stress corrosion cracking	Water chemistry (and plant specific for components that do not meet the material guidelines of NUREG-0313).	Yes, plant specific for components that do not meet the material guidelines of NUREG-0313	R-05 R-09
PWR	Westinghouse and B&W baffle former bolts	Cracking due to Stress corrosion cracking, irradiation-assisted stress corrosion cracking	Plant specific program	Yes, plant specific	R-198
PWR	Westinghouse and B&W baffle former bolts and screws	Loss of preload due to Stress relaxation	Plant specific	Yes, plant specific	R-129 R-201
PWR	Steam generator feedwater impingement plate and support	Loss of section thickness due to Erosion	Plant specific	Yes, plant specific	R-39
PWR	Steam generator tubes	Denting due to Corrosion of steel tube support plate	Steam generator tubing integrity; water chemistry and plant specific reconfirmation of tube crack propagation analyses.	Yes, plant specific.	R-43

Table 1. Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
PWR	Tube support lattice bars made of steel	Loss of material due to Flow-accelerated corrosion	Applicant must provide a commitment to submit, for NRC review and approval, an inspection plan for tube support lattice bars as based upon staff approved NEI 97-06 guidelines, or other alternative regulatory basis for steam generator degradation management, at least 24 months prior to period of extended operation	No, but commitment to be confirmed.	R-41
PWR	PWR Nickel alloy reactor coolant pressure boundary penetrations and pressurizer heater sheaths and sleeves	Cracking due to Primary water stress corrosion cracking	Inservice inspection, water chemistry, and a plant-specific program consistent with applicant commitments to NRC Orders, Bulletins and Generic Letters associated with nickel alloys.	Yes, site review of plant-specific AMP.	R-01 R-06 R-75 R-89 R-90
PWR	PWR core support pads/guide lugs, pressurizer spray heads	Cracking due to Primary water stress corrosion cracking	Plant specific	Yes, plant specific	R-24 R-88
PWR (CE)	Steam generator feedwater inlet ring and supports	Loss of material due to Flow-accelerated corrosion	Combustion Engineering (CE) System 80 steam generator feedwater ring inspection	Yes, plant specific - Combustion engineering (CE) steam generator feedwater ring inspectionCombustion engineering (CE) steam generator feedwater ring inspection	R-51
BWR	Core shroud and core plate access hole cover (welded	Cracking due to Stress corrosion cracking,	Inservice inspection, and water chemistry	No	R-95

Table 1. Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
	and mechanical covers)	intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Inservice inspection, water chemistry, and augmented inspection of the access hole cover welds	No	R-94
	Core shroud and core plate, support structure, top guide, core spray lines and spargers, jet pump assemblies, control rod drive housing, nuclear instrumentation guide tubes	Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking	BWR vessel internals; water chemistry	No	R-104
		Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	BWR vessel internals; water chemistry	No	R-100 R-92 R-93 R-96 R-97 R-98 R-99
	Feedwater and control rod drive (CRD) return line nozzles	Cracking due to Cyclic loading	Feedwater nozzle; CRD return line nozzle	No	R-65 R-66
	Instrumentation Intermediate range monitor (IRM) dry tubes Source range monitor (SRM) dry tubes Incore neutron flux monitor guide tubes	Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	BWR vessel internals; water chemistry	No	R-105
	Jet pump assembly castings; orificed fuel support	Loss of fracture toughness due to Thermal aging and neutron irradiation embrittlement	Thermal aging and neutron irradiation embrittlement	No	R-101 R-103
	Penetrations	Cracking due to stress corrosion cracking, Intergranular stress corrosion cracking, cyclic loading	BWR penetrations; water chemistry	No	R-69
BWR	Piping, piping components, and piping elements	Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking	BWR stress corrosion cracking and Water Chemistry	No	R-22 R-68

Table 1. Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
	Unclad top head and nozzles	Loss of material due to General, pitting and crevice corrosion	Inservice inspection, and water chemistry	No	R-59
	Vessel shell attachment welds	Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking	BWR vessel ID attachment welds; water chemistry	No	R-64
BWR/ PWR	BWR/PWR Piping, piping components, and piping elements; PWR steam generator components	Loss of material due to Flow-accelerated corrosion	Flow-accelerated corrosion	No	R-23 R-37 R-38
	CASS piping	Loss of fracture toughness due to Thermal aging embrittlement	Thermal aging embrittlement of CASS	No	R-52 R-77
	CASS pump casing and valve body	Loss of fracture toughness due to Thermal aging embrittlement	Inservice inspection	No	R-08
	Piping, piping components, and piping elements	Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking	BWR stress corrosion cracking and Water Chemistry	No	R-20 R-21
	Reactor coolant pressure boundary (RCPB) valve closure bolting, manway and holding bolting, and closure bolting in high-pressure and high-temperature systems	Cracking due to Stress corrosion cracking	Bolting Integrity	No	R-10 R-11 R-78
		Loss of material due to Wear	Bolting Integrity	No	R-26 R-29 R-79
		Loss of preload due to Stress relaxation	Bolting Integrity	No	R-12 R-27 R-32 R-80
	Reactor vessel closure studs and stud assembly	Cracking due to Stress corrosion cracking	Reactor head closure studs	No	R-71
		Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking	Reactor head closure studs	No	R-60

Table 1. Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
PWR	(Alloy 600) Steam generator tubes, repair sleeves, and plugs	Cracking due to Primary water stress corrosion cracking, intergranular attack, OD stress corrosion cracking, Denting due to corrosion of tube support plate, Loss of material due to fretting, wear, wastage, and pitting corrosion; Ligament cracking due to c	Steam generator tubing integrity; water chemistry	No	R-40 R-44 R-47 R-48 R-49 R-50
	External surfaces of steel components in reactor coolant system pressure boundary	Loss of material due to Boric acid corrosion	Boric acid corrosion	No	R-17
	Pressurizer integral support, Reactor coolant system piping, piping components, and piping elements	Cracking due to Cyclic loading	Inservice inspection	No	R-19 R-56
	Reactor internals, reactor vessel flange	Loss of material due to Wear	Inservice inspection	No	R-115 R-142 R-148 R-152 R-156 R-170 R-179 R-190 R-208 R-87
	Reactor vessel closure studs and stud assembly	Loss of material due to Wear	Reactor head closure studs	No	R-72
	Reactor vessel nozzles safe ends and CRD housing; reactor coolant system components (except CASS and bolting)	Cracking due to Cyclic loading	Inservice inspection, and water chemistry	No	R-58
		Cracking due to Stress corrosion cracking	Inservice inspection, and water chemistry	No	R-25 R-30 R-76
			Inservice Inspection, Water chemistry, and RVI program commitment	No	R-14

Table 1. Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
PWR	Reactor vessel nozzles safe ends and CRD housing; reactor coolant system components (except CASS and bolting)	Cracking due to Stress corrosion cracking, primary water stress corrosion cracking	Inservice inspection, and water chemistry	No	R-07 R-83
	Steam generator secondary manways and handholds (steel)	Loss of material due to Erosion	Inservice inspection	No	R-31
	Steam generator upper and lower heads; tubesheets; primary nozzles and safe ends	Cracking due to Stress corrosion cracking	Inservice inspection, and water chemistry	No	R-35
	Steel tube support plate	Cracking due to Primary water stress corrosion cracking, intergranular attack, OD stress corrosion cracking, Denting due to corrosion of tube support plate, Loss of material due to fretting, wear, wastage, and pitting corrosion; Ligament cracking due to c	Steam generator tubing integrity; water chemistry	No	R-42
	Vessel internals (except Westinghouse and B&W baffle former bolts)	Loss of fracture toughness due to Thermal aging and neutron irradiation embrittlement, void swelling	Thermal aging and neutron irradiation embrittlement	No	R-111 R-140 R-153 R-171 R-183 R-191 R-206
		Loss of material due to Wear	Inservice inspection and recommendations of IEB 88-09	No	R-145
BWR/ PWR	Piping, piping components, and piping elements	None	None	NA - No AEM or AMP	RP-01 RP-02 RP-03 RP-04 RP-05 RP-06 RP-07 RP-08

Table 2. Summary of Aging Management Programs for the Engineered Safety Features Evaluated in Chapter V of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Piping, piping components, and piping elements in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	E-10 E-13 E-16
BWR/ PWR	Ducting, piping, piping components, and piping elements internal and external surfaces	Loss of material due to General corrosion	Plant specific	Yes, plant specific	E-25 E-26 E-29 E-30 E-35
BWR/ PWR	Piping, piping components, and piping elements internal surfaces	Loss of material due to Pitting and crevice corrosion	Plant specific	Yes, plant specific	E-33
				Yes, plant specific	E-14
BWR/ PWR	Partially encased tanks with breached moisture barrier	Loss of material due to Pitting and crevice corrosion	Plant specific	Yes, plant specific	E-01
BWR/ PWR	Containment isolation piping and components external surfaces	Loss of material due to General, pitting, crevice, and MIC	Plant specific	Yes, plant specific	E-32
BWR	Seals in standby gas treatment system	Hardening and loss of strength due to Elastomer degradation	Plant specific	Yes, plant specific	E-05 E-06
PWR	High-pressure safety injection (charging) pump miniflow orifice	Loss of material due to Erosion	Plant specific	Yes, plant specific	E-24
BWR/ PWR	Containment isolation piping, piping components, and piping elements internal surfaces	Macrofouling and loss of material due to General, pitting, crevice and MIC	Plant specific	Yes, plant specific	E-22 E-34 E-36
BWR	Drywell and suppression chamber spray system nozzles and flow orifices	Macrofouling from loss of material due to General corrosion	Plant specific	Yes, plant specific	E-04
BWR	Piping, piping components, and piping elements in emergency core cooling system	Loss of material due to General, pitting and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be evaluated	E-08

Table 2. Summary of Aging Management Programs for the Engineered Safety Features Evaluated in Chapter V of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Piping, piping components, and piping elements (internal surfaces) and ducting closure bolting	Loss of material due to General, pitting and crevice corrosion	Plant specific	Yes, plant specific	E-27 E-31 E-40
BWR/ PWR	Buried Piping, piping components, and piping elements	Loss of material due to general, pitting, and crevice corrosion	Buried piping and tanks surveillance or Buried piping and tanks inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	E-42
BWR/ PWR	Piping, piping components, and piping elements	Loss of material due to Pitting, crevice corrosion, and galvanic corrosion	Closed-cycle cooling water system	No	EP-13
BWR	Piping, piping components, and piping elements	Loss of material due to Flow-accelerated corrosion	Flow-accelerated corrosion	No	E-07 E-09
	Piping, piping components, and piping elements with 4 inch and larger nominal diameter	Cracking due to Stress corrosion cracking	BWR stress corrosion cracking and Water Chemistry	No	E-15
BWR/ PWR	Bolting and Closure bolting	Loss of material due to General, pitting and crevice corrosion; Loss of preload due to stress relaxation; Cracking due to stress corrosion cracking and cyclic loading	Bolting Integrity	No	E-02 E-03 EP-1 EP-24 EP-25
	Components serviced by closed-cycle cooling system	Macrofouling and loss of material due to General, pitting and crevice corrosion	Closed-cycle cooling water system	No	E-17 E-19

Table 2. Summary of Aging Management Programs for the Engineered Safety Features Evaluated in Chapter V of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Components serviced by open-cycle cooling system	Loss of material due to General, pitting, crevice, MIC; macrofouling due to Biofouling; reduction of heat transfer due to biofouling	Open-cycle cooling water system	No	E-18 E-20 E-21 E-23
	Gray Cast Iron Heat exchanger shell	Loss of material due to selective leaching	Selective leaching of materials	No	E-43
	Piping, piping components, and piping elements	Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking	Water Chemistry	No	E-37
	Piping, piping components, and piping elements of CASS in emergency core cooling systems	Loss of fracture toughness due to Thermal aging embrittlement	Thermal aging embrittlement of CASS	No	E-11
	Piping, piping components, and piping elements, and tanks in containment spray and emergency core cooling system	Cracking due to Stress corrosion cracking	Water Chemistry	No	E-12 E-38
PWR	Bolting	Loss of material due to Boric acid corrosion	Boric acid corrosion	No	E-41
	External surfaces	Loss of material due to Boric acid corrosion	Boric acid corrosion	No	E-28
	External surfaces of steel and and aluminum piping, piping components, and piping elements	Loss of material due to Boric acid corrosion	Boric acid corrosion	No	EP-2
	Piping, piping components, and piping elements (internal surfaces)	Loss of material due to Boric acid corrosion	Water Chemistry	No	EP-23

Table 2. Summary of Aging Management Programs for the Engineered Safety Features Evaluated in Chapter V of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
PWR	Piping, piping components, and piping elements, and tanks in containment spray and emergency core cooling system	Loss of material due to Boric acid corrosion	Boric acid corrosion	No	E-39
BWR/ PWR	Ducting	None	None	NA - No AEM or AMP	EP-14
	Piping, piping components, and piping elements	None	None	NA - No AEM or AMP	EP-10 EP-11 EP-15 EP-16 EP-17 EP-18 EP-21 EP-22 EP-4 EP-5 EP-6 EP-7 EP-8 EP-9
PWR	External surfaces of steel and and aluminum piping, piping components, and piping elements	None	None	NA - No AEM or AMP	EP-3
	Piping, piping components, and piping elements	None	None	NA - No AEM or AMP	EP-12 EP-19 EP-20

Table 3.Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Components in spent fuel pool cooling and cleanup systems and in the shutdown cooling system of older BWRs	Loss of material due to General, pitting and crevice corrosion (for unlined/unclad) and loss of material due to pitting and crevice corrosion (after liner/cladding degradation in elastomer lined and stainless steel clad steel components)	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	A-35 A-39 A-40
BWR	Piping, piping components, and piping elements; heat exchangers	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	A-58 A-70
BWR/ PWR	Linings in spent fuel pool cooling and cleanup system; seals and collars in ventilation systems	Loss of material due to wear and Hardening and loss of strength due to Elastomer degradation	Plant specific	Yes, plant specific	A-15 A-16 A-17 A-18 A-36 A-73
BWR/ PWR	Components in load handling, chemical and volume control system (PWR), and reactor water cleanup and shutdown cooling systems (older BWR)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	A-06 A-100 A-34 A-37 A-42 A-57 A-62
BWR	Components in contact with sodium penta-borate solution in standby liquid control system (BWR)	Cracking due to Stress corrosion cracking	Water Chemistry and One Time Inspection	Yes, detection of aging effects is to be further evaluated	A-59
BWR/ PWR	Heat exchangers in reactor water cleanup system (BWR); high pressure pumps in chemical and volume control system (PWR)	Cracking due to Stress corrosion cracking and cyclic loading	Plant specific	Yes, plant specific	A-68 A-71 A-85

Table 3.Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Components in ventilation systems, diesel fuel oil system, and emergency diesel generator systems; external surfaces of all auxiliary system steel components	Loss of material due to General, pitting, crevice, and microbiologically influenced corrosion	Plant specific	Yes, plant specific	A-08 A-09 A-10 A-105 A-11 A-12 A-13 A-14 A-23 A-24 A-27 A-46 A-77 A-78 A-80 A-81
BWR/ PWR	Components in reactor coolant pump oil collect system of fire protection	Loss of material due to General, pitting and crevice corrosion	One-time inspection	Yes, detection of aging effects is to be further evaluated	A-82
		Loss of material due to General, pitting, crevice, and galvanic corrosion	One-time inspection	Yes, detection of aging effects is to be further evaluated	A-83
BWR/ PWR	Diesel fuel oil tanks in diesel fuel oil system and emergency diesel generator system	Loss of material due to General, pitting, crevice, MIC and macrofouling due to Biofouling	Fuel oil chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	A-30
PWR	Heat exchanger components in PWR chemical and volume control system	Cracking due to stress corrosion cracking and/or Cyclic loading	Water chemistry and a plant-specific verification program	Yes, plant specific	A-69 A-84
BWR/ PWR	High-strength steel closure bolting exposed to air with steam or water leakage; High-pressure pump casing and closure bolting in PWR chemical and volume control system	Cracking due to stress corrosion cracking and/or Cyclic loading	Plant specific	Yes, plant specific	A-104 A-76

Table 3.Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Neutron absorbing sheets in spent fuel storage racks	Reduction of neutron-absorbing capacity and loss of material due to General corrosion	Plant specific	Yes, plant specific	A-88 A-89
BWR/ PWR	Buried Piping, piping components, and piping elements	Loss of material due to general, pitting, and crevice corrosion, and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	A-01
BWR	Components in shutdown cooling system (older BWR)	Cracking due to Stress corrosion cracking	BWR stress corrosion cracking and Water Chemistry	No	A-101 A-61
	Piping, piping components, and piping elements in reactor water cleanup system	Cracking due to Stress corrosion cracking, intergranular stress corrosion cracking	Reactor water cleanup system inspection	No	A-41 A-60
BWR/ PWR	Closure bolting	Loss of material due to General, pitting, and crevice corrosion; cracking due to stress corrosion cracking and cyclic loading; loss of preload due to stress relaxation	Bolting Integrity	No	A-03 A-04 AP-26 AP-27 AP-28
	Components in or serviced by closed-cycle cooling water system	Loss of material due to General, pitting, crevice, galvanic, and microbiologically influenced corrosion	Closed-cycle cooling water system	No	A-25 A-52 A-63 A-67 AP-12 AP-24

Table 3.Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Components in or serviced by open-cycle cooling water systems	Loss of material due to General, pitting, crevice, and MIC; Reduction of heat transfer due to biofouling	Open-cycle cooling water system	No	A-31 A-32 A-38 A-43 A-44 A-53 A-54 A-64 A-65 A-72 A-74 AP-25
		Macrofouling due to biofouling and loss of material due to Pitting, crevice, microbiologically influenced, and selective leaching	Open-cycle cooling water system and Selective Leaching	No	A-48 A-49 A-51 A-66
	Components in water-based fire protection system	Loss of material due to General, pitting, crevice, and microbiologically influenced corrosion and macrofouling due to Biofouling	Fire water system	No	A-33 A-45 A-47 A-55
	Concrete structural fire barriers - walls, ceilings and floors in fire protection	Concrete cracking and spalling due to Freeze thaw, aggressive chemical attack, and reaction with aggregates; Loss of material due to corrosion of embedded steel	Fire protection and structures monitoring	No	A-90 A-91 A-92 A-93
	Crane structural girders and rail system in load handling system	Loss of material due to General corrosion and due to Wear (rails only)	Overhead heavy load and light load handling systems	No	A-05 A-07
	Fire-rated doors and fire barrier penetration seals	Increased elastomer hardness, shrinkage and loss of strength due to Weathering; Loss of material due to wear of steel	Fire protection	No	A-19 A-20 A-21 A-22
	Gray cast iron components buried in soil	Loss of material due to selective leaching and general corrosion	Selective leaching of materials	No	A-02

Table 3.Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Gray cast iron components in or serviced by closed-cycle cooling water systems	Loss of material due to pitting and crevice corrosion, and selective leaching	Closed-Cycle Cooling Water System and Selective Leaching of Materials	No	A-50
	Internal surfaces of steel piping, piping components, and piping elements and closure bolting in compressed air system	Loss of material due to General, pitting and crevice corrosion	Compressed air monitoring	No	A-103 A-26
	Neutron absorbing sheets in spent fuel storage racks	Reduction of neutron-absorbing capacity due to Boraflex degradation	Boraflex monitoring	No	A-86 A-87
	Piping, piping components, and piping elements	Loss of material due to General, pitting, crevice, and microbiologically influenced corrosion and macrofouling due to Biofouling	Fire water system	No	A-56
	Piping, piping components, and piping elements in diesel fire pump fuel oil system	Loss of material due to General, pitting and crevice corrosion	Fire protection and fuel oil chemistry	No	A-28
	Spent fuel storage racks and piping, piping components, and piping elements in spent fuel pool cooling and cleanup	Cracking due to Stress corrosion cracking	Water Chemistry	No	A-96 A-97
	Steel new fuel storage rack assembly	Loss of material due to General, pitting and crevice corrosion	Structures monitoring	No	A-94
	Tanks in diesel fuel oil system	Loss of material due to General, pitting and crevice corrosion	Aboveground steel tanks	No	A-95
PWR	Bolting and Closure bolting	Loss of material due to Boric acid corrosion	Boric acid corrosion	No	A-102
	External surfaces of steel and and aluminum piping, piping components, and piping elements	Loss of material due to Boric acid corrosion	Boric acid corrosion	No	A-79 AP-1

Table 3.Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Piping, piping components, and piping elements	None	None	NA - No AEM or AMP	AP-10 AP-13 AP-14 AP-15 AP-16 AP-17 AP-19 AP-2 AP-20 AP-21 AP-22 AP-3 AP-4 AP-5 AP-6 AP-7 AP-8 AP-9
PWR	Piping, piping components, and piping elements	None	None	NA - No AEM or AMP	AP-11 AP-18
	Stainless steel piping, piping components, and piping elements containing treated borated water	None	None	No	AP-23

Table 4. Summary of Aging Management Programs for the Steam and Power Conversion System Evaluated in Chapter VIII of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Piping, piping components, and piping elements	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	S-08 S-11
BWR/ PWR	Piping, piping components, and piping elements; Tanks, and heat exchanger shell-side components	Loss of material due to General, pitting and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be evaluated	S-04 S-06 S-09 S-10 S-18 S-19
		Loss of material due to Pitting and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be evaluated	S-13 S-14 S-21 S-22 S-35
BWR/ PWR	Piping, piping components, and piping elements	Loss of material due to General, pitting, crevice, MIC and macrofouling due to Biofouling	Plant specific	Yes, plant specific	S-12
BWR/ PWR	External surfaces	Loss of material due to General corrosion	Plant specific	Yes, plant specific	S-29
BWR/ PWR	Heat exchanger shell side components	Loss of material due to General, pitting, crevice, and MIC	Plant specific	Yes, plant specific	S-17
		Loss of material due to Pitting, crevice, and MIC	Plant specific	Yes, plant specific	S-20
BWR/ PWR	Buried piping, piping components, piping elements, and tanks	Loss of material due to General, pitting, crevice, and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	S-01
BWR/ PWR	Piping, piping components, and piping elements; Heat exchanger tube side components including tubes	Cracking due to Stress corrosion cracking	Water chemistry and one-time inspection	Yes, detection of aging effects is to be evaluated	S-37 S-38 S-39
BWR/ PWR	Bolting	Loss of material due to General, pitting and crevice corrosion	Bolting Integrity	No	S-32

Table 4. Summary of Aging Management Programs for the Steam and Power Conversion System Evaluated in Chapter VIII of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Item Number in GALL**
BWR/ PWR	Closure bolting	Cracking due to Cyclic loading, stress corrosion cracking	Bolting Integrity	No	S-03
		Loss of material due to General, pitting and crevice corrosion	Bolting Integrity	No	S-02 S-34
		Loss of preload due to Stress relaxation	Bolting Integrity	No	S-33
	Heat exchanger shell side components	Loss of material due to General, pitting and crevice corrosion	Closed-cycle cooling water system	No	S-23
		Loss of material due to General, pitting, crevice, MIC and macrofouling due to Biofouling	Open-cycle cooling water system	No	S-24 S-26
		Loss of material due to Pitting and crevice corrosion	Closed-cycle cooling water system	No	S-25
	Heat exchanger tubes	Reduction of heat transfer	Open-cycle cooling water system	No	S-28
		Reduction of heat transfer due to biofouling	Open-cycle cooling water system	No	S-27
	Piping, piping components, and piping elements	Loss of material due to Flow-accelerated corrosion	Flow-accelerated corrosion	No	S-15 S-16
		Loss of material due to Pitting and crevice corrosion	Water Chemistry	No	S-05 S-36
	Tank	Loss of material due to General corrosion	Aboveground steel tanks	No	S-31
PWR	All external surfaces	Loss of material due to Boric acid corrosion	Boric acid corrosion	No	S-30
	Piping, piping components, and piping elements	Loss of material due to Pitting and crevice corrosion	Water Chemistry	No	S-07
BWR/ PWR	Piping, piping components, and piping elements	None	None	No	SP-1 SP-10

Table 5. Summary of Aging Management Programs for the Structures and Component Supports Evaluated in Chapters II and III of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**GALL Item Number**
Common Components of All Types of PWR and BWR Containment					
BWR/ PWR	Penetration sleeves, penetration bellows, and dissimilar metal welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	C-13.
BWR/ PWR	Penetration sleeves, bellows, and dissimilar metal welds	Cracking due to cyclic loading; crack initiation and growth due to SCC	Containment inservice inspection (ISI) and containment leak rate test	Yes, detection of aging effects is to be evaluated	C-14 C-15.
BWR/ PWR	Penetration sleeves, penetration bellows, and dissimilar metal welds	Loss of material due to corrosion	Containment ISI and Containment leak rate test	No	C-12.
BWR/ PWR	Personnel airlock and equipment hatch	Loss of material due to corrosion	Containment ISI and containment leak rate test	No	C-16.
BWR/ PWR	Personnel airlock and equipment hatch	Loss of leak tightness in closed position due to mechanical wear of locks, hinges, and closure mechanisms	Containment leak rate test and plant technical specifications	No	C-17.
BWR/ PWR	Seals, gaskets, and moisture barriers	Loss of sealant and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers	Containment ISI and containment leak rate test	No	C-18.
PWR Concrete (Reinforced and Prestressed) and Steel Containment BWR Concrete (Mark II and III) and Steel (Mark I, II, and III) Containment					
BWR/ PWR	Concrete elements: foundation, dome, and wall	Aging of accessible and inaccessible concrete areas due to leaching of calcium hydroxide, aggressive chemical attack, and corrosion of embedded steel	Containment ISI	Yes, a plant-specific aging management program is required for inaccessible areas as stated	C-02 C-03, C-05.
BWR/ PWR	Concrete elements: foundation	Cracks and distortion due to increased stress levels from settlement	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	C-06.

Table 5. Summary of Aging Management Programs for the Structures and Component Supports Evaluated in Chapters II and III of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**GALL Item Number**
BWR/ PWR	Concrete elements: foundation	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	C-07.
BWR/ PWR	Concrete elements: foundation, dome, and wall	Reduction of strength and modulus due to elevated temperature	Plant specific	Yes, for any portions of concrete containment that exceed specified temperature limits	C-08.
BWR/ PWR	Prestressed containment: tendons and anchorage components	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	C-11.
BWR/ PWR	Steel elements: liner plate, containment shell, downcomers, drywell support skirt, ECCS suction header	Loss of material due to corrosion in accessible and inaccessible areas	Containment ISI and containment leak rate test	Yes, if corrosion is significant for inaccessible areas	C-09, C-19.
BWR	Steel elements: vent header, drywell head, torus, downcomers, and pool shell	Cumulative fatigue damage(CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	C-13, C-21.
BWR/ PWR	Steel elements: protected by coating	Loss of material due to corrosion in accessible areas only	Protective coating monitoring and maintenance	No	C-12, C-19.
BWR/ PWR	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion of prestressing tendons and anchorage components	Containment ISI	No	C-10.
BWR/ PWR	Concrete elements: foundation, dome, and wall	Scaling, cracking, and spalling due to freeze-thaw; expansion and cracking due to reaction with aggregate	Containment ISI	No, if stated conditions are satisfied for inaccessible areas	C-01, C-04.

Table 5. Summary of Aging Management Programs for the Structures and Component Supports Evaluated in Chapters II and III of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**GALL Item Number**
BWR	Steel elements: vent line bellows, vent headers, and downcomers	Cracking due to cyclic loads; crack initiation and growth due to SCC	Containment ISI and Containment leak rate test	Yes, detection of aging effects is to be evaluated	C-20, C-22.
BWR	Steel elements: suppression chamber liner	Crack initiation and growth due to SCC	Containment ISI and containment leak rate test	No	C-24.
BWR	Steel elements: drywell head and downcomer pipes	Fretting and lock up due to wear	Containment ISI	No	C-23.
Class I Structures					
BWR/ PWR	All Groups except Group 6: accessible and inaccessible interior/exterior concrete and steel components	All types of aging effects	Structures monitoring	No, if within the scope of the applicant's structures monitoring program and a plant-specific aging management program is required for inaccessible areas as stated.	T-01, T-02, T-03, T-04, T-06, T-11, T-13.
BWR/ PWR	Groups 1-3, 5, 7-9: inaccessible concrete components, such as exterior walls below grade and foundation	Aging of inaccessible concrete areas due to aggressive chemical attack, corrosion of embedded steel and leaching of calcium hydroxide	Plant specific	Yes, a plant specific aging management program is required for inaccessible areas as stated	T-02, T-05, T-07.
BWR/ PWR	Group 6: all accessible/ inaccessible concrete, metal, and earthen components	All types of aging effects, including loss of material due to abrasion, cavitation, and corrosion	Inspection of water-control structures or FERC/US Army Corp of Engineers dam inspection and maintenance	No	T-15, T-16, T-17, T-18, T-19, T-20, T-21, T-22.
BWR/ PWR	Group 5: liners	Cracking due to SCC; loss of material due to pitting and crevice corrosion	Water chemistry and monitoring of spent fuel pool water level	No	T-14.

Table 5. Summary of Aging Management Programs for the Structures and Component Supports Evaluated in Chapters II and III of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**GALL Item Number**
BWR/ PWR	Groups 1-3, 5, 6: all masonry block walls	Cracking due to restraint, shrinkage, creep, and aggressive environment	Masonry wall	No	T-12.
BWR/ PWR	Groups 1-3, 5, 7-9: foundation	Cracks and distortion due to increased stress levels from settlement	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	T-08.
BWR/ PWR	Groups 1-3, 5-9: foundation	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	T-09.
BWR/ PWR	Groups 1-5: concrete	Reduction of strength and modulus due to elevated temperature	Plant specific	Yes, for any portions of concrete that exceed specified temperature limits	T-10.
BWR/ PWR	Groups 7, 8: liners	Crack Initiation and growth due to SCC; loss of material due to crevice corrosion	Plant specific	Yes	T-23.
BWR/ PWR	Group 6: Seals, gaskets, and moisture barriers	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures monitoring	No	TP-7
Component Supports					
BWR/ PWR	All Groups: support members: anchor bolts, concrete surrounding anchor bolts, welds, grout pad, bolted connections, etc.	Aging of component supports	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	T-29, T-30, T-31, TP-6, TP-8.

Table 5. Summary of Aging Management Programs for the Structures and Component Supports Evaluated in Chapters II and III of the GALL Report					
Type	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**GALL Item Number**
BWR/ PWR	Groups B1.1, B1.2, and B1.3: support members: anchor bolts and welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	T-26.
PWR	All Groups: support members: anchor bolts and welds	Loss of material due to boric acid corrosion	Boric acid corrosion	No	T-25, TP-3.
BWR/ PWR	Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds, spring hangers, guides, stops, and vibration isolators	Loss of material due to environmental corrosion; loss of mechanical function due to corrosion, distortion, dirt, overload, etc.	ISI	No	T-24, T-28, TP-1, TP-2.
BWR/ PWR	Group B1.1: high strength low-alloy bolts	Crack initiation and growth due to SCC	Bolting integrity	No	T-27.

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APPENDIX

PLANT SYSTEMS EVALUATED IN THE GALL REPORT (VOLUME 2)

LISTS OF ITEM NUMBERS IN THE GALL REPORT (VOLUME 2)

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LISTS OF ITEM NUMBERS IN THE GALL REPORT (VOLUME 2)

LISTS OF TABLES OF ITEM NUMBERS IN THE GALL REPORT (VOLUME 2) (Cont.)

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Plant Systems
Evaluated in the GALL Report (Volume 2)

Type	System	Section in GALL (Vol. 2)
BWR	Automatic depressurization system	V.D2
BWR	Containment structures: Mark I steel containments Mark II concrete and steel containments Mark III concrete and steel containments Common components	 II.B1 II.B2 II.B3 II.B4
BWR	High-pressure coolant injection	V.D2
BWR	High-pressure core spray	V.D2
BWR	Low-pressure coolant injection and residual heat removal	V.D2
BWR	Low-pressure core spray	V.D2
BWR	Reactor building	III.A1
BWR	Reactor building with steel superstructure	III.A2
BWR	Reactor coolant pressure boundary	IV.C1
BWR	Reactor coolant system connected systems (up to and including the second isolation valve): Automatic depressurization system Feedwater High-pressure core spray High-pressure coolant injection Isolation condenser Low-pressure coolant injection Low-pressure core spray Main steam Reactor core isolation cooling Reactor water cleanup Recirculation system Residual heat removal Shutdown cooling Standby liquid control	 IV.C1 IV.C1 IV.C1 IV.C1 IV.C1 IV.C1 IV.C1 IV.C1 IV.C1 IV.C1 IV.C1 IV.C1 IV.C1 IV.C1
BWR	Reactor core isolation cooling	V.D2
BWR	Reactor vessel	IV.A1
BWR	Reactor vessel internals	IV.B1
BWR	Reactor water cleanup system	VII.E3
BWR	Shutdown cooling system (older plants)	VII.E4
BWR	Standby gas treatment system	V.B
BWR	Standby liquid control system	VII.E2
BWR	Suppression pool cleanup system	VII.A5
BWR	Unit vent stack	III.A9
BWR/PWR	Auxiliary and radwaste area ventilation system	VII.F2
BWR/PWR	Auxiliary building, diesel generator building, radwaste building, turbine building, switchgear room, auxiliary feedwater pump house, and utility/piping tunnels	III.A3
BWR/PWR	Carbon steel components	V.E, VII.I, VIII.H
BWR/PWR	Closed-cycle cooling water system (reactor auxiliary cooling water)	VII.C2

Plant Systems
Evaluated in the GALL Report (Volume 2) (continued)

Type	System	Section in GALL (Vol. 2)
BWR/PWR	Component supports	III.B
BWR/PWR	Compressed air system	VII.D
BWR/PWR	Concrete tanks	III.A7
BWR/PWR	Condensate system	VIII.E
BWR/PWR	Containment internal structures, excluding refueling canal	III.A4
BWR/PWR	Containment isolation components (containment isolation valves for in-scope systems are addressed in chapters IV, VII, and VIII)	V.C
BWR/PWR	Control room/building	III.A1
BWR/PWR	Control room area ventilation system	VII.F1
BWR/PWR	Demineralized water makeup	Not in scope of 10 CFR 50.54
BWR/PWR	Diesel fuel oil system	VII.H1
BWR/PWR	Diesel generator building ventilation system	VII.F4
BWR/PWR	Electrical components	VI.A, B
BWR/PWR	Emergency diesel generator system	VII.H2
BWR/PWR	Extraction steam system	VIII.C
BWR/PWR	Feedwater system	VIII.D2, D1
BWR/PWR	Fire protection	VII.G
BWR/PWR	Fuel storage facility and refueling canal	III.A5
BWR/PWR	Heating and ventilation systems	VII.F1, F2, F3, F4
BWR/PWR	Main steam system	VIII.B2, B1
BWR/PWR	New and spent fuel storage	VII.A1, A2
BWR/PWR	Open-cycle cooling water system (service water system)	VII.C1
BWR/PWR	Overhead heavy load and light load (related to refueling) handling systems	VII.B
BWR/PWR	Potable and sanitary water	Not in scope of 10 CFR 50.54
BWR/PWR	Primary containment heating and ventilation system	VII.F3
BWR/PWR	Refueling canal	III.A5
BWR/PWR	Spent fuel pool cooling and cleanup	VII.A3, A4
BWR/PWR	Steam turbine system	VIII.A
BWR/PWR	Steel tanks	III.A8
BWR/PWR	Ultimate heat sink	VII.C3
BWR/PWR	Water-control structures (e.g., intake structure, cooling tower, and spray pond)	III.A6
PWR	Accumulators	V.D1
PWR	Auxiliary feedwater system	VIII.G
PWR	Chemical and volume control system	VII.E1
PWR	Combustible gas control (containment H_2 control)	V.E1
PWR	Containment spray system	V.A
PWR	Containments: Concrete containments Steel containments Common components	 II.A1 II.A2 II.A3
PWR	Coolant storage/refueling water system	V.D1

Plant Systems
Evaluated in the GALL Report (Volume 2) (continued)

Type	System	Section in GALL (Vol. 2)
PWR	Core flood system (see accumulators or safety injection tanks)	V.D1
PWR	High-pressure safety injection	V.D1
PWR	Lines to chemical and volume control system	V.D1
PWR	Low-pressure safety injection	V.D1
PWR	Shield building	III.A1
PWR	Reactor coolant system and connected lines (up to and including the second isolation valve): Chemical and volume control system Core flood system Drains and instrumentation lines High-pressure injection system Low-pressure injection Residual heat removal or shutdown cooling Safety injection Sampling system	 IV.C2 IV.C2 IV.C2 IV.C2 IV.C2 IV.C2 IV.C2 IV.C2
PWR	Reactor coolant system, pressurizer, pressurizer relief tank, and other Class 1 components	IV.C2
PWR	Reactor vessel	IV.A2
PWR	Reactor vessel internals	IV.B2, B3, B4
PWR	Residual heat removal or shutdown cooling	V.D1
PWR	Safety injection tanks	V.D1
PWR	Steam generator blowdown system	VIII.F
PWR	Steam generators	IV.D1, D2

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Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-01	Instrument penetrations and primary side nozzles	Nickel alloy	Reactor coolant	Cracking/ primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and plant specific AMP consistent with applicant commitments to NRC Orders, Bulletins and Generic Letters associated with nickel alloys.	Yes, plant specific
R-02	Class 1 piping, fittings and branch connections <NPS 4	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 Inspection in accordance with ASME Section XI does not require volumetric examination of pipes less than NPS 4. A plant-specific destructive examination or a nondestructive examination (NDE) that permits inspection of the inside surfaces of the piping is to be conducted to ensure that cracking has not occurred and the component intended function will be maintained during the extended period of operation.	Yes, parameters monitored/ inspected and detection of aging effects are to be evaluated

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-03	Class 1 piping, fittings and branch connections <NPS 4	Stainless steel, Steel	Reactor coolant	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) Inspection in accordance with ASME Section XI does not require volumetric examination of pipes less than NPS 4. A plant-specific destructive examination or a nondestructive examination (NDE) that permits inspection of the inside surfaces of the piping is to be conducted to ensure that cracking has not occurred and the component intended function will be maintained during the extended period of operation.	Yes, parameters monitored/ inspected and detection of aging effects are to be evaluated
R-04	Piping, piping components, and piping elements	Steel, stainless steel, cast austenitic stainless steel, carbon steel with nickel-alloy or stainless steel cladding, nickel-alloy	Reactor coolant	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of extended operation, and, for Class 1 components, environmental effects on fatigue are to be addressed. See the Standard Review Plan, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii), and for addressing environmental effects on fatigue. See Chapter X.M1 of this report for meeting the requirements of 10 CFR 54.21(c)(1)(iii).	Yes, TLAA

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-05	Class 1 piping, piping components, and piping elements	Cast austenitic stainless steel	Reactor coolant	Cracking/ stress corrosion cracking	Monitoring and control of primary water chemistry in accordance with the guidelines in EPRI TR-105714 (Rev. 3 or later revisions or update) minimize the potential of SCC, and material selection according to the NUREG-0313, Rev. 2 guidelines of ≤0.035% C and ≥7.5% ferrite has reduced susceptibility to SCC. For CASS components that do not meet either one of the above guidelines, a plant-specific aging management program is to be evaluated. The program is to include (a) adequate inspection methods to ensure detection of cracks, and (b) flaw evaluation methodology for CASS components that are susceptible to thermal aging embrittlement.	Yes, plant specific
R-06	Pressurizer instrumentation penetrations and heater sheaths and sleeves	Nickel alloy	Reactor coolant	Cracking/ primary water stress corrosion cracking	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” for Class 1 components and Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and plant specific AMP consistent with applicant commitments to NRC Bulletin BL-04-01 or any subsequent regulatory requirements.	Yes, plant specific

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-07	Class 1 piping, fittings and primary nozzles, safe ends, manways, and flanges	Stainless steel, steel with stainless steel or nickel-alloy cladding, nickel-alloy	Reactor coolant	Cracking/ stress corrosion cracking, primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714	No
R-08	Class 1 pump casings, and valve bodies and bonnets	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F)	Loss of fracture toughness/ thermal aging embrittlement	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components For pump casings and valve bodies, screening for susceptibility to thermal aging is not required. The ASME Section XI inspection requirements are sufficient for managing the effects of loss of fracture toughness due to thermal aging embrittlement of CASS pump casings and valve bodies. Alternatively, the requirements of ASME Code Case N-481 for pump casings, are sufficient for managing the effects of loss of fracture toughness due to thermal aging embrittlement of CASS pump casings.	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-09	Class 1 pump casings and valve bodies	CASS, carbon steel with stainless steel cladding	Reactor coolant	Cracking/ stress corrosion cracking	Monitoring and control of primary water chemistry in accordance with the guidelines in EPRI TR-105714 (Rev. 3 or later revisions or update) minimize the potential of SCC, and material selection according to the NUREG-0313, Rev. 2 guidelines of ≤0.035% C and ≥7.5% ferrite has reduced susceptibility to SCC. For CASS components that do not meet either one of the above guidelines, see Chapter XI.M1, “ASME Section XI, Subsections IWB, IWC, and IWD.”	No
R-10	Closure bolting	Steel	Air with reactor coolant leakage	Cracking/ stress corrosion cracking	Chapter XI.M18, “Bolting Integrity”	No
R-11	Closure bolting	High-strength low-alloy steel, stainless steel	Air with reactor coolant leakage	Cracking/ stress corrosion cracking	Chapter XI.M18, “Bolting Integrity”	No
R-12	Closure bolting	High-strength low-alloy steel, stainless steel	Air with reactor coolant leakage	Loss of preload/ stress relaxation	Chapter XI.M18, “Bolting Integrity”	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-13	Pressurizer relief tank Tank shell and heads Flanges and nozzles Same as above	Steel with stainless steel cladding	Treated borated water	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of extended operation. See the Standard Review Plan, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). See Chapter X.M1 of this report, for meeting the requirements of 10 CFR 54.21(c)(1)(iii).	Yes, TLAA
R-14	Pressurizer relief tank Tank shell and heads Flanges and nozzles	Stainless steel/ steel with stainless steel cladding	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 2 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-15	Isolation condenser tube side components	Stainless steel, Steel	Reactor coolant	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP in Chapter XI.M1 is to be augmented to detect cracking due to stress corrosion cracking and cyclic loading or loss of material due to pitting and crevice corrosion, and verification of the effectiveness of the program is required to ensure that significant degradation is not occurring and the component intended function will be maintained during the extended period of operation. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes, plant specific

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-16	Isolation condenser tube side components	Stainless steel, Steel	Reactor coolant	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP in Chapter XI.M1 is to be augmented to detect cracking due to stress corrosion cracking and cyclic loading or loss of material due to pitting and crevice corrosion, and verification of the effectiveness of the program is required to ensure that significant degradation is not occurring and the component intended function will be maintained during the extended period of operation. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes, plant specific
R-17	External surfaces	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-18	Piping and components external surfaces and bolting	Stainless steel, Steel	System temperature up to 340°C (644°F)	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of extended operation. See the Standard Review Plan, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). See Chapter X.M1 of this report for meeting the requirements of 10 CFR 54.21(c)(1)(iii).	Yes, TLAA
R-19	Pressurizer Integral support	Stainless steel, Steel	Air with metal temperature up to 288°C (550°F)	Cracking/ cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components	No
R-20	Piping, piping components, and piping elements greater than or equal to 4 NPS	Stainless steel, cast austenitic stainless steel	Reactor coolant	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking" and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-21	Piping, piping components, and piping elements greater than or equal to 4 NPS	Nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking" and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-22	Piping, piping components, and piping elements greater than or equal to 4 NPS	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking" and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-23	Piping, piping components, and piping elements	Steel	Reactor coolant	Wall thinning/ flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
R-24	Pressurizer Spray head	Nickel alloy, cast austenitic stainless steel, stainless steel	Reactor coolant	Cracking/ primary water stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes, plant specific
R-25	Pressurizer components	Steel with stainless steel or nickel alloy cladding; or stainless steel	Reactor coolant	Cracking/ stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714	No
R-26	Pump and valve closure bolting	Steel	System temperature up to 288°C (550°F)	Loss of material/ wear	Chapter XI.M18, "Bolting Integrity"	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-27	Pump and valve closure bolting	High- strength low-alloy steel SA 193 Gr. B7	System temperature up to 288°C (550°F)	Loss of preload/ stress relaxation	Chapter XI.M18, "Bolting Integrity"	No
R-28	Pump and valve closure bolting	Steel	System temperature up to 288°C (550°F)	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of extended operation; check Code limits for allowable cycles (less than 7000 cycles) of thermal stress range. See the Standard Review Plan, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
R-29	Pump and valve seal flange closure bolting	Stainless steel, Steel	Air with metal temperature up to 288°C (550°F)	Loss of material/ wear	Chapter XI.M18, "Bolting Integrity"	No
R-30	Reactor coolant system piping and fittings Cold leg Hot leg Surge line Spray line	Stainless steel/ steel with stainless steel cladding	Reactor coolant	Cracking/ stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714	No
R-31	Secondary manways and handholes (cover only)	Steel	Air with leaking secondary-side water and/or steam	Loss of material/ erosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 2 components	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-32	Steam generator closure bolting	Steel	System temperature up to 340°C (644°F)	Loss of preload/ stress relaxation	Chapter XI.M18, "Bolting Integrity"	No
R-33	Steam generator components	Steel	Secondary feedwater/steam	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
R-34	Steam generator shell assembly (for OTSG), upper and lower shell, and transition cone (for recirculating steam generator)	Steel	Secondary feedwater/steam	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 2 components and Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 As noted in NRC Information Notice IN 90-04, general and pitting corrosion of the shell exists, the AMP guidelines in Chapter XI.M1 may not be sufficient to detect general and pitting corrosion, and additional inspection procedures are to be developed, if required.	Yes, detection of aging effects is to be evaluated
R-35	Steam generator components Upper and lower heads Tube sheets	Steel with stainless steel or nickel-alloy cladding	Reactor coolant	Cracking/ stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-36	Steam generator components such as, secondary side nozzles (vent, drain, and instrumentation)	Nickel alloy	Secondary feedwater/steam	Cracking/ stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes, plant specific
R-37	Pressure boundary and structural Steam nozzle and safe end FW nozzle and safe end	Steel	Secondary feedwater/steam	Wall thinning/ flow-accelerated corrosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No
R-38	Pressure boundary and structural FW and AFW nozzles and safe ends Steam nozzles and safe ends	Steel	Secondary feedwater/steam	Wall thinning/ flow-accelerated corrosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No
R-39	Steam generator feedwater impingement plate and support	Steel	Secondary feedwater	Loss of material/ erosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-40	Tube plugs	Nickel alloy	Reactor coolant	Cracking/ primary water stress corrosion cracking	Chapter XI.M19, “Steam Generator Tubing Integrity” and Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714	No
R-41	Tube support lattice bars	Steel	Secondary feedwater/steam	Loss of material/ flow-accelerated corrosion	Applicant must provide a commitment to submit, for NRC review and approval, an inspection plan for tube support lattice bars as based upon staff approved NEI 97-06 guidelines, or other alternative regulatory basis for steam generator degradation management, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-42	Tube support plates	Steel	Secondary feedwater/steam	Ligament cracking/ corrosion	Chapter XI.M19, “Steam Generator Tubing Integrity” and Chapter XI.M2, “Water Chemistry,” for PWR secondary water in EPRI TR-102134	No
R-43	Tubes	Nickel alloy	Secondary feedwater/steam	Denting/ corrosion of carbon steel tube support plate	Chapter XI.M19, “Steam Generator Tubing Integrity” and Chapter XI.M2, “Water Chemistry,” for PWR secondary water in EPRI TR-102134. For plants where analyses were completed in response to NRC Bulletin 88-02 “Rapidly Propagating Cracks in SG Tubes,” the results of those analyses have to be reconfirmed for the period of license renewal.	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-44	Tubes and sleeves	Nickel alloy	Reactor coolant	Cracking/ primary water stress corrosion cracking	Chapter XI.M19, "Steam Generator Tubing Integrity" and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 .	No
R-45	Tubes and sleeves	Nickel alloy	Reactor coolant and secondary feedwater/steam	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of extended operation, and, for Class 1 components, environmental effects on fatigue are to be addressed. See the Standard Review Plan, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii), and for addressing environmental effects on fatigue. See Chapter X.M1 of this report for meeting the requirements of 10 CFR 54.21(c)(1)(iii).	Yes, TLAA
R-46	Tubes and sleeves	Nickel alloy	Reactor coolant and secondary feedwater/steam	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of license renewal. See the Standard Review Plan, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
R-47	Tubes and sleeves	Nickel alloy	Secondary feedwater/steam	Cracking/ outer diameter stress corrosion cracking	Chapter XI.M19, "Steam Generator Tubing Integrity" and Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	no

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-48	Tubes and sleeves	Nickel alloy	Secondary feedwater/steam	Cracking/ intergranular attack	Chapter XI.M19, "Steam Generator Tubing Integrity" and Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	no
R-49	Tubes and sleeves	Nickel alloy	Secondary feedwater/steam	Loss of material/ fretting and wear	Chapter XI.M19, "Steam Generator Tubing Integrity" and Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
R-50	Tubes and sleeves (exposed to phosphate chemistry)	Nickel alloy	Secondary feedwater/steam	Loss of material/ wastage and pitting corrosion	Chapter XI.M19, "Steam Generator Tubing Integrity" and Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
R-51	Upper assembly and separators Feedwater inlet ring and support	Steel	Secondary feedwater/steam	Loss of material/ flow-accelerated corrosion	A plant-specific aging management program is to be evaluated. As noted in Combustion Engineering (CE) Information Notice (IN) 90-04 and NRC IN 91-19 and LER 50-362/90-05-01, this form of degradation has been detected only in certain CE System 80 steam generators.	Yes, plant specific
R-52	Class 1 piping, piping components, and piping elements	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F)	Loss of fracture toughness/ thermal aging embrittlement	Chapter XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-53	Reactor vessel internals components	Stainless steel, cast austenitic stainless steel, nickel alloy	Reactor coolant	Cumulative fatigue damage/ fatigue	For components for which a fatigue analysis has been performed for the 40-year period, fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA
R-54	Reactor vessel internals components	Stainless steel, cast austenitic stainless steel, nickel alloy	Reactor coolant	Cumulative fatigue damage/ fatigue	For components for which a fatigue analysis has been performed for the 40-year period, fatigue is a time-limited aging analysis (TLAA) to be performed for the period of extended operation. See the Standard Review Plan, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-55	Class 1 piping, fittings and branch connections <NPS 4	Stainless steel, Steel	Reactor coolant	Cracking/ thermal and mechanical loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components Inspection in accordance with ASME Section XI does not require volumetric examination of pipes less than NPS 4. A plant-specific destructive examination or a nondestructive examination (NDE) that permits inspection of the inside surfaces of the piping is to be conducted to ensure that cracking has not occurred and the component intended function will be maintained during the extended period of operation. The AMPs are to be augmented by verifying that service-induced weld cracking is not occurring in the small-bore piping less than NPS 4, including pipe, fittings, and branch connections. See Chapter XI.M32, "One-Time Inspection" for an acceptable verification method.	Yes, parameters monitored/ inspected and detection of aging effects are to be evaluated
R-56	Reactor coolant system piping and fittings Cold leg Hot leg Surge line Spray line	Stainless steel/ steel with stainless steel cladding	Reactor coolant	Cracking/ cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-57	Class 1 piping, fittings and branch connections <NPS 4	Stainless steel/ steel with stainless steel cladding	Reactor coolant	Cracking/ thermal and mechanical loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components Inspection in accordance with ASME Section XI does not require volumetric examination of pipes less than NPS 4. A plant-specific destructive examination or a nondestructive examination (NDE) that permits inspection of the inside surfaces of the piping is to be conducted to ensure that cracking has not occurred and the component intended function will be maintained during the extended period of operation. The AMPs are to be augmented by verifying that service-induced weld cracking is not occurring in the small-bore piping less than NPS 4, including pipe, fittings, and branch connections. See Chapter XI.M32, "One-Time Inspection" for an acceptable verification method.	Yes, parameters monitored/ inspected and detection of aging effects are to be evaluated

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-58	Pressurizer components	Steel with stainless steel or nickel alloy cladding; or stainless steel	Reactor coolant	Cracking/ cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 Cracks in the pressurizer cladding could propagate from cyclic loading into the ferrite base metal and weld metal. However, because the weld metal between the surge nozzle and the vessel lower head is subjected to the maximum stress cycles and the area is periodically inspected as part of the ISI program, the existing AMP is adequate for managing the effect of pressurizer clad cracking.	No
R-59	Top head enclosure (without cladding) Top head Nozzles (vent, top head spray or RCIC, and spare)	Steel	Reactor coolant	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-60	Top head enclosure Closure studs and nuts	High strength low alloy steel Maximum tensile strength <1172 MPa (<170 Ksi)	Air with reactor coolant leakage	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	Chapter XI.M3, “Reactor Head Closure Studs”	No
R-61	Top head enclosure Vessel flange leak detection line	Stainless steel, nickel alloy	Air with reactor coolant leakage	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	A plant-specific aging management program is to be evaluated because existing programs may not be able to mitigate or detect crack initiation and growth due to SCC of vessel flange leak detection line.	Yes, plant specific

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-62	Vessel shell Intermediate beltline shell Beltline welds	Steel (without lining/coating or with degraded lining/coating)	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement	Neutron irradiation embrittlement is a time dependent aging mechanism to be evaluated for the period of extended operation for all ferritic materials that have a neutron fluence exceeding 1017 n/cm2 (E >1 MeV) at the end of the license renewal term. Aspects of this evaluation may involve a TLAA. In accordance with approved BWRVIP-74, the TLAA is to evaluate the impact of neutron embrittlement on: (a) the adjusted reference temperature, the plant's pressure-temperature limits, (b) the need for inservice inspection of circumferential welds, and (c) the Charpy upper shelf energy or the equivalent margins analyses performed in accordance with 10 CFR 50, Appendix G. Additionally, the applicant is to monitor axial beltline weld embrittlement. One acceptable method is to determine that the mean RTNDT of the axial beltline welds at the end of the extended period of operation is less than the value specified by the staff in its May 7, 2000 letter. See the Standard Review Plan, Section 4.2 "Reactor Vessel Neutron Embri	Yes, TLAA

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-63	Vessel shell Intermediate beltline shell Beltline welds	Steel (without lining/coating or with degraded lining/coating)	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement	Chapter XI.M31, "Reactor Vessel Surveillance"	Yes, plant specific
R-64	Vessel shell Attachment welds	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	Chapter XI.M4, "BWR Vessel ID Attachment Welds," and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-65	Nozzles Feedwater	Steel (without lining/coating or with degraded lining/coating)	Reactor coolant	Cracking/ cyclic loading	Chapter XI.M5, "BWR Feedwater Nozzle"	No
R-66	Nozzles Control rod drive return line	Steel (without lining/coating or with degraded lining/coating)	Reactor coolant	Cracking/ cyclic loading	Chapter XI.M6, "BWR Control Rod Drive Return Line Nozzle"	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-67	Nozzles Low pressure coolant injection or RHR injection mode	Steel	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement	Neutron irradiation embrittlement is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation for all ferritic materials that have a neutron fluence greater than 1017 n/cm2 (E >1 MeV) at the end of the license renewal term. In accordance with approved BWRVIP-74, the TLAA is to evaluate the impact of neutron embrittlement on: (a) the adjusted reference temperature, the plant's pressure-temperature limits, (b) the Charpy upper shelf energy, and (c) the equivalent margins analyses performed in accordance with 10 CFR 50, Appendix G. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations. See the Standard Review Plan, Section 4.2 "Reactor Vessel Neutron Embrittlement" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-68	Nozzle safe ends High pressure core spray Low pressure core spray Control rod drive return line Recirculating water Low pressure coolant injection or RHR injection mode	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking," and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-69	Penetrations Control rod drive stub tubes Instrumentation Jet pump instrument Standby liquid control Flux monitor Drain line	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, cyclic loading	Chapter XI.M8, "BWR Penetrations," and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-70	Support skirt and attachment welds	Steel	Air – indoor uncontrolled	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-71	Closure head Stud assembly	High strength low alloy steel Maximum tensile strength <1172 MPa (<170 Ksi)	Air with reactor coolant leakage	Cracking/ stress corrosion cracking	Chapter XI.M3, “Reactor Head Closure Studs”	No
R-72	Closure head Stud assembly	High strength low alloy steel Maximum tensile strength <1172 MPa (<170 Ksi)	Air with reactor coolant leakage	Loss of material/ wear	Chapter XI.M3, “Reactor Head Closure Studs”	No
R-73	Closure head Stud assembly	High strength low alloy steel Maximum tensile strength <1172 MPa (<170 Ksi)	Air with reactor coolant leakage	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes TLAA
R-74	Closure head Vessel flange leak detection line	Stainless steel	Air with reactor coolant leakage	Cracking/ stress corrosion cracking	A plant-specific aging management program is to be evaluated because existing programs may not be capable of mitigating or detecting crack initiation and growth due to SCC in the vessel flange leak detection line.	Yes, plant specific

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-75	Control rod drive head penetration Nozzle	Nickel alloy	Reactor coolant	Cracking/ primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and plant specific AMP consistent with applicant commitments to NRC Order EA-03-009 or any subsequent regulatory requirements.	Yes, plant specific
R-76	Control rod drive head penetration Pressure housing	Stainless steel, cast austenitic stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714	No
R-77	Control rod drive head penetration Pressure housing	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F)	Loss of fracture toughness/ thermal aging embrittlement	Chapter XI.M12 "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No
R-78	Control rod drive head penetration Flange bolting	Stainless steel	Air with reactor coolant leakage	Cracking/ stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No
R-79	Control rod drive head penetration Flange bolting	Stainless steel	Air with reactor coolant leakage	Loss of material/ wear	Chapter XI.M18, "Bolting Integrity"	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-80	Control rod drive head penetration Flange bolting	Stainless steel	Air with reactor coolant leakage	Loss of preload/ stress relaxation	Chapter XI.M18, “Bolting Integrity”	No
R-81	Nozzles Inlet Outlet Safety injection	Steel with stainless steel cladding	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement	Neutron irradiation embrittlement is a time-limited aging analysis (TLAA) to be evaluated for the period of license renewal for all ferritic materials that have a neutron fluence greater than 1017 n/cm2 (E >1 MeV) at the end of the license renewal term. The TLAA is to evaluate the impact of neutron embrittlement on: (a) the RTPTS value based on the requirements in 10 CFR 50.61, (b) the adjusted reference temperature, the plant’s pressure-temperature limits, (c) the Charpy upper shelf energy, and (d) the equivalent margins analyses performed in accordance with 10 CFR 50, Appendix G. The applicant may choose to demonstrate that the materials in the inlet, outlet, and safety injection nozzles are not controlling for the TLAA evaluations.	Yes, TLAA
R-82	Nozzles Inlet Outlet Safety injection	Steel with stainless steel cladding	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement	Chapter XI.M31, “Reactor Vessel Surveillance”	Yes, plant specific

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-83	Nozzles Inlet Outlet Safety injection	Stainless steel, cast austenitic stainless steel, nickel alloy and associated welds and buttering	Reactor coolant	Cracking/ stress corrosion cracking, primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714	No
R-84	Vessel shell Upper shell Intermediate and lower shell (including beltline welds)	Steel with stainless steel cladding	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement	Neutron irradiation embrittlement is a time-limited aging analysis (TLAA) to be evaluated for the period of license renewal for all ferritic materials that have a neutron fluence of greater than 1017 n/cm2 (E >1 MeV) at the end of the license renewal term. The TLAA is to evaluate the impact of neutron embrittlement on: (a) the RTPTS value based on the requirements in 10 CFR 50.61, (b) the adjusted reference temperature, the plant's pressure temperature limits, (c) the Charpy upper shelf energy, and (d) the equivalent margins analyses performed in accordance with 10 CFR 50, Appendix G. See the Standard Review Plan, Section 4.2 "Reactor Vessel Neutron Embrittlement" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, plant specific

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-85	Vessel shell Upper shell Intermediate and lower shell (including beltline welds)	SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process	Reactor coolant	Crack growth/ cyclic loading	Growth of intergranular separations (underclad cracks) in low-alloy steel forging heat affected zone under austenitic stainless steel cladding is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation for all the SA 508-Cl 2 forgings where the cladding was deposited with a high heat input welding process. The methodology for evaluating an underclad flaw is in accordance with the current well-established flaw evaluation procedure and criterion in the ASME Section XI Code. See the Standard Review Plan, Section 4.7, “Other Plant-Specific Time-Limited Aging Analysis,” for generic guidance for meeting the requirements of 10 CFR 54.21(c).	Yes TLAA
R-86	Vessel shell Upper shell Intermediate and lower shell (including beltline welds)	Steel with stainless steel cladding	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement	Chapter XI.M31, “Reactor Vessel Surveillance”	Yes, plant specific
R-87	Vessel shell Vessel flange	Steel	Reactor coolant	Loss of material/ wear	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” for Class 1 components	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-88	Core support pads/core guide lugs	Nickel alloy	Reactor coolant	Cracking/ primary water stress corrosion cracking	A plant-specific aging management program is to be evaluated. The applicant is to provide a plant-specific AMP or participate in industry programs to determine appropriate AMP.	Yes, plant specific
R-89	Penetrations Instrument tubes (bottom head)	Nickel alloy	Reactor coolant	Cracking/ primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and plant specific AMP consistent with applicant commitments to NRC Bulletin BL-03-02 or any subsequent regulatory requirements.	Yes, plant specific
R-90	Penetrations Head vent pipe (top head) Instrument tubes (top head)	Nickel alloy	Reactor coolant	Cracking/ primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and plant specific AMP consistent with applicant commitments to NRC Order EA-03-009 or any subsequent regulatory requirements.	Yes, plant specific
R-91	Pressure vessel support Skirt support	Steel	Air – indoor uncontrolled	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-92	Core shroud and core plate Core shroud (upper, central, lower)	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M9, "BWR Vessel Internals," for core shroud and Chapter XI.M2, "Water Chemistry" for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-93	Core shroud and core plate Core plate Core plate bolts (used in early BWRs)	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M9, "BWR Vessel Internals," for core plate and Chapter XI.M2, "Water Chemistry" for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-94	Core shroud and core plate Access hole cover (welded covers)	Nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) Because cracking initiated in crevice regions is not amenable to visual inspection, for BWRs with a crevice in the access hole covers, an augmented inspection is to include ultrasonic testing (UT) or other demonstrated acceptable inspection of the access hole cover welds.	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-95	Core shroud and core plate Access hole cover (mechanical covers)	Nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-96	Core shroud and core plate Shroud support structure (shroud support cylinder, shroud support plate, shroud support legs)	Nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M9, "BWR Vessel Internals," for shroud support and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-97	Core shroud and core plate Shroud support structure (shroud support cylinder, shroud support plate, shroud support legs)	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M9, "BWR Vessel Internals," for the LPCI coupling and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-98	Top guide	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M9, "BWR Vessel Internals," for top guide and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) For top guides with neutron fluence exceeding the IASCC threshold (5x1020, E>IMeV) inspect ten (10) percent of the top guide locations using enhanced visual inspection technique, EVT-1 within 12 years, one-half (5 percent) to be completed within 6 years. Locations selected for examination will be areas that have exceeded the neutron fluence threshold. The extent and frequency of examination of the top guide is similar to the examination of the control rod drive housing guide tube in BWRVIP-47.	No
R-99	Core spray lines and spargers Core spray lines (headers) Spray rings Spray nozzles Thermal sleeves	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M9, "BWR Vessel Internals," for core spray internals and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-100	Jet pump assemblies Thermal sleeve Inlet header Riser brace arm Holddown beams Inlet elbow Mixing assembly Diffuser Castings	Nickel alloy, cast austenitic stainless steel, stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M9, “BWR Vessel Internals,” for jet pump assembly and Chapter XI.M2, “Water Chemistry,” for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-101	Jet pump assemblies Castings	Cast austenitic stainless steel	Reactor coolant	Loss of fracture toughness/ thermal aging and neutron irradiation embrittlement	Chapter XI.M13, “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)”	No
R-102	Jet pump assemblies Jet pump sensing line	Stainless steel	Reactor coolant	Cracking/ cyclic loading	A plant-specific aging management program is to be evaluated.	Yes, plant specific
R-103	Fuel supports and control rod drive assemblies Orificed fuel support	Cast austenitic stainless steel	Reactor coolant	Loss of fracture toughness/ thermal aging and neutron irradiation embrittlement	Chapter XI.M13, “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)”	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-104	Fuel supports and control rod drive assemblies Control rod drive housing	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	Chapter XI.M9, "BWR Vessel Internals," for lower plenum and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-105	Instrumentation Intermediate range monitor (IRM) dry tubes Source range monitor (SRM) dry tubes Incore neutron flux monitor guide tubes	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI. M9, "BWR Vessel Internals," for lower plenum and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
R-106	Upper internals assembly Upper support plate Upper core plate Hold-down spring	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-107	Upper internals assembly Upper support plate Upper core plate Hold-down spring	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-108	Upper internals assembly Hold-down spring	Stainless steel	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-109	Upper internals assembly Upper support column	Stainless steel, cast austenitic stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-110	Upper internals assembly Upper support column	Stainless steel, cast austenitic stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-111	Upper internals assembly Upper support column (only cast austenitic stainless steel portions)	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F) and neutron flux	Loss of fracture toughness/ thermal aging and neutron irradiation embrittlement, void swelling	Chapter XI.M13, “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)”	No
R-112	Upper internals assembly Upper support column bolts Upper core plate alignment pins Fuel alignment pins	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-113	Upper internals assembly Upper support column bolts Upper core plate alignment pins Fuel alignment pins	Stainless steel, nickel alloy	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-114	Upper internals assembly Upper support column bolts	Stainless steel, nickel alloy	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-115	Upper internals assembly Upper core plate alignment pins	Stainless steel, nickel alloy	Reactor coolant	Loss of material/ wear	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” for Class 1 components	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-116	RCCA guide tube assemblies RCCA guide tubes	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-117	RCCA guide tube assemblies RCCA guide tubes	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-118	RCCA guide tube assemblies RCCA guide tube bolts RCCA guide tube support pins	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-119	RCCA guide tube assemblies RCCA guide tube bolts, RCCA guide tube support pins	Stainless steel, nickel alloy	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-120	Core barrel (CB) CB flange (upper) CB outlet nozzles Thermal shield	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-121	Core barrel (CB) CB flange (upper) CB outlet nozzles Thermal shield	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-122	Core barrel (CB) CB flange (upper) CB outlet nozzles Thermal shield	Stainless steel	Reactor coolant >250°C (>482°F) and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-123	Baffle/former assembly Baffle and former plates	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-124	Baffle/former assembly Baffle and former plates	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-125	Baffle/former assembly Baffle/former bolts	Stainless steel	Reactor coolant and high fluence (>1 x 10E21 n/cm2 E >0.1 MeV)	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-126	Baffle/former assembly Baffle/former bolts	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-127	Baffle/former assembly Baffle and former plates	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-128	Baffle/former assembly Baffle/former bolts	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement	A plant-specific aging management program is to be evaluated.	Yes, plant specific

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-129	Baffle/former assembly Baffle/former bolts	Stainless steel, nickel alloy	Reactor coolant	Loss of preload/ stress relaxation	A plant-specific aging management program is to be evaluated. Visual inspection (VT-3) is to be augmented to detect relevant conditions of stress relaxation because only the heads of the baffle/former bolts are visible, and a plant-specific aging management program is thus required.	Yes, plant specific
R-130	Lower internal assembly Lower core plate Radial keys and clevis inserts	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-131	Lower internal assembly Lower core plate Radial keys and clevis inserts	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-132	Lower internal assembly Lower core plate	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-133	Lower internal assembly Fuel alignment pins Lower support plate column bolts Clevis insert bolts	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-134	Lower internal assembly Fuel alignment pins Lower support plate column bolts Clevis insert bolts	Stainless steel, nickel alloy	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-135	Lower internal assembly Fuel alignment pins Lower support plate column bolts Clevis insert bolts	Stainless steel, nickel alloy	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-136	Lower internal assembly Lower support plate column bolts	Stainless steel, nickel alloy	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-137	Lower internal assembly Clevis insert bolts	Stainless steel, nickel alloy	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-138	Lower internal assembly Lower support forging or casting Lower support plate columns	Stainless steel, cast austenitic stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-139	Lower internal assembly Lower support forging or casting Lower support plate columns	Stainless steel, cast austenitic stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-140	Lower internal assembly Lower support forging or casting Lower support plate columns	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F) and neutron flux	Loss of fracture toughness/ thermal aging and neutron irradiation embrittlement, void swelling	Chapter XI.M13, “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)”	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-141	Lower internal assembly Lower support forging Lower support plate columns	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-142	Lower internal assembly Radial keys and clevis Inserts	Stainless steel	Reactor coolant	Loss of material/ wear	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” for Class 1 components	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-143	Instrumentation support structures Flux thimble guide tubes	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-144	Instrumentation support structures Flux thimble guide tubes	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-145	Instrumentation support structures Flux thimble	Stainless steel	Reactor coolant	Loss of material/ wear	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components and recommendations of NRC I&E Bulletin 88-09 "Thimble Tube Thinning in Westinghouse Reactors," described bellow: In response to I&E Bulletin 88-09, an inspection program, with technical justification, is to be established and is to include (a) an appropriate thimble tube wear acceptance criterion, e.g., percent through-wall loss, and includes allowances for inspection methodology and wear scar geometry uncertainty, (b) an appropriate inspection frequency, e.g., every refueling outage, and (c) inspection methodology such as eddy current technique that is capable of adequately detecting wear of the thimble tubes. In addition, corrective actions include isolation or replacement if a thimble tube fails to meet the above acceptance criteria. Inspection schedule is in accordance with the guidelines of I&E Bulletin 88-09.	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-146	Upper Internals Assembly Upper guide structure support plate Fuel alignment plate Fuel alignment plate guide lugs and guide lug inserts	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-147	Upper Internals Assembly Upper guide structure support plate Fuel alignment plate Fuel alignment plate guide lugs and guide lug inserts	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-148	Upper Internals Assembly Fuel alignment plate Fuel alignment plate guide lugs and their lugs Hold-down ring	Stainless steel	Reactor coolant	Loss of material/ wear	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components	No
R-149	CEA Shroud Assemblies	Stainless steel, cast austenitic stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-150	CEA Shroud Assemblies CEA shrouds bolts	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-151	CEA Shroud Assemblies CEA shrouds bolts	Stainless steel, cast austenitic stainless steel, nickel alloy	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-152	CEA shroud assemblies CEA shroud extension shaft guides	Stainless steel	Reactor coolant	Loss of material/ wear	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components	No
R-153	CEA Shroud Assemblies	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F) and neutron flux	Loss of fracture toughness/ thermal aging and neutron irradiation embrittlement, void swelling	Chapter XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No
R-154	CEA Shroud Assemblies CEA shrouds bolts	Stainless steel, nickel alloy	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-155	Core support barrel Core support barrel upper flange	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-156	Core support barrel Core support barrel upper flange Core support barrel alignment keys	Stainless steel	Reactor coolant	Loss of material/ wear	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-157	Core support barrel Core support barrel upper flange	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-158	Core support barrel Core support barrel upper flange	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-159	Core shroud assembly Core shroud tie rods (core support plate attached by welds in later plants)	Stainless steel, cast austenitic stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-160	Core shroud assembly Core shroud tie rods (core support plate attached by welds in later plants)	Stainless steel, cast austenitic stainless steel, nickel alloy	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-161	Core barrel assembly Core barrel cylinder (top and bottom flange) Lower internals assembly-to-core barrel bolts Core barrel-to-thermal shield bolts Baffle plates and formers	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-162	Core shroud assembly Core shroud assembly bolts (later plants are welded)	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-163	Core shroud assembly Core shroud assembly bolts (later plants are welded)	Stainless steel, nickel alloy	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-164	Core shroud assembly Core shroud assembly bolts (later plants are welded)	Stainless steel, nickel alloy	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-165	Core shroud assembly Core shroud assembly bolts Core shroud tie rods	Stainless steel, nickel alloy	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-166	Lower internal assembly Core support plate Lower support structure beam assemblies Core support column Core support barrel snubber assemblies	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-167	Lower internal Assembly Fuel alignment pins Core support column bolts	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-168	Lower internal assembly Core support plate Fuel alignment pins Lower support structure beam assemblies Core support column Core support column bolts Core support barrel snubber assemblies	Stainless steel, cast austenitic stainless steel, nickel alloy	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-169	Lower internal assembly Core support plate Fuel alignment pins Lower support structure beam assemblies Core support column bolts Core support barrel snubber assemblies	Stainless steel, nickel alloy	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-170	Lower internal assembly Fuel alignment pins Core support barrel snubber assemblies	Stainless steel, nickel alloy	Reactor coolant	Loss of material/ wear	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” for Class 1 components	No
R-171	Lower internal assembly Core support column	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F) and neutron flux	Loss of fracture toughness/ thermal aging and neutron irradiation embrittlement, void swelling	Chapter XI.M13, “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)”	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-172	Plenum cover and plenum cylinder Plenum cover assembly Plenum cylinder Reinforcing plates	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-173	Plenum cover and plenum cylinder Top flange-to-cover bolts Bottom flange-to-upper grid screws	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-174	Plenum cover and plenum cylinder Plenum cover assembly Plenum cylinder Reinforcing plates Top flange-to-cover bolts Bottom flange-to-upper grid screws	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-175	Upper grid assembly Upper grid rib section Upper grid ring forging Fuel assembly support pads Plenum rib pads	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-176	Upper grid assembly Rib- to-ring screws	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-177	Upper grid assembly Upper grid rib section Upper grid ring forging Fuel assembly support pads Plenum rib pads Rib-to-ring screws	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-178	Upper grid assembly Upper grid rib section Upper grid ring forging Fuel assembly support pads Plenum rib pads Rib-to-ring screws	Stainless steel	Reactor coolant	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-179	Upper grid assembly Fuel assembly support pads Plenum rib pads	Stainless steel	Reactor coolant	Loss of material/ wear	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” for Class 1 components	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-180	Control rod guide tube (CRGT) assembly CRGT pipe and flange CRGT spacer casting CRGT rod guide tubes CRGT rod guide sectors	Stainless steel, cast austenitic stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-181	Control rod guide tube (CRGT) assembly CRGT spacer screws Flange-to-upper grid screws	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-182	Control rod guide tube (CRGT) assembly CRGT pipe and flange CRGT spacer casting CRGT spacer screws Flange-to-upper grid screws CRGT rod guide tubes CRGT rod guide sectors	Stainless steel, cast austenitic stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-183	Control rod guide tube (CRGT) assembly CRGT spacer casting	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F) and neutron flux	Loss of fracture toughness/ thermal aging and neutron irradiation embrittlement, void swelling	Chapter XI.M13, “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)”	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-184	Control rod guide tube (CRGT) assembly Flange-to-upper grid screws	Stainless steel	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-185	Core support shield assembly Core support shield cylinder (top and bottom flange) Outlet and vent valve (VV) nozzles VV body and retaining ring	Stainless steel, PH stainless steel forging, CASS	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-186	Core support shield assembly Core support shield-to-core barrel bolts VV assembly locking device	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-187	Core support shield assembly Core support shield cylinder (top and bottom flange) Core support shield-to-core barrel bolts VV retaining ring VV assembly locking device	Stainless steel, nickel alloy, PH Stainless Steel forging	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-188	Core support shield assembly Core support shield cylinder (top and bottom flange) Core support shield-to-core barrel bolts Outlet and vent valve (VV) nozzles VV assembly locking device	Stainless steel, nickel alloy, PH Stainless Steel forging	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-189	Reactor vessel internals components	Stainless steel, cast austenitic stainless steel, nickel alloy, PH Stainless Steel forging	Reactor coolant	Cumulative fatigue damage/ fatigue	For components for which a fatigue analysis has been performed for the 40-year period, fatigue is a time-limited aging analysis (TLAA) to be performed for the period of extended operation, and, for Class 1 components, environmental effects on fatigue are to be addressed. See the Standard Review Plan, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-190	Core support shield assembly Core support shield cylinder (top flange) VV assembly locking device	Stainless steel	Reactor coolant	Loss of material/ wear	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components	No
R-191	Core support shield assembly Outlet and vent valve nozzles VV body and retaining ring	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F) and neutron flux	Loss of fracture toughness/ thermal aging and neutron irradiation embrittlement, void swelling	Chapter XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No
R-192	Core support shield assembly Core support shield-to-core barrel bolts	Stainless steel, nickel alloy	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-193	Core barrel assembly Core barrel cylinder (top and bottom flange) Baffle plates and formers	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-194	Core barrel assembly Lower internals assembly-to-core barrel bolts Core barrel-to-thermal shield bolts	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-195	Core barrel assembly Core barrel cylinder (top and bottom flange) Lower internals assembly-to-core barrel bolts Core barrel-to-thermal shield bolts Baffle plates and formers	Stainless steel, nickel alloy	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-196	Core barrel assembly Core barrel cylinder (top and bottom flange) Lower internals assembly-to-core barrel bolts Core barrel-to-thermal shield bolts Baffle plates and formers	Stainless steel, nickel alloy	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-197	Core barrel assembly Lower internals assembly-to-core barrel bolts Core barrel-to-thermal shield bolts	Stainless steel, nickel alloy	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-198	Core barrel assembly Baffle/former bolts and screws	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	A plant-specific aging management program is to be evaluated. Historically the VT-3 visual examinations have not identified baffle/former bolt cracking because cracking occurs at the juncture of the bolt head and shank, which is not accessible for visual inspection. However, recent UT examinations of the baffle/former bolts have identified cracking in several plants. The industry is currently addressing the issue of baffle bolt cracking in the PWR Materials Reliability Project, Issues Task Group (ITG) activities to determine, develop, and implement the necessary steps and plans to manage the applicable aging effects on a plant-specific basis.	Yes, plant specific

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-199	Core barrel assembly Baffle/former bolts and screws	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-200	Core barrel assembly Baffle/former bolts and screws	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	A plant-specific aging management program is to be evaluated.	Yes, plant specific
R-201	Core barrel assembly Baffle/former bolts and screws	Stainless steel	Reactor coolant	Loss of preload/ stress relaxation	A plant-specific aging management program is to be evaluated. Visual inspection (VT-3) is to be augmented to detect relevant conditions of stress relaxation because only the heads of the baffle/former bolts are visible, and a plant-specific aging management program is thus required.	Yes, plant specific

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-202	Lower grid assembly Lower grid rib section Fuel assembly support pads Lower grid flow dist. plate Orifice plugs Lower grid and shell forgings Guide blocks Shock pads Support post pipes Incore guide tube spider castings	Stainless steel, cast austenitic stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-203	Lower grid assembly Lower grid rib-to-shell forging screws Lower internals assembly-to-thermal shield bolts Guide blocks and bolts Shock pads and bolts	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-204	Lower grid assembly Lower grid rib section Fuel assembly support pads Lower grid rib-to-shell forging screws Lower grid flow dist. plate Orifice plugs Lower grid and shell forgings Lower internals assembly-to-thermal shield bolts Guide blocks and bolts Shock pads and bolts Support post pipes Incore guide tube spider castings	Stainless steel, cast austenitic stainless steel, nickel alloy	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-205	Lower grid assembly Lower grid rib section Fuel assembly support pads Lower grid rib-to-shell forging screws Lower grid flow dist. plate Orifice plugs Lower grid and shell forgings Lower internals assembly-to-thermal shield bolts Guide blocks and bolts Shock pads and bolts Support post pipes	Stainless steel, nickel alloy	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-206	Lower grid assembly Incore guide tube spider castings	Cast austenitic stainless steel	Reactor coolant >250°C (>482°F) and neutron flux	Loss of fracture toughness/ thermal aging and neutron irradiation embrittlement, void swelling	Chapter XI.M13, “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)”	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-207	Lower grid assembly Lower grid rib-to-shell forging screws Lower internals assembly-to-thermal shield bolts	Stainless steel, nickel alloy	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-208	Lower grid assembly Fuel assembly support pads Guide blocks	Stainless steel	Reactor coolant	Loss of material/ wear	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” for Class 1 components	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-209	Flow distributor assembly Flow distributor head and flange Incore guide support plate Clamping ring	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-210	Flow distributor assembly Shell forging-to-flow distributor bolts	Stainless steel, nickel alloy	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-211	Flow distributor assembly Flow distributor head and flange Shell forging-to-flow distributor bolts Incore guide support plate Clamping ring	Stainless steel, nickel alloy	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-212	Flow distributor assembly Flow distributor head and flange Shell forging-to-flow distributor bolts Incore guide support plate Clamping ring	Stainless steel, nickel alloy	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-213	Flow distributor assembly Shell forging-to-flow distributor bolts	Stainless steel, nickel alloy	Reactor coolant	Loss of preload/ stress relaxation	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-214	Thermal shield	Stainless steel	Reactor coolant	Cracking/ stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 and the applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
R-215	Thermal shield	Stainless steel	Reactor coolant	Changes in dimensions/Void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
R-216	Thermal shield	Stainless steel	Reactor coolant and neutron flux	Loss of fracture toughness/ neutron irradiation embrittlement, void swelling	Applicant must provide a commitment which includes the following elements: (1) to participate in industry programs for investigating and managing aging effects applicable to Reactor Internals, (2) to evaluate and implement the results of the industry programs as applicable to the Reactor Internals design and, (3) to submit, for NRC review and approval an inspection plan for Reactor Internals, as based on industry recommendation, at least 24 months prior to the extended period.	No, but licensee commitment to be confirmed.
RP-01	Piping, piping components, and piping elements	Steel	Concrete	None	None	No

Table A1. Listing of Reactor Coolant System Component Line Items in Chapter IV of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
RP-02	Piping, piping components, and piping elements	Cast austenitic stainless steel	Air – indoor uncontrolled (External)	None	None	No
RP-03	Piping, piping components, and piping elements	Nickel alloy	Air – indoor uncontrolled (External)	None	None	No
RP-04	Piping, piping components, and piping elements	Stainless steel	Air – indoor uncontrolled (External)	None	None	No
RP-05	Piping, piping components, and piping elements	Stainless steel	Air with borated water leakage	None	None	No
RP-06	Piping, piping components, and piping elements	Stainless steel	Concrete	None	None	No
RP-07	Piping, piping components, and piping elements	Stainless steel	Gas	None	None	No
RP-08	Piping, piping components, and piping elements	Stainless steel	Treated borated water	None	None	No

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Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
E-01	Partially encased tanks with breached moisture barrier	Stainless steel	Untreated water or raw water	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated for pitting and crevice corrosion of tank bottom because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes, plant specific
E-02	Closure bolting	Steel	Air with steam or water leakage	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M18, “Bolting Integrity”	No
E-03	Closure bolting	High strength steel	Air with steam or water leakage	Cracking/ cyclic loading, stress corrosion cracking	Chapter XI.M18, “Bolting Integrity”	No
E-04	Drywell and suppression chamber spray system (internal surfaces: Flow orifice Spray nozzles	Steel	Air – indoor uncontrolled (Internal)	Macrofouling and loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-05	Elastomer seals	Elastomers	Air – indoor uncontrolled (External)	Hardening and loss of strength/ elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-06	Elastomer seals	Elastomers	Air – indoor uncontrolled >35°C (>95°F) (Internal/ External)	Hardening and loss of strength/ elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific

Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
E-07	Piping, piping components, and piping elements	Steel	Air and steam	Loss of material/ flow-accelerated corrosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No
E-08	Piping, piping components, and piping elements	Steel	Treated water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
E-09	Piping, piping components, and piping elements	Steel	Treated water	Loss of material/ flow-accelerated corrosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No
E-10	Piping, piping components, and piping elements	Steel	Treated water	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, “Metal Fatigue” for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
E-11	Piping, piping components, and piping elements	Cast austenitic stainless steel	Treated borated water >250°C (>482°F)	Loss of fracture toughness/ thermal aging embrittlement	Chapter XI.M12, “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)”	No
E-12	Piping, piping components, piping elements, and tanks	Stainless steel	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714	No

Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
E-13	Piping, piping components, and piping elements	Stainless steel	Treated borated water	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
E-14	Piping, piping components, and piping elements internal surfaces	Stainless steel	Condensation (Internal/External)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-15	Piping, piping components, and piping elements with 4 inch and larger nominal diameter	Stainless steel	Raw water	Cracking/ stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking," and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
E-16	Piping, piping components, and piping elements	Stainless steel	Treated water	Cumulative fatigue damage	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
E-17	Heat exchanger shell side components	Steel	Closed cycle cooling water	Macrofouling and loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
E-18	Heat exchanger shell side components including tubes	Steel	Raw water	Macrofouling and loss of material/ general, pitting, crevice, and microbiologically influenced corrosion and biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
E-19	Heat exchanger shell side components including tubes	Stainless steel	Closed cycle cooling water	Loss of material/ pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
E-20	Heat exchanger shell side components including tubes	Stainless steel	Raw water	Macrofouling and loss of material/ general, pitting, crevice, and microbiologically influenced corrosion and biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
E-21	Heat exchanger tubes (serviced by open-cycle cooling water)	Stainless steel	Raw water	Reduction of heat transfer/ biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
E-22	Containment isolation piping and components internal surfaces	Steel	Raw water	Macrofouling and loss of material/ general, pitting, crevice and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated. See IN 85-30 for evidence of microbiologically influenced corrosion.	Yes, plant specific

Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
E-23	Heat exchanger tubes (serviced by open-cycle cooling water)	Steel	Raw water	Reduction of heat transfer/ biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
E-24	Orifice (miniflow recirculation)	Stainless steel	Treated borated water	Loss of material/ erosion	A plant-specific aging management program is to be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging. See LER 50-275/94-023 for evidence of erosion.	Yes, plant specific
E-25	Ducting, piping and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-26	Ducting, piping and components external surfaces	Steel	Air – indoor uncontrolled (External)	Loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-27	Piping and components internal surfaces	Steel	Condensation (Internal)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-28	External surfaces	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No
E-29	Piping and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific

Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
E-30	Containment isolation piping and components internal surfaces	Steel	Condensation (External)	Loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-31	Containment isolation piping and components internal surfaces	Steel	Treated water	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-32	Containment isolation piping and components external surfaces	Steel	Untreated water	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated. See IN 85-30 for evidence of microbiologically influenced corrosion.	Yes, plant specific
E-33	Containment isolation piping and components internal surfaces	Stainless steel	Treated water	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-34	Containment isolation piping and components internal surfaces	Stainless steel	Untreated water	Macrofouling and loss of material/ pitting, crevice and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated. See IN 85-30 for evidence of microbiologically influenced corrosion.	Yes, plant specific

Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
E-35	Containment isolation piping and components external surfaces	Steel	Air – indoor uncontrolled (External)	Loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-36	Containment isolation piping and components internal surfaces	Stainless steel	Raw water	Macrofouling and loss of material/ general, pitting, crevice and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated. See IN 85-30 for evidence of microbiologically influenced corrosion.	Yes, plant specific
E-37	Piping, piping components, and piping elements	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking and intergranular stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for BWR water in BWRVIP-29 (EPRI TR-103515)	No
E-38	Safety injection tank (accumulator)	Steel with stainless steel cladding	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714	No
E-39	Safety injection tank (accumulator)	Steel with stainless steel cladding	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No
E-40	Ducting closure Bolting	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes, plant specific
E-41	Bolting	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No

Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
E-42	Piping, piping components, and piping elements	Steel	Soil	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M28, "Buried Piping and Tanks Surveillance," Or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated
E-43	Heat exchanger shell	Gray cast iron	Treated water	Loss of material/ Selective leaching	Chapter XI.M33, "Selective Leaching of Material"	No
E-44	External surfaces	Steel	Air – indoor uncontrolled (External)	Loss of material/ General corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-45	External surfaces	Steel	Air – outdoor (External)	Loss of material/ General corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
E-46	External surfaces	Steel	Condensation (External)	Loss of material/ General corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
EP-1	Bolting	Steel	Air – outdoor (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.18, "Bolting Integrity"	No
EP-2	Piping, piping components, and piping elements	Aluminum	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No 1
EP-3	Piping, piping components, and piping elements	Aluminum	Air – indoor uncontrolled (Internal/External)	None	None	No

Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
EP-4	Piping, piping components, and piping elements	Steel	Air – indoor controlled (External)	None	None	No
EP-5	Piping, piping components, and piping elements	Steel	Concrete	None	None	No
EP-6	Piping, piping components, and piping elements	Steel	Lubricating oil (no water pooling)	None	None	No
EP-7	Piping, piping components, and piping elements	Steel	Gas	None	None	No
EP-8	Piping, piping components, and piping elements	Cast austenitic stainless steel	Air – indoor uncontrolled (External)	None	None	No
EP-9	Piping, piping components, and piping elements	Copper alloy	Gas	None	None	No
EP-10	Piping, piping components, and piping elements	Copper alloy	Air – indoor uncontrolled (External)	None	None	No

Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
EP-11	Piping, piping components, and piping elements	Copper alloy	Lubricating oil (no water pooling)	None	None	No
EP-12	Piping, piping components, and piping elements	Copper alloy <15% Zn	Air with borated water leakage	None	None	No
EP-13	Heat exchanger tubes	Copper alloy <15% Zn	Closed cycle cooling water	Loss of material/ pitting, crevice corrosion and galvanic corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
EP-14	Ducting	Galvanized steel	Air – indoor uncontrolled (External)	None	None	No
EP-15	Piping, piping components, and piping elements	Glass	Air – indoor uncontrolled (External)	None	None	No
EP-16	Piping, piping components, and piping elements	Glass	Lubricating oil	None	None	No
EP-17	Piping, piping components, and piping elements	Nickel alloy	Air – indoor uncontrolled (External)	None	None	No
EP-18	Piping, piping components, and piping elements	Stainless steel	Air – indoor uncontrolled (External)	None	None	No

Table A2. Listing of Engineered Safety Feature Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
EP-19	Piping, piping components, and piping elements	Stainless steel	Air with borated water leakage	None	None	No
EP-20	Piping, piping components, and piping elements	Stainless steel	Concrete	None	None	No
EP-21	Piping, piping components, and piping elements	Stainless steel	Lubricating oil	None	None	No
EP-22	Piping, piping components, and piping elements	Stainless steel	Gas	None	None	No
EP-23	Piping, piping components, and piping elements internal surfaces	Stainless steel	Treated borated water	None	None	No
EP-24	Closure bolting	Steel	Air – indoor uncontrolled (External)	Loss of preload/ stress relaxation	Chapter XI.M18, “Bolting Integrity,”	No
EP-25	Closure bolting	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M.18, “Bolting Integrity”	No

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Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-01	Piping, piping components, and piping elements	Steel (with or without coating or wrapping)	Soil	Loss of material/ general, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated
A-02	Piping, piping components, and piping elements	Gray cast iron	Soil	Loss of material/ selective leaching and general corrosion	Chapter XI.M33, "Selective Leaching of Materials"	No
A-03	Closure bolting	Steel	Air with steam or water leakage	Loss of material/ general corrosion	Chapter XI.M18, "Bolting Integrity"	No
A-04	Closure bolting	High strength steel	Air with steam or water leakage	Cracking/ cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No
A-05	Cranes - rails	Steel	Air – indoor uncontrolled (External)	Loss of material/ wear	Chapter XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-06	Cranes - Structural girders	Steel	Air – indoor uncontrolled (External)	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation for structural girders of cranes that fall within the scope of 10 CFR 54. See the Standard Review Plan, Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," for generic guidance for meeting the requirements of 10 CFR 54.21 (c).	Yes, TLAA
A-07	Cranes - Structural girders	Steel	Air – indoor uncontrolled (External)	Loss of material/ General corrosion	Chapter XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No
A-08	Ducting and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-09	Ducting, piping and components external surfaces	Stainless steel	Condensation (External)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-10	Ducting and components external surfaces	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-11	Ducting, piping and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-12	Ducting, piping and components internal surfaces	Stainless steel	Condensation (Internal)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-13	Ducting and components internal surfaces	Steel	Condensation (Internal)	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-14	Ducting and components internal surfaces	Galvanized steel	Condensation (Internal)	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-15	Elastomer lining	Elastomers	Treated borated water	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program that determines and assesses the qualified life of the linings in the environment is to be evaluated.	Yes, plant specific
A-16	Elastomer lining	Elastomers	Treated water	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program that determines and assesses the qualified life of the linings in the environment is to be evaluated.	Yes, plant specific

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-17	Elastomer seals and components	Elastomers	Air – indoor uncontrolled >35°C (>95°F) (Internal)	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-18	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (Internal)	Loss of material/ wear	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-19	Fire barrier penetration seals	Elastomers	Air – indoor uncontrolled	Increased hardness, shrinkage and loss of strength/ weathering	Chapter XI.M26, “Fire Protection”	No
A-20	Fire barrier penetration seals	Elastomers	Air – outdoor	Increased hardness, shrinkage and loss of strength/ weathering	Chapter XI.M26, “Fire Protection”	No
A-21	Fire rated doors	Steel	Air – indoor uncontrolled	Loss of material/ wear	Chapter XI.M26, “Fire Protection”	No
A-22	Fire rated doors	Steel	Air – outdoor	Loss of material/ wear	Chapter XI.M26, “Fire Protection”	No
A-23	Piping, piping components, and piping elements	Steel	Moist air	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-24	Piping, piping components, and piping elements	Steel	Air – outdoor (External)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-25	Piping, piping components, piping elements, and tanks	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
A-26	Compressed air system Piping, piping components, and piping elements	Steel	Condensation (Internal)	Loss of material/ general and pitting corrosion	Chapter XI.M24, “Compressed Air Monitoring”	No
A-27	Diesel engine exhaust Piping, piping components, and piping elements	Steel; stainless steel	Diesel Exhaust	Loss of material/ general (steel only), pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-28	Piping, piping components, and piping elements	Steel	Fuel oil	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M26, “Fire Protection,” and Chapter XI.M30, “Fuel Oil Chemistry”	No
A-30	Piping, piping components, and piping elements	Steel	Fuel oil	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M30, “Fuel Oil Chemistry” The AMP is to be augmented by verifying the effectiveness of fuel oil chemistry control. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-31	Piping, piping components, and piping elements	Steel	Raw water	Loss of material/ general, pitting, crevice and microbiologically influenced corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
A-32	Piping, piping components, and piping elements	Steel	Raw water	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
A-33	Piping, piping components, and piping elements	Steel	Raw water	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M27, “Fire Water System”	No
A-34	Piping, piping components, and piping elements	Steel	Air – indoor uncontrolled	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-35	Piping, piping components, and piping elements	Steel	Treated water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
A-36	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (External)	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-37	Piping, piping components, and piping elements	Steel	Treated water	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
A-38	Piping, piping components, and piping elements	Steel (without lining/coating or with degraded lining/coating)	Raw water	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-39	Piping, piping components, and piping elements	Steel with elastomer lining	Treated borated water	Loss of material/ pitting and crevice corrosion (only for steel after lining degradation)	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
A-40	Piping, piping components, and piping elements	Steel with elastomer lining or stainless steel cladding	Treated water	Loss of material/ pitting and crevice corrosion (only for steel after lining/cladding degradation)	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
A-41	Piping, piping components, and piping elements	Cast austenitic stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M25, "BWR Reactor Water Cleanup System"	No
A-42	Piping, piping components, and piping elements	Cast austenitic stainless steel	Treated water	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
A-43	Piping, piping components, and piping elements	Copper alloy <15% Zn	Raw water	Loss of material/ pitting and crevice corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-44	Piping, piping components, and piping elements	Copper alloy <15% Zn	Raw water	Loss of material/ pitting, and crevice corrosion and macrofouling/ biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
A-45	Piping, piping components, and piping elements	Copper alloy <15% Zn	Raw water	Loss of material/ pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M27, “Fire Water System”	No
A-46	Piping, piping components, and piping elements	Copper alloy >15% Zn	Condensation (External)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-47	Piping, piping components, and piping elements	Copper alloy >15% Zn	Raw water	Macrofouling/ biofouling and loss of material/ pitting and crevice corrosion, and selective leaching	Chapter XI.M27, “Fire Water System” and Chapter XI.M33, “Selective Leaching of Materials”.	No
A-48	Piping, piping components, and piping elements	Copper alloy >15% Zn	Raw water	Loss of material/ pitting and crevice corrosion, and selective leaching	Chapter XI.M20, “Open-Cycle Cooling Water System” and Chapter XI.M33, “Selective Leaching of Materials”	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-49	Piping, piping components, and piping elements	Copper alloy >15% Zn	Raw water	Macrofouling/ biofouling and loss of material/ pitting and crevice corrosion, and selective leaching	Chapter XI.M20, “Open-Cycle Cooling Water System” and Chapter XI.M33, “Selective Leaching of Materials”	No
A-50	Piping, piping components, and piping elements	Gray cast iron	Closed cycle cooling water	Loss of material/ pitting and crevice corrosion, and selective leaching	Chapter XI.M21, “Closed-Cycle Cooling Water System,” and Chapter XI.M33, “Selective Leaching of Materials”	No
A-51	Piping, piping components, and piping elements	Gray cast iron	Raw water	Macrofouling/ biofouling and loss of material/ pitting, crevice, microbiologically influenced corrosion, and selective leaching	Chapter XI.M20, “Open-Cycle Cooling Water System” and Chapter XI.M33, “Selective Leaching of Materials”	No
A-52	Piping, piping components, and piping elements	Stainless steel	Closed cycle cooling water	Loss of material/ pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
A-53	Piping, piping components, and piping elements	Stainless steel	Raw water	Loss of material/ pitting and crevice corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-54	Piping, piping components, and piping elements	Stainless steel	Raw water	Loss of material/ pitting, and crevice corrosion and macrofouling/ biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
A-55	Piping, piping components, and piping elements	Stainless steel	Raw water	Loss of material/ pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M27, “Fire Water System”	No
A-56	Piping, piping components, and piping elements	Steel with stainless steel cladding	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714	No
A-57	Piping, piping components, and piping elements	Stainless steel	Treated borated water	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
A-58	Piping, piping components, and piping elements	Stainless steel	Treated water	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-59	Piping, piping components, and piping elements	Stainless steel	Sodium pentaborate solution	Cracking/ stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
A-60	Piping, piping components, and piping elements	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M25, "BWR Reactor Water Cleanup System"	No
A-61	Piping, piping components, and piping elements	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking" and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
A-62	Piping, piping components, and piping elements	Stainless steel	Treated water	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
A-63	Heat exchanger shell side components	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-64	Heat exchanger tube side components including tubes	Steel	Raw water	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
A-65	Heat exchanger tube side components including tubes	Copper alloy <15% Zn	Raw water	Loss of material/ pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
A-66	Heat exchanger tube side components including tubes	Copper alloy >15% Zn	Raw water	Macrofouling/ biofouling and loss of material/ pitting, crevice, microbiologically influenced corrosion, and selective leaching	Chapter XI.M20, “Open-Cycle Cooling Water System” and Chapter XI.M33, “Selective Leaching of Materials”	No
A-67	Heat exchanger shell side components including tubes	Stainless steel/ steel with stainless steel cladding	Closed cycle cooling water	Loss of material/ microbiologically influenced corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-68	Heat exchanger shell side components including tubes	Stainless steel/ steel with stainless steel cladding	Closed cycle cooling water >60°C (>140°F)	Cracking/ stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-69	Heat exchanger tube side components including tubes	Stainless steel	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking, cyclic loading	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR□105714 The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading, or loss of material due to pitting and crevice corrosion. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes, plant specific
A-70	Heat exchanger tube side components including tubes	Stainless steel/ steel with stainless steel cladding	Treated water	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
A-71	Heat exchanger tube side components including tubes	Stainless steel/ steel with stainless steel cladding	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes, plant specific

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-72	Heat exchanger tubes	Copper alloy <15% Zn	Raw water	Reduction of heat transfer/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
A-73	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (External)	Loss of material/ wear	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-74	Heat exchanger tubes	Copper alloy >15% Zn	Raw water	Reduction of heat transfer/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
A-76	High-pressure pump Casing and closure bolting	Stainless steel, Steel	Treated borated water	Cracking/ cyclic loading	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-77	External surfaces	Steel	Air – indoor uncontrolled (External)	Loss of material/ General corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-78	External surfaces	Steel	Air – outdoor (External)	Loss of material/ General corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-79	External surfaces	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No
A-80	Piping and components external surfaces and bolting	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and corrosion	A plant specific aging management program is to be evaluated	Yes, plant specific

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-81	External surfaces	Steel	Condensation (External)	Loss of material/ General corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-82	Reactor coolant pump oil collection system Tank	Steel	Lubricating oil	Loss of material/ general, pitting and crevice corrosion	A plant specific aging management program that determines the thickness of the lower portion of the tank is to be evaluated. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
A-83	Reactor coolant pump oil collection system Piping, tubing, valve bodies	Steel, copper alloy	Lubricating oil	Loss of material/ general, galvanic, pitting and crevice corrosion	A plant specific aging management program that monitors the degradation of the components is to be evaluated. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
A-84	Regenerative heat exchanger tube and shell side components including tubes	Stainless steel	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking, cyclic loading	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading, or loss of material due to pitting and crevice corrosion. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes, plant specific

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-85	Regenerative heat exchanger tube and shell side components including tubes	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-86	Spent fuel storage racks Neutron-absorbing sheets - PWR	Boraflex	Treated borated water	Reduction of neutron-absorbing capacity/ boraflex degradation	Chapter XI.M22, “Boraflex Monitoring”	No
A-87	Spent fuel storage racks Neutron-absorbing sheets - BWR	Boraflex	Treated water	Reduction of neutron-absorbing capacity/ boraflex degradation	Chapter XI.M22, “Boraflex Monitoring”	No
A-88	Spent fuel storage racks Neutron-absorbing sheets - PWR	Boral, boron steel	Treated borated water	Reduction of neutron-absorbing capacity and loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-89	Spent fuel storage racks Neutron-absorbing sheets - BWR	Boral, boron steel	Treated water	Reduction of neutron-absorbing capacity and loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-90	Structural fire barriers – walls, ceilings and floors	Reinforced concrete	Air – indoor uncontrolled	Concrete cracking and spalling/ freeze-thaw, aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, “Fire Protection” and Chapter XI.S6, “Structures Monitoring Program”	No
A-91	Structural fire barriers – walls, ceilings and floors	Reinforced concrete	Air – indoor uncontrolled	Loss of material/ corrosion of embedded steel	Chapter XI.M26, “Fire Protection” and Chapter XI.S6, “Structures Monitoring Program”	No
A-92	Structural fire barriers – walls, ceilings and floors	Reinforced concrete	Air – outdoor	Concrete cracking and spalling/ freeze-thaw, aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, “Fire Protection” and Chapter XI.S6, “Structures Monitoring Program”	No
A-93	Structural fire barriers – walls, ceilings and floors	Reinforced concrete	Air – outdoor	Loss of material/ corrosion of embedded steel	Chapter XI.M26, “Fire Protection” and Chapter XI.S6, “Structures Monitoring Program”	No
A-94	Structural Steel	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.S6, “Structures Monitoring Program”	No
A-95	Tank	Steel	Air – outdoor (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M29, “Aboveground Steel Tanks”	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-96	Spent fuel storage racks Storage racks - BWR	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515	No
A-97	Spent fuel storage racks Storage racks - PWR	Stainless steel	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714	No
A-100	Heat exchanger shell side components including tubes	Stainless steel	Treated borated water	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
A-101	Piping, piping components, and piping elements	Cast austenitic stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking" and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
A-102	Bolting	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No
A-103	Closure bolting	Steel	Saturated air	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M24, "Compressed Air Monitoring"	No
A-104	Closure bolting	High strength steel	Air with steam or water leakage	Cracking/ cyclic loading, stress corrosion cracking	A plant specific aging management program is to be evaluated	Yes, plant specific

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-105	Ducting closure bolting	Steel	Air – indoor uncontrolled	Loss of material/ general pitting and crevice corrosion	A plant specific aging management program is to be evaluated	Yes, plant specific
AP-1	Piping, piping components, and piping elements	Aluminum	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No
AP-2	Piping, piping components, and piping elements	Steel	Air – indoor controlled (External)	None	None	No
AP-3	Piping, piping components, and piping elements	Steel	Concrete	None	None	No
AP-4	Piping, piping components, and piping elements	Steel	Dried Air	None	None	No
AP-5	Piping, piping components, and piping elements	Steel	Lubricating oil (no water pooling)	None	None	No
AP-6	Piping, piping components, and piping elements	Steel	Gas	None	None	No
AP-7	Piping, piping components, and piping elements	Cast austenitic stainless steel	Air – indoor uncontrolled (External)	None	None	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-8	Piping, piping components, and piping elements	Copper alloy	Dried Air	None	None	No
AP-9	Piping, piping components, and piping elements	Copper alloy	Gas	None	None	No
AP-10	Piping, piping components, and piping elements	Copper alloy	Lubricating oil (no water pooling)	None	None	No
AP-11	Piping, piping components, and piping elements	Copper alloy <15% Zn	Air with borated water leakage	None	None	No
AP-12	Piping, piping components, and piping elements	Copper alloy <15% Zn	Closed cycle cooling water	Loss of material/ pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
AP-13	Piping, piping components, and piping elements	Galvanized steel	Air – indoor uncontrolled	None	None	No
AP-14	Piping, piping components, and piping elements	Glass	Air – indoor uncontrolled (External)	None	None	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-15	Piping, piping components, and piping elements	Glass	Lubricating oil	None	None	No
AP-16	Piping, piping components, and piping elements	Nickel alloy	Air – indoor uncontrolled (External)	None	None	No
AP-17	Piping, piping components, and piping elements	Stainless steel	Air – indoor uncontrolled (External)	None	None	No
AP-18	Piping, piping components, and piping elements	Stainless steel	Air with borated water leakage	None	None	No
AP-19	Piping, piping components, and piping elements	Stainless steel	Concrete	None	None	No
AP-20	Piping, piping components, and piping elements	Stainless steel	Dried Air	None	None	No
AP-21	Piping, piping components, and piping elements	Stainless steel	Lubricating oil (no water pooling)	None	None	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-22	Piping, piping components, and piping elements	Stainless steel	Gas	None	None	No
AP-23	Piping, piping components, and piping elements	Stainless steel	Treated borated water	None	None	No
AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
AP-25	Piping, piping components, and piping elements	Steel with internal lining or coating	Raw water	Loss of material/ lining or coating degradation	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
AP-26	Closure bolting	Steel	Air – indoor uncontrolled (External)	Loss of preload/ stress relaxation	Chapter XI.M18, “Bolting Integrity”	No
AP-27	Closure bolting	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M18, “Bolting Integrity”	No
AP-28	Bolting	Steel	Air – outdoor (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M18, “Bolting Integrity”	No

Table A3. Listing of Auxiliary System Line Items in Chapter VII of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-29	Piping, piping components, and piping elements	Gray cast iron	Raw water	Loss of material/ selective leaching	Chapter XI.M33, “Selective Leaching of Materials”.	No
AP-30	Diesel engine lubricating oil subsystem Piping, piping components and piping elements	Steel	Lubricating oil	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes, plant specific
AP-31	Piping, piping components, and piping elements	Gray cast iron	Treated water	Loss of material/ selective leaching	Chapter XI.M33, “Selective Leaching of Materials”	No
AP-32	Piping, piping components, and piping elements	Copper alloy >15% Zn	Treated water	Loss of material/ selective leaching	Chapter XI.M33, “Selective Leaching of Materials”	No
AP-33	Diesel engine exhaust Piping, piping components, and piping elements	Stainless steel	Diesel exhaust	Cracking/stress corrosion cracking	A plant-specific aging management program is to be evaluated	Yes, plant specific
AP-34	Heat exchanger tubes	Copper alloy <15% Zn	Treated water	Loss of material/ pitting, crevice corrosion and galvanic corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
S-01	Buried piping, piping components, piping elements, and tanks	Steel (with or without coating or wrapping)	Soil	Loss of material/ general, pitting, crevice and microbiologically influenced corrosion	Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection"	No Yes, detection of aging effects and operating experience are to be further evaluated
S-02	Closure bolting	Steel	Air with steam or water leakage	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No
S-03	Closure bolting	High strength steel	Air with steam or water leakage	Cracking/ cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No
S-04	Piping, piping components, and piping elements	Steel	Steam	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
S-05	Piping, piping components, and piping elements	Steel	Steam	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
S-06	Piping, piping components, and piping elements	Steel	Steam	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134. The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-07	Piping, piping components, and piping elements	Steel	Steam	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
S-08	Piping, piping components, and piping elements	Steel	Steam	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-09	Piping, piping components, and piping elements	Steel	Treated water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR□103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
S-10	Piping, piping components, piping elements, and tanks	Steel	Treated water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR□102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-11	Piping, piping components, and piping elements	Steel	Treated water	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA
S-12	Piping, piping components, and piping elements	Steel	Untreated water	Macrofouling and loss of material/ biofouling and general, pitting, crevice, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-13	BWR tanks	Stainless steel	Treated water	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
S-14	Tanks	Stainless steel	Treated water	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-15	Piping, piping components, and piping elements	Steel	Steam	Wall thinning/ flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-16	Piping, piping components, and piping elements	Steel	Treated water	Wall thinning/ flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
S-17	Heat exchanger shell side components	Steel	Lubricating oil	Loss of material/ general, pitting, crevice and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-18	BWR heat exchanger shell side components	Steel	Treated water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
S-19	PWR heat exchanger shell side components	Steel	Treated water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-20	Heat exchanger shell side components	Stainless steel	Lubricating oil	Loss of material/ pitting, crevice, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-21	BWR heat exchanger shell side components	Stainless steel	Treated water	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-22	PWR heat exchanger shell side components	Stainless steel	Treated water	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-23	Heat exchanger shell side components	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
S-24	Heat exchanger shell side components	Steel	Raw water	Macrofouling and loss of material/ biofouling and general, pitting, crevice, & microbiologically influenced corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-25	Heat exchanger shell side components	Stainless steel	Closed cycle cooling water	Loss of material/ pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
S-26	Heat exchanger shell side components	Stainless steel	Raw water	Macrofouling and loss of material/ biofouling and pitting, crevice, & microbiologically influenced corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-27	Heat exchanger tubes	Steel	Raw water	Reduction of heat transfer/ biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-28	Heat exchanger tubes	Stainless steel	Raw water	Reduction of heat transfer/ fouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
S-29	External surfaces	Steel	Air – indoor uncontrolled (External)	Loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-30	External surfaces	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
S-31	Tank	Steel	Air – outdoor (External)	Loss of material/ general corrosion	Chapter XI.M29, “Aboveground Carbon Steel Tanks”	No
S-32	Bolting	Steel	Air – outdoor (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M18, “Bolting Integrity”	No
S-33	Closure bolting	Steel	Air – indoor uncontrolled (External)	Loss of preload/ stress relaxation	Chapter XI.M18, “Bolting Integrity”	No
S-34	Closure bolting	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M18, “Bolting Integrity”	No
S-35	Piping, piping components, and piping elements	Stainless steel	Treated water	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” for BWR water in BWRVIP-29 (EPRI TR-103515). The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-36	Piping, piping components, and piping elements	Stainless steel	Steam	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” for PWR secondary water in EPRI TR-102134	No
S-37	Piping, piping components, and piping elements	Stainless steel	Steam	Cracking/ stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR secondary water in EPRI TR-102134	Yes, detection of aging effects is to be evaluated

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
S-38	Piping, piping components, and piping elements	Stainless steel	Steam	Cracking/ stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515). The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
S-39	Heat exchanger tube side components including tubes	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134. The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated.
S-40	Bolting	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No
S-41	External surfaces	Steel	Air – outdoor (External)	Loss of material/ General corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
S-42	External surfaces	Steel	Condensation (External)	Loss of material/ General corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
SP-1	Piping, piping components, and piping elements	Steel	Air – indoor controlled (External)	None	None	No
SP-2	Piping, piping components, and piping elements	Steel	Concrete	None	None	No

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
SP-3	Piping, piping components, and piping elements	Steel	Lubricating oil (no water pooling)	None	None	No
SP-4	Piping, piping components, and piping elements	Steel	Gas	None	None	No
SP-5	Piping, piping components, and piping elements	Copper alloy	Gas	None	None	No
SP-6	Piping, piping components, and piping elements	Copper alloy	Air – indoor uncontrolled (External)	None	None	No
SP-7	Piping, piping components, and piping elements	Copper alloy	Lubricating oil (no water pooling)	None	None	No
SP-8	Piping, piping components, and piping elements	Copper alloy <15% Zn	Closed cycle cooling water	Loss of material/ pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
SP-9	Piping, piping components, and piping elements	Glass	Air – indoor uncontrolled (External)	None	None	No

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
SP-10	Piping, piping components, and piping elements	Glass	Lubricating oil	None	None	No
SP-11	Piping, piping components, and piping elements	Nickel alloy	Air – indoor uncontrolled (External)	None	None	No
SP-12	Piping, piping components, and piping elements	Stainless steel	Air – indoor uncontrolled (External)	None	None	No
SP-13	Piping, piping components, and piping elements	Stainless steel	Concrete	None	None	No
SP-14	Piping, piping components, and piping elements	Stainless steel	Lubricating oil (no water pooling)	None	None	No
SP-15	Piping, piping components, and piping elements	Stainless steel	Gas	None	None	No
SP-16	Piping, piping components, and piping elements	Stainless steel	Treated water	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” for PWR secondary water in EPRI TR-102134. The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
SP-17	Piping, piping components, and piping elements	Stainless steel	Treated water	Cracking/ stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134. The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. The augmentation is still being resolved for SP-33	Yes, detection of aging effects is to be evaluated.
SP-18	Piping, piping components, and piping elements	Nickel-based alloys	Steam	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
SP-19	Piping, piping components, and piping elements	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI-TR 103515) or PWR secondary water in EPRI TR-102134. The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
SP-20	Piping, piping components, and piping elements	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

Table A4. Listing of Steam and Power Conversion System Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
SP-21	Piping, piping components, and piping elements	Stainless steel	Treated water	Loss of material/ pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
SP-22	Piping, piping components, and piping elements	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-01	Concrete Dome; wall; basemat; ring girder; buttresses	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking/ freeze-thaw	Chapter XI.S2, "ASME Section XI, Subsection IWL" Accessible areas: Inspections performed in accordance with IWL will indicate the presence of loss of material (spalling, scaling) and cracking due to freeze-thaw. Inaccessible Areas: Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557). Documented evidence confirms that where the existing concrete had air content of 3% to 6%, subsequent inspection did not exhibit degradation related to freeze-thaw. Such inspections should be considered a part of the evaluation. The weathering index for the continental US is shown in ASTM C33-90, Fig. 1.	No, if stated conditions are satisfied for inaccessible areas

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-02	Concrete Dome; wall; basemat; ring girder; buttresses	Concrete	Water	Increase in porosity, permeability/ leaching of calcium hydroxide	Chapter XI.S2, "ASME Section XI, Subsection IWL" Accessible areas: Inspections performed in accordance with IWL will indicate the presence of increase in porosity, and permeability for to leaching of calcium hydroxide. Inaccessible Areas: A plant-specific aging management program is required for below-grade inaccessible areas (basemat and concrete wall), if the concrete is exposed to flowing water (NUREG-1557). An aging management program is not required, even if reinforced concrete is exposed to flowing water, if there is documented evidence that confirms the in-place concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	A plant-specific aging management program is required for inaccessible areas as stated

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-03	Concrete Dome; wall; basemat; ring girder; buttresses	Concrete	Aggressive environment	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack	Chapter XI.S2, “ASME Section XI, Subsection IWL”. Accessible Areas: Inspections performed in accordance with IWL will indicate the presence of increase in porosity and permeability, cracking, or loss of material (spalling, scaling) due to aggressive chemical attack. Inaccessible Areas: A plant-specific aging management program is required for below-grade exterior reinforced concrete (basemat, embedded walls), of the below-grade environment is aggressive (ph < 5.5, chlorides > 500ppm, or sulfates > 1,500 ppm). Examination of representative samples of below-grade concrete, when excavated for any reason, is to be included as part of a plant-specific program, Note: Periodic monitoring of below-grade water chemistry (including consideration of potential seasonal variations) is an acceptable approach to demonstrate that the below-grade environment is aggressive or non-aggressive.	A plant-specific aging management program is required for inaccessible areas as stated

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-04	Concrete: Dome; wall; basemat; ring girders; buttresses	Concrete	Any	Expansion and cracking/ reaction with aggregates	Accessible Areas: Inspections performed in accordance with IWL will indicate the presence of cracking due to reaction with aggregates. Inaccessible Areas: Evaluation is needed if testing and petrographic examinations of aggregates performed in accordance with ASTM C295-54, ASTM C227-50, or ACI 201.2R-77 (NUREG-1557) demonstrate that the aggregates are reactive.	No, if the stated conditions are satisfied for inaccessible areas

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-05	Concrete: Dome; wall; basemat; ring girders; buttresses; reinforcing steel	Concrete; steel	Air – indoor uncontrolled or air - outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel	Chapter XI.S6, “ASME Section XI, Subsection IWL”. Accessible Areas: Inspections performed in accordance with IWL will indicate the presence of cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel. Inaccessible Areas: A plant-specific aging management program is required for below-grade exterior reinforced concrete (basemat, embedded walls), if the below-grade environment is aggressive (ph<5.5, chlorides > 500ppm, or sulfates > 1,500 ppm). Examination of representative samples of below-grade concrete, when excavated for any reason, is to be included as part of a plant-specific program. Note: periodic monitoring of below-grade water chemistry (including consideration of potential seasonal variations) is an acceptable approach to demonstrate that the below-grade environment is aggressive or non-aggressive.	Yes, a plant-specific aging management program is required for inaccessible areas as stated

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-06	Concrete Dome; wall; basemat; ring girder; buttresses	Concrete	Soil	Cracks and distortion due to increased stress levels from settlement	Chapter XI.S6, "Structures Monitoring Program" The initial licensing basis for some plants included a program to monitor settlement. If no settlement was evident during the first decade or so, the NRC may have given the licensee approval to discontinue the program. However, if a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	No, if within the scope of the applicant's structures monitoring program
C-07	Concrete: Foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction in foundation strength, cracking, differential settlement/ erosion of porous concrete subfoundation	Chapter XI.S6, "Structures Monitoring Program" Erosion of cement from porous concrete subfoundations beneath containment basemats is described in IN 97-11. IN 98-26 proposes Maintenance Rule Structures Monitoring for managing this aging effect, if applicable. If a de-watering system is relied upon for control of erosion of cement from porous concrete subfoundations, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	No, if within the scope of the applicant's structures monitoring program

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-08	Concrete Dome; wall; basemat; ring girder; buttresses	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus/ elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program The implementation of 10 CFR 50.55a and IWL would not be able to identify the reduction of strength and modulus due to elevated temperature. Thus, for any portions of concrete containment that exceed specified temperature limits, further evaluations are warranted. Subsection CC-3400 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 150°F except for local areas, such as around penetrations, which are not allowed to exceed 200°F. If significant equipment loads are supported by concrete at temperatures exceeding 150°F, an evaluation of the ability to withstand the postulated design loads is to be made. Higher temperatures than given above may be allowed in the concrete if tests and/or calculations are provided to evaluate the reduction in strength and this reduction is applied to the design allowables.	Yes, if applicable.
C-09	Steel elements: Liner; liner anchors; integral	Steel	Air – indoor uncontrolled or air - outdoor	Loss of material/ corrosion	Chapter XI.S1, “ASME Section XI, Subsection IWE” For inaccessible areas (embedded	

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
	attachments				containment steel shell or liner), loss of material due to corrosion is not significant if the following conditions are satisfied: 1. Concrete meeting the requirements of ACI 318 or 349 and the guidance of 201.2R was used for the containment concrete in contact with the embedded containment shell or liner. 2. The concrete is monitored to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell or liner. 3. The moisture barrier, at the junction where the shell or liner becomes embedded, is subject to aging management activities in accordance with IWE requirements. 4. Borated water spills and water ponding on the containment concrete floor are not common and when detected are cleaned up in a timely manner.	
C-09 (cont'd)					If any of the above conditions cannot be satisfied, then a plant-specific aging management program for corrosion is required. Chapter XI.S4, "10 CFR Part 50,	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
					Appendix J" and If a coatings program is credited for managing loss of material due to corrosion during the current licensing term (e.g., relief request from IWE), then it is to be continued during the period of extended operation. See Chapter XI.S8, "Protective Coating Monitoring and Maintenance Program."	No
C-10	Prestressing system: Tendons; anchorage components	Steel	Air – indoor uncontrolled or air - outdoor	Loss of material/ corrosion	Chapter XI.S2, "ASME Section XI, Subsection IWL"	No
C-11	Prestressing system: Tendons; anchorage components	Steel	Air – indoor uncontrolled or air - outdoor	Loss of prestress/ relaxation; shrinkage; creep; elevated temperature	Loss of tendon prestress is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.5, "Concrete Containment Tendon Prestress" for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). See Chapter X.S1 of this report for meeting the requirements of 10 CFR 54.21(c)(1)(iii). For periodic monitoring of prestress, see Chapter XI.S2.	Yes, TLAA

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-12	Penetration sleeves	Steel; dissimilar metal welds	Air – indoor uncontrolled or air outdoor	Loss of material/ corrosion	Chapter XI.S1, "ASME Section XI, Subsection IWE," (Note: IWE examination category E-F, surface examination of dissimilar metal welds, is optional) Chapter XI.S4, "10 CFR Part 50, Appendix J," and If a coatings program is credited for managing loss of material due to corrosion during the current licensing term (e.g., relief request from IWE), then it is to be continued during the period of extended operation. See Chapter XI.S8, "Protective Coating Monitoring and Maintenance Program"	No No No
C-13	Penetration sleeves; penetration bellows	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled	Cumulative fatigue damage/ fatigue (Only if CLB fatigue analysis exists)	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-14	Penetration sleeves; penetration bellows	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled	Cracking/ cyclic loading (CLB fatigue analysis does not exist)	Chapter XI.S1 “ASME Section XI, Subsection IWE ” and Chapter XI.S4, “10 CFR Part 50, Appendix J” Evaluation of 10 CFR 50.55a/IWE is augmented as follows: (4) Detection of Aging Effects: VT-3 visual inspection may not detect fine cracks.	Yes, detection of aging effects is to be evaluated

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-15	Penetration sleeves; penetration bellows	Stainless steel; dissimilar metal welds	Air – indoor uncontrolled	Cracking/ stress corrosion cracking	Chapter XI.S1, "ASME Section XI, Subsection IWE" and Chapter XI.S4, "10 CFR Part 50, Appendix J" Evaluation of 10 CFR 50.55a/IWE is augmented as follows: *(4) Detection of Aging Effects*: Stress corrosion cracking (SCC) is a concern for dissimilar metal welds. In the case of bellows assemblies, SCC may cause aging effects particularly if the material is not shielded from a corrosive environment. Subsection IWE covers inspection of these items under examination categories E-B, E-F, and E-P (10 CFR Part 50, Appendix J pressure tests). 10 CFR 50.55a identifies examination categories E-B and E-F as optional during the current term of operation. For the extended period of operation, Examination Categories E-B & E-F, and additional appropriate examinations to detect SCC in bellows assemblies and dissimilar metal welds are warranted to address this issue. *(10) Operating Experience:* IN 92-20 describes an instance of containment bellows cracking, resulting in loss of leak tightness.	Yes, detection of aging effects is to be evaluated

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-16	Personnel airlock; equipment hatch	Steel	Air – indoor uncontrolled	Loss of material/ corrosion	Chapter XI.S1, "ASME Section XI, Subsection IWE," Chapter XI.S4, "10 CFR Part 50, Appendix J," and If a coatings program is credited for managing loss of material due to corrosion during the current licensing term (e.g., relief request from IWE), then it is to be continued during the period of extended operation. See Chapter XI.S8, "Protective Coating Monitoring and Maintenance Program."	No No No
C-17	Personnel airlock; equipment hatch: Locks, hinges, and closure mechanisms	Steel	Air – indoor uncontrolled or air outdoor	Loss of leak tightness/ mechanical wear of locks, hinges and closure mechanisms	Chapter XI.S4, "10 CFR Part 50, Appendix J" and Plant Technical Specifications	No
C-18	Seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Seals, elastomers, rubber and other similar materials	Air – indoor uncontrolled or air outdoor	Loss of sealing; leakage through containment/ deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Chapter XI.S1, "ASME Section XI, Subsection IWE" Leak tightness will be monitored by 10 CFR Part 50, Appendix J Leak Rate Tests for pressure boundary, seals and gaskets (including O-rings).	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-19	Steel elements: Drywell; torus; drywell head; embedded shell and sand pocket regions; drywell support skirt; torus ring girder; downcomers; ECCS suction header NOTE: Inspection of containment supports is addressed by ASME Section XI, Subsection IWF (see III.B1.3) This is essentially same as C-09, except for the structural components.	Steel	Air – indoor uncontrolled or air - outdoor	Loss of material/ corrosion	Chapter XI.S1, "ASME Section XI, Subsection IWE" For inaccessible areas (embedded containment steel shell or liner), loss of material due to corrosion is not significant if the following conditions are satisfied: 1. Concrete meeting the requirements of ACI 318 or 349 and the guidance of 201.2R was used for the containment concrete in contact with the embedded containment shell or liner. 2. The concrete is monitored to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell or liner. 3. The moisture barrier, at the junction where the shell or liner becomes embedded, is subject to aging management activities in accordance with IWE requirements. 4. Borated water spills and water ponding on the containment concrete floor are not common and when detected are cleaned up in a timely manner.	Yes, if corrosion is significant for inaccessible areas

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-19 (cont'd)					If any of the above conditions cannot be satisfied, then a plant-specific aging management program for corrosion is required. Chapter XI.S4, "10 CFR Part 50, Appendix J" and If a coatings program is credited for managing loss of material due to corrosion during the current licensing term (e.g., relief request from IWE), then it is to be continued during the period of extended operation. See Chapter XI.S8, "Protective Coating Monitoring and Maintenance Program."	 No No
C-20	Steel elements: Torus; vent line; vent header; vent line bellows; downcomers Essentially same as C-14, except for the structural components	Stainless steel; steel	Air – indoor uncontrolled	Cracking/ cyclic loading (CLB fatigue analysis does not exist)	Chapter XI.S1 "ASME Section XI, Subsection IWE " and Chapter XI.S4, "10 CFR Part 50, Appendix J" Evaluation of 10 CFR 50.55a/IWE is augmented as follows: *(4) Detection of Aging Effects:* VT-3 visual inspection may not detect fine cracks.	Yes, detection of aging effects is to be evaluated

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-21	Steel elements: Torus; vent line; vent header; vent line bellows; downcomers Essentially same as C-13, except for the structural components	Stainless steel; steel	Air – indoor uncontrolled	Cumulative fatigue damage/ fatigue (Only if CLB fatigue analysis exists)	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis" for acceptable methods for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-22	Steel elements: Vent line bellows Essentially same as C-15, except for the structural components and materials	Stainless steel	Air – indoor uncontrolled	Cracking/ stress corrosion cracking	Chapter XI.S1, "ASME Section XI, Subsection IWE " and Chapter XI.S4, "10 CFR Part 50, Appendix J" Evaluation of 10 CFR 50.55a/IWE is augmented as follows: *(4) Detection of Aging Effects:* Stress corrosion cracking (SCC) is a concern for dissimilar metal welds. In the case of bellows assemblies, SCC may cause aging effects particularly if the material is not shielded from a corrosive environment. Subsection IWE covers inspection of these items under examination categories E-B, E-F, and E-P (10 CFR Part 50, Appendix J pressure tests). 10 CFR 50.55a identifies examination categories E-B and E-F as optional during the current term of operation. For the extended period of operation, Examination Categories E-B and E-F, and additional appropriate examinations to detect SCC in bellows assemblies and dissimilar metal welds are warranted to address this issue. *(10) Operating Experience:* IN 92-20 describes an instance of containment bellows cracking, resulting in loss of leak tightness.	Yes, detection of aging effects is to be evaluated

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
C-23	Steel elements: Drywell head; downcomers	Steel; graphite plate	Air – indoor uncontrolled	Fretting or lockup/ mechanical wear	Chapter XI.S1, "ASME Section XI, Subsection IWE"	No
C-24	Steel elements: Suppression chamber shell (interior surface)	Stainless steel	Air – indoor uncontrolled	Cracking/ stress corrosion cracking	Chapter XI.S1, "ASME Section XI, Subsection IWE" and Chapter XI.S4, "10 CFR Part 50, Appendix J"	No
T-01	Concrete: Exterior above and below grade; foundation	Reinforced concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking/ freeze-thaw	Chapter XI.S6, "Structures Monitoring Program" Accessible Areas: Inspections performed in accordance with "Structures Monitoring Program" will indicate the presence of loss of material (spalling, scaling) and cracking due to freeze-thaw. Inaccessible Areas: Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557). Documented evidence to confirm that existing concrete has air content of 3% to 6% and subsequent inspections did not exhibit degradation related to freeze-thaw, should be considered a part of the evaluation. The weathering index for the continental US is shown in ASTM C33-90, Fig.1.	No, if within the scope of the applicant's structures monitoring program and stated conditions are satisfied for inaccessible areas

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-02	Concrete: Exterior above and below grade; foundation	Reinforced concrete	Water – flowing	Increase in porosity and permeability, loss of strength/ leaching of calcium hydroxide	Chapter XI.S6, "Structures Monitoring Program" Accessible Areas: Inspections performed in accordance with "Structures Monitoring Program" will indicate the presence of increase in porosity and permeability due to leaching of calcium hydroxide Inaccessible Areas: A plant –specific aging management program is required for below-grade inaccessible areas (basemat and concrete wall) if the concrete is exposed to flowing water (NUREG-1557). An aging management program is not required, even if reinforced concrete is exposed to flowing water, if there is documented evidence that confirms the in-place concrete was constructed in accordance with the recommendations in ACI 201.2R-77	No, if within the scope of the applicant's structures monitoring program and a plant-specific aging management program is required for inaccessible areas as stated

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-03	Concrete: All	Reinforced concrete	Any	Expansion and cracking/ reaction with aggregates	Chapter XI.S6, "Structures Monitoring Program" Accessible Areas: Inspections/evaluations performed in accordance with "Structures Monitoring Program" will indicate the presence of expansion and cracking due to reaction with aggregates. Inaccessible Areas: Evaluation is needed if testing and petrographic examinations of aggregates performed in accordance with ASTM C295-54, ASTM C227-50, or ACI 201.2R-77 (NUREG-1557) demonstrate that the aggregates are reactive.	No, if within the scope of the applicant's structures monitoring program and the stated conditions are satisfied for inaccessible areas
T-04	Concrete: Interior and above-grade exterior	Reinforced concrete	Air – indoor uncontrolled or air - outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel	Chapter XI.S6, "Structures Monitoring Program" Accessible areas: Inspections performed in accordance with "Structures Monitoring Program" will indicate the presence of cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel.	No, if within the scope of the applicant's structures monitoring program

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-05	Concrete: Below-grade exterior; foundation	Reinforced concrete	Aggressive environment	Cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel	Inaccessible Areas: A plant-specific aging management program is required (may be a part of structures monitoring program) if the below-grade environment is aggressive (ph < 5.5, chlorides > 500ppm, or sulfates > 1500ppm). Examination of representative samples of below-grade concrete, when excavated for any reason, is to be included as part of a plant-specific program. Note: Periodic monitoring of below-grade water chemistry (including consideration of potential seasonal variations) is an acceptable approach to demonstrate that the below-grade environment is aggressive or non-aggressive.	Yes, a plant-specific aging management program is required for inaccessible areas as stated
T-06	Concrete: Interior and above-grade exterior	Reinforced concrete	Aggressive environment	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack	Chapter XI.S6, “Structures Monitoring Program” Accessible Areas: Inspections performed in accordance with “Structures Monitoring Program” will indicate the presence of increase in porosity and permeability, cracking, or loss of material (spalling, scaling) due to aggressive chemical attack.	No, if within the scope of the applicant’s structures monitoring program

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-07	Concrete: Below-grade exterior; foundation	Reinforced concrete	Aggressive environment	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack	Inaccessible Areas: A plant-specific aging management program is required (may be a part of structures monitoring program) if the below-grade environment is aggressive (ph < 5.5, chlorides > 500ppm, or sulfates > 1500ppm). Examination of representative samples of below-grade concrete, when excavated for any reason, is to be included as part of a plant-specific program. Note: Periodic monitoring of below-grade water chemistry (including consideration of potential seasonal variations) is an acceptable approach to demonstrate that the below-grade environment is aggressive or non-aggressive.	Yes, a plant-specific aging management program is required for inaccessible areas as stated
T-08	Concrete: All	Reinforced concrete	Soil	Cracks and distortion due to increased stress levels from settlement	Chapter XI.S6, “Structures Monitoring Program” The initial Licensing Basis for some plants included a program to monitor settlement. If no settlement was evident during the first decade or so, the NRC may have given the licensee approval to discontinue the program. However, if a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	No, if within the scope of the applicant’s structures monitoring program

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-09	Concrete: Foundation; subfoundation	Reinforced concrete; porous concrete	Flowing water under foundation	Reduction in foundation strength, cracking, differential settlement/ erosion of porous concrete subfoundation	Chapter XI.S6, "Structures Monitoring Program" Erosion of cement from porous concrete subfoundations beneath containment basemats is described in IN 97-11. IN 98-26 proposes Maintenance Rule Structures Monitoring for managing this aging effect, if applicable. If a de-watering system is relied upon for control of erosion of cement from porous concrete subfoundations, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	No, if within the scope of the applicant's structures monitoring program
T-10	Concrete: All	Reinforced concrete	Air – indoor uncontrolled	Reduction of strength and modulus/ elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program For any concrete elements that exceed specified temperature limits, further evaluations are warranted. Appendix A of ACI 349-85 specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 150°F except for local areas which are allowed to have increased temperatures not to exceed 200°F.	Yes, if applicable

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-11	Steel components: All structural steel	Steel	Air – indoor uncontrolled or air - outdoor	Loss of material/ corrosion	Chapter XI.S6, "Structures Monitoring Program" If protective coatings are relied upon to manage the effects of aging, the structures monitoring program is to include requirements to address protective coating monitoring and maintenance.	No, if within the scope of the applicant's structures monitoring program
T-12	Masonry walls: All	Concrete block	Air – indoor uncontrolled	Cracking due to restraint shrinkage, creep, and aggressive environment	Chapter XI.S5, "Masonry Wall Program"	No
T-13	Steel components: Radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; Steam generator supports	Lubrite	Air – indoor uncontrolled	Lock-up/ wear	Chapter XI.S3, "ASME Section XI, Subsection IWF" or Chapter XI.S6, "Structures Monitoring Program"	No, if within the scope of Section XI, IWF or structures monitoring program
T-14	Steel components: Fuel pool liner	Stainless steel	Water – standing	Cracking/ stress corrosion cracking Loss of material/pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry Program" and monitoring of the spent fuel pool water level	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-15	Concrete: Exterior above and below grade; foundation; interior slab	Reinforced concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking/ freeze-thaw	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance As described in NUREG-1557, freeze-thaw does not cause loss of material from reinforced concrete in foundations, and in above- and below-grade exterior concrete, for plants located in a geographic region of negligible weathering conditions (weathering index <100 day-inch/yr). Loss of material from such concrete is not significant at plants located in areas in which weathering conditions are severe (weathering index >500 day-inch/yr) or moderate (100-500 day-inch/yr), provided that the concrete mix design meets the air content (entrained air 3-6%) and water-to-cement ratio (0.35-0.45) specified in ACI 318-63 or ACI 349-85. Therefore, if these conditions are satisfied, aging management is not required. The weathering index is defined in ASTM C33-90, Table 3, Footnote E. Fig. 1 of ASTM C33-90 illustrates the various weathering index regions throughout the U.S.	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-16	Concrete: Exterior above and below grade; foundation; interior slab	Reinforced concrete	Water – flowing	Increase in porosity and permeability, loss of strength/ leaching of calcium hydroxide	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance As described in NUREG-1557, leaching of calcium hydroxide from reinforced concrete becomes significant only if the concrete is exposed to flowing water. Even if reinforced concrete is exposed to flowing water, such leaching is not significant if the concrete is constructed to ensure that it is dense, well-cured, has low permeability, and that cracking is well controlled. Cracking is controlled through proper arrangement and distribution of reinforcing bars. All of the above characteristics are assured if the concrete was constructed with the guidance of ACI 201.2R-77. Therefore, if these conditions are satisfied, aging management is not required.	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-17	Concrete: All	Reinforced concrete	Any	Expansion and cracking/ reaction with aggregates	Chapter XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC / US Army Corp of Engineers dam inspections and maintenance As described in NUREG-1557, investigations, tests, and petrographic examinations of aggregates performed in accordance with ASTM C295-54 or ASTM C227-50 can demonstrate that those aggregates do not react within reinforced concrete. For potentially reactive aggregates, aggregate-reinforced concrete reaction is not significant if the concrete was constructed in accordance with ACI 201.2R-77. Therefore, if these conditions are satisfied, aging management is not required.	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-18	Concrete: All	Reinforced concrete	Air – indoor uncontrolled or air - outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance. As described in NUREG-1557, corrosion of exterior above-grade and interior embedded steel is not significant if the steel is not exposed to an aggressive environment (concrete pH <11.5 or chlorides >500 ppm). If such steel is exposed to an aggressive environment, corrosion is not significant if the concrete in which the steel is embedded has a low water-to-cement ratio (0.35-0.45), adequate air entrainment (3-6%), low permeability, and is designed in accordance with ACI 318-63 or ACI 349-85. Therefore, if these conditions are satisfied, aging management is not required.	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-19	Concrete: All	Reinforced concrete	Aggressive environment	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance As described in NUREG-1557, corrosion of exterior above-grade and interior embedded steel is not significant if the steel is not exposed to an aggressive environment (concrete pH <11.5 or chlorides >500 ppm). If such steel is exposed to an aggressive environment, corrosion is not significant if the concrete in which the steel is embedded has a low water-to-cement ratio (0.35-0.45), adequate air entrainment (3-6%), low permeability, and is designed in accordance with ACI 318-63 or ACI 349-85. Therefore, if these conditions are satisfied, aging management is not required.	No
T-20	Concrete: Exterior above and below grade; foundation; interior slab	Reinforced concrete	Water – flowing	Loss of material/ abrasion; cavitation	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-21	Metal components: All structural members	Steel; Copper alloys	Air – indoor uncontrolled or air - outdoor	Loss of material/ corrosion	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance If protective coatings are relied upon to manage the effects of aging, this AMP is to include requirements to address protective coating monitoring and maintenance.	No
T-22	Earthen water-control structures: Dams, embankments, reservoirs, channels, canals and ponds	Various	Water – flowing Water – standing	Loss of material, loss of form/ erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance.	No
T-23	Steel components: Fuel pool liner	Stainless steel	Water – standing	Cracking/ stress corrosion cracking Loss of material/pitting and crevice corrosion	Plant-specific aging management program	Yes

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-24	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled or air outdoor	Loss of material/ general and pitting corrosion	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No
T-25	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No
T-26	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled	Cumulative fatigue damage/ fatigue (Only if CLB fatigue analysis exists)	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, “Metal Fatigue” for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA
T-27	High strength bolting for NSSS component supports	Low alloy steel, yield strength >150 ksi	Air – indoor uncontrolled (External)	Cracking/ stress corrosion cracking	Chapter XI.M18, “Bolting Integrity”	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-28	Constant and variable load spring hangers; guides; stops; sliding surfaces; design clearances; vibration isolators	Steel and non-steel materials (e.g., lubrite plates, vibration isolators, etc.)	Air – indoor uncontrolled or air - outdoor	Loss of mechanical function/ Corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads; elastomer hardening	Chapter XI.S3, “ASME Section XI, Subsection IWF”	No
T-29	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reinforced concrete; grout	Air – indoor uncontrolled or air - outdoor	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	Chapter XI.S6, “Structures Monitoring Program”	No, if within the scope of the applicant’s structures monitoring program
T-30	Support members; welds; bolted connections; support anchorage to building structure	Steel	Air – indoor uncontrolled (External)	Loss of material/ general and pitting corrosion	Chapter XI.S6, “Structures Monitoring Program”	No, if within the scope of the applicant’s structures monitoring program

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
T-31	Vibration isolation elements	Non-metallic (e.g., Rubber)	Air – indoor uncontrolled or air - outdoor	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	Chapter XI.S6, “Structures Monitoring Program”	No, if within the scope of the applicant’s structures monitoring program
TP-1	Steel components: Radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; other supports	Lubrite	Air – indoor uncontrolled	Loss of mechanical function/ Corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads; elastomer hardening	Chapter XI.S6, “Structural Monitoring Program”	No
TP-2	Sliding support bearings and sliding support surfaces	Lubrite	Air – outdoor	Loss of mechanical function/ Corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads; elastomer hardening	Chapter XI.S6, “Structural Monitoring Program”	No
TP-3	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel, aluminum	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
TP-4	Support members; welds; bolted connections; support anchorage to building structure	Stainless steel	Air with borated water leakage	None	None	No
TP-5	Support members; welds; bolted connections; support anchorage to building structure	Stainless steel	Air – indoor uncontrolled	None	None	No
TP-6	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel, aluminum, stainless steel	Air – outdoor	Loss of material/ pitting and crevice corrosion	Chapter XI.S6, “Structural Monitoring Program”	No
TP-7	Seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Elastomers such as EPDM rubber	Various	Loss of sealing/ deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Chapter XI.S6, “Structures Monitoring Program”	No

Table A5. Listing of Structures and Component Support Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
TP-8	Support members; welds; bolted connections; support anchorage to building structure	Galvanized steel, aluminum	Air – indoor uncontrolled	Loss of material/ galvanic corrosion	Chapter XI.S6, “Structural Monitoring Program”	No

Table A6. Listing of Electrical Component Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
L-01	Conductor insulation for electrical cables and connections	Various organic polymers (e.g., EPR, SR, EPDM, XLPE)	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation of organics (Thermal/ thermoxidative), radiolysis and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation, and moisture intrusion	Chapter XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No

Table A6. Listing of Electrical Component Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
L-02	Conductor insulation for electrical cables used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance (IR)	Various organic polymers (e.g., EPR, SR, EPDM, XLPE)	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation of organics (Thermal/ thermoxidative), radiolysis and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation, and moisture intrusion	Chapter XI.E2, "Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits"	No

Table A6. Listing of Electrical Component Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
L-03	Conductor insulation for inaccessible medium-voltage (2kV to 15kV) cables (e.g., installed in conduit or direct buried)	Various organic polymers (e.g., EPR, SR, EPDM, XLPE)	Adverse localized environment caused by exposure to moisture and voltage	Localized damage and breakdown of insulation leading to electrical failure/ moisture intrusion, water trees	Chapter XI.E3, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No
L-04	Connector contacts for electrical connectors exposed to borated water leakage	Various metals used for electrical contacts	Air with borated water leakage	Corrosion of connector contact surfaces/ intrusion of borated water	Chapter XI.M10, “Boric Acid Corrosion”	No
L-05	Electrical equipment subject to 10 CFR 50.49 EQ requirements	Various polymeric and metallic materials	Adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage	Various degradation/ various mechanisms	EQ is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.4, "Environmental Qualification (EQ) of Electrical Equipment," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). See Chapter X.E1, “Environmental Qualification (EQ) of Electric Components,” of this report for meeting the requirements of 10 CFR 54.21(c)(1)(iii).	Yes, TLAA

Table A6. Listing of Electrical Component Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
LP-01	Fuse Holders (Not Part of a Larger Assembly) Metallic Clamp	Copper alloy	Air – indoor	Fatigue/ ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	A plant-specific aging management program is to be evaluated	Yes, plant specific
LP-02	Fuse Holders (Not Part of a Larger Assembly)	Insulation material – bakelite, phenolic melamine or ceramic, molded polycarbonate and other	Air – indoor uncontrolled (Internal/External)	None	None	No

Table A6. Listing of Electrical Component Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
LP-03	Fuse Holders (Not Part of a Larger Assembly)	Insulation material – bakelite, phenolic melamine or ceramic, molded polycarbonate and other	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen or > 60-year service limiting temperature	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation (Thermal/ thermoxidative) of organics/thermoplastics, radiation-induced oxidation, moisture intrusion and ohmic heating	Chapter XI.E1, “Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”	No
LP-04	Phase bus Bus/connections	Aluminum / Silver Plated Aluminum Copper / Silver Plated Copper; Stainless steel, steel	Air – indoor and outdoor	Loosening of bolted connections/ thermal cycling and ohmic heating	A plant-specific aging management program is to be evaluated	Yes, plant specific

Table A6. Listing of Electrical Component Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
LP-05	Phase bus Insulation/insulators	Porcelain, xenoy, thermo-plastic organic polymers	Air – indoor and outdoor	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ thermal/thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation; moisture/debris intrusion, and ohmic heating	A plant-specific aging management program is to be evaluated	Yes, plant specific
LP-06	Phase bus Enclosure assemblies	Steel, galvanized steel	Air – indoor and outdoor	Loss of material/ general corrosion	Chapter XI.S6, “Structures Monitoring Program”	No
LP-07	High voltage insulators	Porcelain, Malleable iron, aluminum, galvanized steel, cement	Air – outdoor	Degradation of insulator quality/ presence of any salt deposits and surface contamination	A plant-specific aging management program is to be evaluated	Yes, plant specific

Table A6. Listing of Electrical Component Line Items in Chapter VI of the GALL Report						
Item	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
LP-08	Transmission conductors and connections	Aluminum, steel	Air – outdoor	Loss of material/ wind induced abrasion and fatigue Loss of conductor strength/ corrosion Increased resistance of connection/ oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes, plant specific
LP-09	Switchyard bus and connections	Aluminum, copper, bronze, stainless steel, galvanized steel	Air – outdoor	Loss of material/ wind induced abrasion and fatigue Loss of conductor strength/ corrosion Increased resistance of connection/ oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes. plant specific
LP-10	Phase bus Enclosure assemblies	Elastomers	Air – indoor and outdoor	Hardening and loss of strength/ elastomers degradation	Chapter XI.S6, “Structures Monitoring Program”	No
LP-11	High voltage insulators	Porcelain, Malleable iron, aluminum, galvanized steel, cement	Air – outdoor	Loss of material/ mechanical wear due to wind blowing on transmission conductors	A plant-specific aging management program is to be evaluated	Yes, plant specific

List of Item Numbers in the GALL Report
II. Containment Structures

Item Number in GALL	Description
II.A	**Pressurized water reactor (PWR) containments**
II.A1	**Concrete containments (reinforced and prestressed)**
II.A1.1	Concrete elements
II.A1.2	Steel elements
II.A1.3	Prestressing system
II.A2	**Steel containments**
II.A2.1	Steel elements
II.A2.2	Concrete elements
II.A3	**Common components**
II.A3.1	Penetration sleeves, penetration bellows, and dissimilar metal welds
II.A3.2	Personnel airlock and equipment hatch
II.A3.3	Seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)
II.B	**Boiling water reactor (BWR) containments**
II.B1	**Mark I containments**
II.B1.1	Steel containments
II.B1.1.1	Steel elements
II.B2	**Mark II containments**
II.B2.1	Steel containments
II.B2.1.1	Steel elements
II.B2.2	Concrete containments
II.B2.2.1	Concrete elements
II.B2.2.2	Steel elements
II.B2.2.3	Prestressing system
II.B3	**Mark III containments**
II.B3.1	Steel containments
II.B3.1.1	Steel elements
II.B3.1.2	Concrete elements
II.B3.2	Concrete containments
II.B3.2.1	Concrete elements
II.B3.2.2	Steel elements
II.B4	**Common components**
II.B4.1	Penetration sleeves, penetration bellows, and dissimilar metal welds
II.B4.2	Personnel airlock, equipment hatch, and control rod drive (CRD) hatch
II.B4.3	Seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)

List of Item Numbers in the GALL Report
III. Class 1 Structures and Component Supports

Item Number in GALL	Description
III.A	**Class 1 structures**
III.A1	**Group 1 structures (BWR reactor building, PWR shield building, and control room/building)**
III.A1.1	Concrete elements
III.A1.2	Steel elements
III.A1.3	Masonry walls
III.A2	**Group 2 structures (BWR reactor building with steel superstructure)**
III.A2.1	Concrete elements
III.A2.2	Steel elements
III.A2.3	Masonry walls
III.A3	**Group 3 structures (auxiliary building, diesel generator building, radwaste building, turbine building, switchgear room, auxiliary feedwater (AFW) pumphouse, and utility/piping tunnels)**
III.A3.1	Concrete elements
III.A3.2	Steel elements
III.A3.3	Masonry walls
III.A4	**Group 4 structures (containment internal structures, excluding refueling canal)**
III.A4.1	Concrete elements
III.A4.2	Steel elements
III.A5	**Group 5 structures (fuel storage facility, refueling canal)**
III.A5.1	Concrete elements
III.A5.2	Steel elements
III.A5.3	Masonry walls
III.A6	**Group 6 structures (water control structures)**
III.A6.1	Concrete elements
III.A6.2	Steel elements
III.A6.3	Masonry walls
III.A6.4	Earthen water control structures
III.A7	**Group 7 structures (concrete tanks)**
III.A7.1	Concrete elements
III.A7.2	Steel elements
III.A8	**Group 8 structures (steel tanks)**
III.A8.1	Concrete elements
III.A8.2	Steel elements
III.A9	**Group 9 structures (BWR unit vent stack)**
III.A9.1	Concrete elements
III.B	**Component supports**
III.B1	**Supports for ASME piping and components**
III.B1.1	Supports for ASME Class 1 piping and components
III.B1.1.1	Support members; welds, bolted connections; support anchorage to building structure
III.B1.1.2	High-strength bolts for NSSS component supports
III.B1.1.3	Constant/variable load spring hangers; guides; stops; sliding surfaces; design clearances; vibration isolators
III.B1.1.4	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates
III.B1.2	Supports for ASME Class 2 and 3 piping and components
III.B1.2.1	Support members; welds, bolted connections; support anchorage to building structure

List of Item Numbers in the GALL Report
III. Class I Structures and Component Supports (continued)

Item Number in GALL	Description
III.B1.2.2	Constant/variable load spring hangers; guides; stops; sliding surfaces; design clearances; vibration isolators
III.B1.2.3	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates
III.B1.3	Supports for ASME Class MC components (BWR containment supports)
III.B1.3.1	Support members; welds, bolted connections; support anchorage to building structure
III.B1.3.2	Guides; stops; sliding surfaces; design clearances
III.B1.3.3	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates
III.B2	**Supports for cable trays, conduits, HVAC ducts, tube track, instrument tubing, and non-ASME piping and components**
III.B2.1	Support members; welds; bolted connections; support anchorage to building structure
III.B2.2	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates
III.B3	**Anchorage of racks, panels, cabinets, and enclosures for electric equipment and instrumentation**
III.B3.1	Support members; welds; bolted connections; support anchorage to building structure
III.B3.2	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates
III.B4	**Supports for emergency diesel generator (EDG), HVAC system components, and other miscellaneous mechanical equipment**
III.B4.1	Support members; welds; bolted connections; support anchorage to building structure
III.B4.2	Vibration isolation elements
III.B4.3	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates
III.B5	**Supports for platforms, pipe whip restraints, jet impingement shields, masonry walls, and other miscellaneous steel structures**
III.B5.1	Support members; welds; bolted connections; support anchorage to building structure
III.B5.2	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates

List of Item Numbers in the GALL Report
IV.A1. Reactor Vessel (BWR)

Item Number in GALL	Description
IV.A1.1	**Top head enclosure**
IV.A1.1.1	Top head
IV.A1.1.2	Nozzles [vent, top head spray or reactor core isolation cooling (RCIC), and spare]
IV.A1.1.3	Head flange
IV.A1.1.4	Closure studs and nuts
IV.A1.1.5	Vessel flange leak detection line
IV.A1.2	**Vessel shell**
IV.A1.2.1	Vessel flange
IV.A1.2.2	Upper shell
IV.A1.2.3	Intermediate nozzle shell
IV.A1.2.4	Intermediate beltline shell
IV.A1.2.5	Lower shell
IV.A1.2.6	Beltline welds
IV.A1.2.7	Attachment welds
IV.A1.3	**Nozzles**
IV.A1.3.1	Main steam
IV.A1.3.2	Feedwater
IV.A1.3.3	CRD return line
IV.A1.3.4	Low-pressure coolant injection (LPCI) or residual heat removal (RHR) injection mode
IV.A1.4	**Nozzles safe ends**
IV.A1.4.1	High-pressure core spray (HPCS)
IV.A1.4.2	Low-pressure core spray (LPCS)
IV.A1.4.3	CRD return line
IV.A1.4.4	Recirculating water (inlet and outlet)
IV.A1.4.5	LPCI or RHR injection mode
IV.A1.5	**Penetrations**
IV.A1.5.1	CRD stub tubes
IV.A1.5.2	Instrumentation
IV.A1.5.3	Jet pump instrument
IV.A1.5.4	Standby liquid control
IV.A1.5.5	Flux monitor
IV.A1.5.6	Drain line
IV.A1.6	**Bottom head**
IV.A1.7	**Support skirt and attachment welds**

List of Item Numbers in the GALL Report
IV.A2. Reactor Vessel (PWR)

Item Number in GALL	Description
IV.A2.1	**Closure head**
IV.A2.1.1	Dome
IV.A2.1.2	Head flange
IV.A2.1.3	Stud assembly
IV.A2.1.4	Vessel flange leak detection line
IV.A2.2	**Control rod drive (CRD) head penetration**
IV.A2.2.1	Nozzle
IV.A2.2.2	Pressure housing
IV.A2.2.3	Flange bolting
IV.A2.3	**Nozzles**
IV.A2.3.1	Inlet
IV.A2.3.2	Outlet
IV.A2.3.3	Safety injection (on some)
IV.A2.4	**Nozzle safe ends**
IV.A2.4.1	Inlet
IV.A2.4.2	Outlet
IV.A2.4.3	Safety injection (on some)
IV.A2.5	**Shell**
IV.A2.5.1	Upper (nozzle) shell
IV.A2.5.2	Intermediate and lower shell
IV.A2.5.3	Vessel flange
IV.A2.5.4	Bottom head
IV.A2.6	**Core support pads/core guide lugs**
IV.A2.7	**Penetrations**
IV.A2.7.1	Instrumentation tubes (bottom head)
IV.A2.7.2	Head vent pipe (top head)
IV.A2.7.3	Instrument tubes (top head)
IV.A2.8	**Pressure vessel support**
IV.A2.8.1	Skirt support
IV.A2.8.2	Cantilever/column support
IV.A2.8.3	Neutron shield tank

List of Item Numbers in the GALL Report
IV.B1. Reactor Vessel Internals (BWR)

Item Number in GALL	Description
IV.B1.1	**Core shroud, shroud head, and core plate**
IV.B1.1.1	Core shroud (upper, central, and lower)
IV.B1.1.2	Core plate
IV.B1.1.3	Core plate bolts
IV.B1.1.4	Access hole cover
IV.B1.1.5	Shroud support structure
IV.B1.1.6	LPCI coupling
IV.B1.2	**Top guide**
IV.B1.3	**Core spray lines and spargers**
IV.B1.3.1	Core spray lines (headers)
IV.B1.3.2	Spray ring
IV.B1.3.3	Spray nozzles
IV.B1.3.4	Thermal sleeve
IV.B1.4	**Jet pump assemblies**
IV.B1.4.1	Thermal sleeve
IV.B1.4.2	Inlet header
IV.B1.4.3	Riser brace arm
IV.B1.4.4	Holddown beams
IV.B1.4.5	Inlet elbow
IV.B1.4.6	Mixing assembly
IV.B1.4.7	Diffuser
IV.B1.4.8	Castings
IV.B1.4.9	Jet pump sensing line
IV.B1.5	**Fuel support and CRD assemblies**
IV.B1.5.1	Orificed fuel support
IV.B1.5.2	CRD housing
IV.B1.6	**Instrumentation**
IV.B1.6.1	Intermediate range monitor (IRM) dry tubes
IV.B1.6.2	Low-power range monitor (LPRM) dry tubes
IV.B1.6.3	Source range monitor (SRM) dry tubes
IV.B1.6.4	Incore neutron flux monitor guide tubes

List of Item Numbers in the GALL Report
IV.B2. Reactor Vessel Internals (PWR) – Westinghouse

Item Number in GALL	Description
IV.B2.1	**Upper internals assembly**
IV.B2.1.1	Upper support plate
IV.B2.1.2	Upper support column
IV.B2.1.3	Upper support column bolts
IV.B2.1.4	Upper core plate
IV.B2.1.5	Upper core plate alignment pins
IV.B2.1.6	Fuel alignment pins
IV.B2.1.7	Hold-down spring
IV.B2.2	**RCCA guide tube assemblies**
IV.B2.2.1	RCCA guide tubes
IV.B2.2.2	RCCA guide tube bolts
IV.B2.2.3	RCCA guide tube support pins
IV.B2.3	**Core barrel**
IV.B2.3.1	Core barrel
IV.B2.3.2	Core barrel flange
IV.B2.3.3	Core barrel outlet nozzles
IV.B2.3.4	Thermal shield
IV.B2.4	**Baffle/former assembly**
IV.B2.4.1	Baffle/former plates
IV.B2.4.2	Baffle/former bolts
IV.B2.5	**Lower internal assembly**
IV.B2.5.1	Lower core plate
IV.B2.5.2	Fuel alignment pins
IV.B2.5.3	Lower support forging or casting
IV.B2.5.4	Lower support plate columns
IV.B2.5.5	Lower support plate column bolts
IV.B2.5.6	Radial support keys and clevis inserts
IV.B2.5.7	Clevis insert bolts
IV.B2.6	**Instrumentation support structure**
IV.B2.6.1	Flux thimble guide tubes
IV.B2.6.2	Flux thimbles

List of Item Numbers in the GALL Report
IV.B3. Reactor Vessel Internals (PWR) – Combustion Engineering

Item Number in GALL	Description
IV.B3.1	**Upper internals assembly**
IV.B3.1.1	Upper guide structure support plate
IV.B3.1.2	Fuel alignment plate
IV.B3.1.3	Fuel alignment plate guide lugs and guide lug inserts
IV.B3.1.4	Hold-down ring
IV.B3.2	**Control-core element assembly (CEA) shroud assemblies**
IV.B3.2.1	CEA shrouds
IV.B3.2.2	CEA shrouds bolts
IV.B3.2.3	CEA shrouds extension shaft guides
IV.B3.3	**Core support barrel**
IV.B3.3.1	Core support barrel
IV.B3.3.2	Core support barrel upper flange
IV.B3.3.3	Core support barrel alignment keys
IV.B3.4	**Core shroud assembly**
IV.B3.4.1	Core shroud assembly
IV.B3.4.2	Core shroud assembly bolts
IV.B3.4.3	Core shroud tie rods
IV.B3.5	**Lower internal assembly**
IV.B3.5.1	Core support plate
IV.B3.5.2	Fuel alignment pins
IV.B3.5.3	Lower support structure beam assemblies
IV.B3.5.4	Core support column
IV.B3.5.5	Core support column bolts
IV.B3.5.6	Core support barrel snubber assemblies

List of Item Numbers in the GALL Report
IV.B4. Reactor Vessel Internals (PWR) – Babcock & Wilcox (B&W)

Item Number in GALL	Description
IV.B4.1	**Plenum cover and plenum cylinder**
IV.B4.1.1	Plenum cover assembly
IV.B4.1.2	Plenum cylinder
IV.B4.1.3	Reinforcing plates
IV.B4.1.4	Top flange-to-cover bolts
IV.B4.1.5	Bottom flange-to-upper grid screws
IV.B4.2	**Upper grid assembly**
IV.B4.2.1	Upper grid rib section
IV.B4.2.2	Upper grid ring forging
IV.B4.2.3	Fuel assembly support pads
IV.B4.2.4	Plenum rib pads
IV.B4.2.5	Rib-to-ring screws
IV.B4.3	**Control rod guide tube (CRGT) assembly**
IV.B4.3.1	CRGT pipe and flange
IV.B4.3.2	CRGT spacer casting
IV.B4.3.3	CRGT spacer screws
IV.B4.3.4	Flange-to-upper grid screws
IV.B4.3.5	CRGT rod guide tubes
IV.B4.3.6	CRGT rod guide sectors
IV.B4.4	**Core support shield assembly**
IV.B4.4.1	Core support shield cylinder (top and bottom flange)
IV.B4.4.2	Core support shield-to-core barrel bolts
IV.B4.4.3	Outlet and vent valve nozzles
IV.B4.4.4	Vent valve body and retaining ring
IV.B4.4.5	Vent valve assembly locking device
IV.B4.5	**Core barrel assembly**
IV.B4.5.1	Core barrel cylinder (top and bottom flange)
IV.B4.5.2	Lower internals assembly-to-core barrel bolts
IV.B4.5.3	Core barrel-to-thermal shield bolts
IV.B4.5.4	Baffle plates and formers
IV.B4.5.5	Baffle/former bolts and screws
IV.B4.6	**Lower grid (LG) assembly**
IV.B4.6.1	Lower grid rib section
IV.B4.6.2	Fuel assembly support pads
IV.B4.6.3	Lower grid rib-to-shell forging screws
IV.B4.6.4	Lower grid flow distributor plate
IV.B4.6.5	Orifice plugs
IV.B4.6.6	Lower grid and shell forgings
IV.B4.6.7	Lower internals assembly-to-thermal shield bolts
IV.B4.6.8	Guide blocks and bolts
IV.B4.6.9	Shock pads and bolts
IV.B4.6.10	Support post pipes
IV.B4.6.11	Incore guide tube spider castings

List of Item Numbers in the GALL Report
IV.B4. Reactor Vessel Internals (PWR) – Babcock & Wilcox (B&W) (continued)

Item Number in GALL	Description
IV.B4.7	**Flow distributor**
IV.B4.7.1	Flow distributor head and flange
IV.B4.7.2	Shell forging-to-flow distributor bolts
IV.B4.7.3	Incore guide support plate
IV.B4.7.4	Clamping ring
IV.B4.8	**Thermal shield**

List of Item Numbers in the GALL Report
IV.C1. Reactor Coolant Pressure Boundary (BWR)

Item Number in GALL	Description
IV.C1.1	**Piping and fittings**
IV.C1.1.1	Main steam
IV.C1.1.2	Feedwater
IV.C1.1.3	High-pressure coolant injection (HPCI) system
IV.C1.1.4	Reactor core isolation cooling (RCIC) system
IV.C1.1.5	Recirculation
IV.C1.1.6	Residual heat removal (RHR) system
IV.C1.1.7	Low pressure coolant injection (LPCI) system
IV.C1.1.8	Low pressure core spray (LPCS) system
IV.C1.1.9	High pressure core spray (HPCS) system
IV.C1.1.10	Lines to isolation condenser
IV.C1.1.11	Lines to reactor water cleanup (RWC) and standby liquid control (SLC) systems
IV.C1.1.12	Steam line to HPCI and RCIC pump turbine
IV.C1.1.13	Small bore piping less than NPS 4
IV.C1.2	**Recirculation pump**
IV.C1.2.1	Casing
IV.C1.2.2	Cover
IV.C1.2.3	Seal flange
IV.C1.2.4	Closure bolting
IV.C1.3	**Valves**
IV.C1.3.1	Body
IV.C1.3.2	Bonnet
IV.C1.3.3	Seal flange
IV.C1.3.4	Closure bolting
IV.C1.4	**Isolation condenser**
IV.C1.4.1	Tubing
IV.C1.4.2	Tubesheet
IV.C1.4.3	Channel head
IV.C1.4.4	Shell

List of Item Numbers in the GALL Report
IV.C2. Reactor Coolant System and Connected Lines (PWR)

Item Number in GALL	Description
IV.C2.1	**Reactor coolant system piping and fittings**
IV.C2.1.1	Cold-leg
IV.C2.1.2	Hot-leg
IV.C2.1.3	Surge line
IV.C2.1.4	Spray line
IV.C2.1.5	Small-bore reactor coolant system (RCS) piping, fittings, and branch connections less than NPS 4
IV.C2.2	**Connected systems piping and fittings**
IV.C2.2.1	RHR or low-pressure injection system (decay heat removal [DHR]/shutdown system)
IV.C2.2.2	Core flood system (CFS)
IV.C2.2.3	High-pressure injection system (makeup and letdown functions)
IV.C2.2.4	Chemical and volume control system
IV.C2.2.5	Sampling system
IV.C2.2.6	Drains and instrument lines
IV.C2.2.7	Nozzles and safe ends
IV.C2.2.8	Small-bore piping, fittings, and branch connections less than NPS 4 in connected systems
IV.C2.3	**Reactor coolant pump**
IV.C2.3.1	Casing
IV.C2.3.2	Cover
IV.C2.3.3	Closure bolting
IV.C2.4	**Safety and relief valves**
IV.C2.4.1	Body
IV.C2.4.2	Bonnet
IV.C2.4.3	Closure bolting
IV.C2.5	**Pressurizer**
IV.C2.5.1	Shell/heads
IV.C2.5.2	Spray line nozzle
IV.C2.5.3	Surge line nozzle
IV.C2.5.4	Spray head
IV.C2.5.5	Thermal sleeves
IV.C2.5.6	Instrument penetrations
IV.C2.5.7	Safe ends
IV.C2.5.8	Manway and flanges
IV.C2.5.9	Manway and flange bolting
IV.C2.5.10	Heater sheaths and sleeves
IV.C2.5.11	Support keys, skirt, and shear lugs
IV.C2.5.12	Integral support
IV.C2.6	**Pressurizer relief tank**
IV.C2.6.1	Tank shell and heads
IV.C2.6.2	Flanges and nozzles

List of Item Numbers in the GALL Report
IV.D1. Steam Generator (Recirculating)

Item Number in GALL	Description
IV.D1.1	**Pressure boundary and structural**
IV.D1.1.1	Top head
IV.D1.1.2	Steam nozzle and safe end
IV.D1.1.3	Upper and lower shell
IV.D1.1.4	Transition cone
IV.D1.1.5	Feedwater nozzle and safe end
IV.D1.1.6	Feedwater impingement plate and support
IV.D1.1.7	Secondary manway and handhole bolting
IV.D1.1.8	Lower head
IV.D1.1.9	Primary nozzles and safe ends
IV.D1.1.10	Instrument nozzles
IV.D1.1.11	Primary manway (cover and bolting)
IV.D1.2	**Tube bundle**
IV.D1.2.1	Tubes and sleeves
IV.D1.2.2	Tube support lattice bars (combustion engineering [CE])
IV.D1.2.3	Tube plugs
IV.D1.2.4	Tube support plates
IV.D1.3	**Upper assembly and separators**
IV.D1.3.1	Feedwater inlet ring and support

List of Item Numbers in the GALL Report
IV.D2. Steam Generator (Once-Through)

Item Number in GALL	Description
IV.D2.1	**Pressure boundary and structural**
IV.D2.1.1	Upper and lower heads
IV.D2.1.2	Tube sheets
IV.D2.1.3	Primary nozzles and safe ends
IV.D2.1.4	Shell assembly
IV.D2.1.5	Feedwater and auxiliary feedwater nozzles and safe ends
IV.D2.1.6	Steam nozzles and safe ends
IV.D2.1.7	Primary side drain nozzles
IV.D2.1.8	Secondary side nozzles (vent, drain, and instrumentation)
IV.D2.1.9	Primary manways (cover and bolting)
IV.D2.1.10	Secondary manways and handholes (cover and bolting)
IV.D2.2	**Tube bundle**
IV.D2.2.1	Tubes and sleeves
IV.D2.2.2	Tube plugs

List of Item Numbers in the GALL Report
V.A. Containment Spray System (PWR)

Item Number in GALL	Description
V.A.1	**Piping, fittings and miscellaneous items**
V.A.1.1	Piping and fittings up to isolation valve
V.A.1.2	Flow orifice/elements
V.A.1.3	Temperature elements/indicators
V.A.1.4	Bolting
V.A.1.5	Eductors
V.A.2	**Headers and spray nozzles**
V.A.2.1	Piping and fittings
V.A.2.2	Flow orifice
V.A.2.3	Headers
V.A.2.4	Spray nozzles
V.A.3	**Pumps**
V.A.3.1	Bowl/casing
V.A.3.2	Bolting
V.A.4	**Valves (hand, control, check, motor-operated, and containment isolation) in containment spray system**
V.A.4.1	Body and bonnet
V.A.4.2	Bolting
V.A.5	**Valves (hand, control, and containment isolation) in headers and spray nozzles**
V.A.5.1	Body and bonnet
V.A.5.2	Bolting
V.A.6	**Containment spray heat exchanger**
V.A.6.1	Bonnet/cover
V.A.6.2	Tubing
V.A.6.3	Shell
V.A.6.4	Case/cover
V.A.6.5	Bolting

List of Item Numbers in the GALL Report
V.B. Standby Gas Treatment System (BWR)

Item Number in GALL	Description
V.B1	**Ductwork**
V.B.1.1	Duct fittings, access doors, and closure bolts
V.B.1.2	Equipment frames and housing
V.B.1.3	Seals between ducts and fan
V.B.1.4	Seals in dampers and doors
V.B.2	**Filters**
V.B.2.1	Housing and supports
V.B.2.2	Elastomer seals

List of Item Numbers in the GALL Report
V.C. Containment Isolation Components

Item Number in GALL	Description
V.C.1	**Isolation barriers**
V.C.1.1	Valve body and bonnet
V.C.1.2	Pipe penetrations

List of Item Numbers in the GALL Report
V.D1. Emergency Core Cooling System (PWR)

Item Number in GALL	Description
V.D1.1	**Piping and fittings**
V.D1.1.1	Core flood system (CFS)
V.D1.1.2	Residual heat removal (RHR) or shutdown cooling (SDC)
V.D1.1.3	High-pressure safety injection (HPSI)
V.D1.1.4	Low-pressure safety injection (LPSI)
V.D1.1.5	Connecting lines to chemical and volume control system (CVCS) and spent fuel pool (SFP) cooling
V.D1.1.6	Lines to emergency sump
V.D1.1.7	Bolting for flange connections
V.D1.2	**HPSI and LPSI pumps**
V.D1.2.1	Bowl/casing
V.D1.2.2	Bolting
V.D1.2.3	Orifice
V.D1.3	**Refueling water tank (RWT) circulation pump**
V.D1.3.1	Bolting
V.D1.4	**Valves**
V.D1.4.1	Body and bonnet
V.D1.4.2	Bolting
V.D1.5	**Heat exchangers (RCP, HPSI and LPSI pump seals, and RHR or SDC)**
V.D1.5.1	Bonnet/cover
V.D1.5.2	Tubing
V.D1.5.3	Shell
V.D1.5.4	Case/cover
V.D1.5.5	Bolting
V.D1.6	**Heat exchangers (RWT heating)**
V.D1.6.1	Bonnet/cover
V.D1.6.2	Tubing
V.D1.6.3	Shell
V.D1.6.4	Bolting
V.D1.7	**Safety injection tank (accumulator)**
V.D1.7.1	Shell
V.D1.7.2	Manway
V.D1.7.3	Penetrations/nozzles
V.D1.8	**Refueling water tank (RWT)**
V.D1.8.1	Shell
V.D1.8.2	Manhole
V.D1.8.3	Penetrations/nozzles
V.D1.8.4	Bolting
V.D1.8.5	Buried portion of tank

List of Item Numbers in the GALL Report
V.D2. Emergency Core Cooling System (BWR)

Item Number in GALL	Description
V.D2.1	**Piping and Fittings**
V.D2.1.1	High-pressure coolant injection (HPCI)
V.D2.1.2	Reactor core isolation cooling (RCIC)
V.D2.1.3	High-pressure core spray (HPCS)
V.D2.1.4	Low-pressure core spray (LPCS)
V.D2.1.5	Low-pressure coolant injection (LPCI) and residual heat removal (RHR)
V.D2.1.6	Lines to suppression chamber (SC)
V.D2.1.7	Lines to drywell and suppression chamber spray system (DSCSS)
V.D2.1.8	Automatic depressurization system (ADS)
V.D2.1.9	Lines to HPCI and RCIC pump turbine
V.D2.1.10	Lines from HPCI and RCIC pump turbines to condenser
V.D2.2	**Pumps (HPCS or HPCI main and booster, LPCS, LPCI or RHR, and RCIC)**
V.D2.2.1	Bowl/casing
V.D2.2.2	Suction head
V.D2.2.3	Discharge head
V.D2.3	**Valves (check, control, hand, motor operated, and relief valves)**
V.D2.3.1	Body and bonnet
V.D2.4	**Heat exchangers (RHR and LPCI)**
V.D2.4.1	Tubes
V.D2.4.2	Tubesheet
V.D2.4.3	Channel head
V.D2.4.4	**Shell**
V.D2.5	**Drywell and suppression chamber spray system (DSCSS)**
V.D2.5.1	Piping and fittings
V.D2.5.2	Flow orifice
V.D2.5.3	Headers
V.D2.5.4	Spray nozzles

List of Item Numbers in the GALL Report
V.E. Carbon Steel Components

Item Number in GALL	Description
V.E.1	**Carbon steel components**
V.E.1.1	External surfaces
V.E.2	**Closure bolting**
V.E.2.1	In high-pressure or high-temperature systems

List of Item Numbers in the GALL Report
VI.A. Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Item Number in GALL	Description
VI.A.1	**Conductor insulation**
VI.A.1.1	Electrical cables and connections exposed to an adverse localized environment caused by heat, radiation, or moisture
VI.A.1.2	Electrical cables used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance (IR) exposed to an adverse localized environment caused by heat, radiation, or moisture
VI.A.1.3	Inaccessible medium voltage (2 kV to 15 kV) cables (e.g., installed in conduit or direct buried) exposed to an adverse localized environment caused by exposure to moisture and voltage
VI.A.2	**Connector contacts**
VI.A.2.1	Electrical connectors exposed to borated water leakage

List of Item Numbers in the GALL Report
VI.B. Equipment Subject to 10 CFR 50.49 Environmental Qualification Requirements

Item Number in GALL	Description
VI.B.1	**Equipment subject to 10 CFR 50.49 environmental qualification requirements**
VI.B.1.1	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements

List of Item Numbers in the GALL Report
VII.A1. New Fuel Storage

Item Number in GALL	Description
VII.A1.1	**New fuel rack**
VII.A1.1.1	New fuel rack assembly

List of Item Numbers in the GALL Report
VII.A2. Spent Fuel Storage

Item Number in GALL	Description
VII.A2.1	**Spent fuel storage rack**
VII.A2.1.1	Neutron-absorbing sheets
VII.A2.1.2	Storage rack

List of Item Numbers in the GALL Report
VII.A3. Spent Fuel Pool Cooling and Cleanup (PWR)

Item Number in GALL	Description
VII.A3.1	**Piping**
VII.A3.1.1	Closure bolting
VII.A3.2	**Filter**
VII.A3.2.1	Housing
VII.A3.2.2	Closure bolting
VII.A3.2.3	Elastomer lining
VII.A3.3	**Valves (check and hand valves)**
VII.A3.3.1	Body and bonnet
VII.A3.3.2	Closure bolting
VII.A3.3.3	Elastomer lining (hand valves only)
VII.A3.4	**Heat exchanger**
VII.A3.4.1	Shell and access cover
VII.A3.4.2	Channel head and access cover
VII.A3.4.3	Closure bolting
VII.A3.5	**Ion exchanger**
VII.A3.5.1	Shell
VII.A3.5.2	Nozzles
VII.A3.5.3	Closure bolting
VII.A3.5.4	Elastomer lining
VII.A3.6	**Pump**
VII.A3.6.1	Closure bolting

List of Item Numbers in the GALL Report
VII.A4. Spent Fuel Pool Cooling and Cleanup (BWR)

Item Number in GALL	Description
VII.A4.1	**Piping**
VII.A4.1.1	Piping, fittings, and flanges
VII.A4.2	**Filter**
VII.A4.2.1	Housing
VII.A4.2.2	Elastomer lining
VII.A4.3	**Valves (check and hand valves)**
VII.A4.3.1	Body and bonnet
VII.A4.3.2	Elastomer lining (hand valves only)
VII.A4.4	**Heat exchanger**
VII.A4.4.1	Shell and access cover
VII.A4.4.2	Channel head and access cover
VII.A4.4.3	Tubes
VII.A4.4.4	Tubesheet
VII.A4.5	**Ion exchanger**
VII.A4.5.1	Shell
VII.A4.5.2	Nozzles
VII.A4.5.3	Elastomer lining
VII.A4.6	**Pump**
VII.A4.6.1	Casing

List of Item Numbers in the GALL Report
VII.A5. Suppression Pool Cleanup System (BWR)

See Evaluation Summary, page VII A5-1, in Volume 2 of the GALL report (NUREG-1801, March 2001).

List of Item Numbers in the GALL Report
VII.B. Overhead Heavy Load and
Light Load (Related to Refueling) Handling Systems

Item Number in GALL	Description
VII.B.1	**Cranes including bridge and trolley (for cranes that fall within the scope of 10 CFR 54)**
VII.B.1.1	Structural girders
VII.B.2	**Rail system**
VII.B.2.1	Rail

List of Item Numbers in the GALL Report
VII.C1. Open-Cycle Cooling Water System (Service Water System)

Item Number in GALL	Description
VII.C1.1	**Piping**
VII.C1.1.1	Piping and fittings
VII.C1.1.2	Underground piping and fittings
VII.C1.2	**Valves**
VII.C1.2.1	Body and bonnet
VII.C1.3	**Heat exchanger**
VII.C1.3.1	Shell
VII.C1.3.2	Channel
VII.C1.3.3	Channel head and access cover
VII.C1.3.4	Tubesheet
VII.C1.3.5	Tubes
VII.C1.4	**Flow orifice**
VII.C1.4.1	Body
VII.C1.5	**Pump**
VII.C1.5.1	Casing
VII.C1.6	**Basket strainer**
VII.C1.6.1	Body

List of Item Numbers in the GALL Report
VII.C2. Closed-Cycle Cooling Water System

Item Number in GALL	Description
VII.C2.1	**Piping**
VII.C2.1.1	Pipe, fittings, and flanges
VII.C2.2	**Valves (check, hand, control, relief, solenoid, and containment isolation valves)**
VII.C2.2.1	Body and bonnet
VII.C2.3	**Pump**
VII.C2.3.1	Casing
VII.C2.4	**Tank**
VII.C2.4.1	Shell
VII.C2.5	**Flow orifice**
VII.C2.5.1	Body

List of Item Numbers in the GALL Report
VII.C3. Ultimate Heat Sink

Item Number in GALL	Description
VII.C3.1	**Piping**
VII.C3.1.1	Piping and fittings
VII.C3.2	**Valves (check, hand, and control valves)**
VII.C3.2.1	Body and bonnet
VII.C3.3	**Pump**
VII.C3.3.1	Casing

List of Item Numbers in the GALL Report
VII.D. Compressed Air System

Item Number in GALL	Description
VII.D.1	**Piping**
VII.D.1.1	Piping and fittings
VII.D.1.2	Closure bolting
VII.D.2	**Valves (including check valves and containment isolation valves)**
VII.D.2.1	Body and bonnet
VII.D.2.2	Closure bolting
VII.D.3	**Air receiver**
VII.D.3.1	Shell and access cover
VII.D.3.2	Closure bolting
VII.D.4	**Pressure regulators**
VII.D.4.1	Body and bonnet
VII.D.5	**Filter**
VII.D.5.1	Shell and access cover
VII.D.5.2	Closure bolting
VII.D.6	**Dryer**
VII.D.6.1	Shell and access cover
VII.D.6.2	Closure bolting

List of Item Numbers in the GALL Report
VII.E1. Chemical and Volume Control System (PWR)

Item Number in GALL	Description
VII.E1.1	**High-pressure piping (1,500 psig rating)**
VII.E1.1.1	Pipe, fittings, and flanges
VII.E1.1.2	Closure bolting
VII.E1.2	**Low-pressure piping (150 psig rating)**
VII.E1.2.1	Closure bolting
VII.E1.3	**High-pressure valves (check, control, hand, motor-operated, pressure control, and relief valves)**
VII.E1.3.1	Body and bonnet
VII.E1.3.2	Closure bolting
VII.E1.4	**Low-pressure valves (check, control, hand, motor-operated, pressure control, and relief valves)**
VII.E1.4.1	Closure bolting
VII.E1.5	**High-pressure pump**
VII.E1.5.1	Casing
VII.E1.5.2	Closure bolting
VII.E1.6	**Low-pressure pump**
VII.E1.6.1	Closure bolting
VII.E1.7	**Regenerative heat exchanger**
VII.E1.7.1	Channel head and access cover
VII.E1.7.2	Tubesheet
VII.E1.7.3	Tubes
VII.E1.7.4	Shell and access cover
VII.E1.7.5	Closure bolting
VII.E1.8	**Letdown heat exchanger**
VII.E1.8.1	Channel head and access cover
VII.E1.8.2	Tubesheet
VII.E1.8.3	Tubes
VII.E1.8.4	Shell and access cover
VII.E1.8.5	Closure bolting
VII.E1.9	**Basket strainers**
VII.E1.9.1	Closure bolting
VII.E1.10	**Volume control tank**
VII.E1.10.1	Closure bolting

List of Item Numbers in the GALL Report
VII.E2. Standby Liquid Control System (BWR)

Item Number in GALL	Description
VII.E2.1	**Piping**
VII.E2.1.1	Piping and fittings
VII.E2.2	**Solution storage**
VII.E2.2.1	Tank
VII.E2.2.2	Tank heaters
VII.E2.3	**Valves (pump suction, relief, injection, containment isolation, and explosive actuated discharge valves)**
VII.E2.3.1	Body and bonnet
VII.E2.4	**Injection pumps**
VII.E2.4.1	Casing

List of Item Numbers in the GALL Report
VII.E3. Reactor Water Cleanup System (BWR)

Item Number in GALL	Description
VII.E3.1	**Piping**
VII.E3.1.1	Piping and fittings (beyond second isolation valves)
VII.E3.2	**Reactor water cleanup (RWCU) pump**
VII.E3.2.1	Casing
VII.E3.3	**Regenerative heat exchanger**
VII.E3.3.1	Channel head and access cover
VII.E3.3.2	Tubesheet
VII.E3.3.3	Tubes
VII.E3.3.4	Shell and access cover
VII.E3.4	**Nonregenerative heat exchanger**
VII.E3.4.1	Channel head and access cover
VII.E3.4.2	Tubesheet
VII.E3.4.3	Tubes
VII.E3.4.4	Shell and access cover

List of Item Numbers in the GALL Report
VII.E4. Shutdown Cooling System (Older BWR)

Item Number in GALL	Description
VII.E4.1	**Piping**
VII.E4.1.1	Piping and fittings
VII.E4.2	**Pump**
VII.E4.2.1	Casing
VII.E4.3	**Valves (check, control, hand, motor-operated, and relief valves)**
VII.E4.3.1	Body and bonnet
VII.E4.4	**Heat Exchanger**
VII.E4.4.1	Channel head and access cover
VII.E4.4.2	Tubesheet
VII.E4.4.3	Tubes
VII.E4.4.4	Shell and access cover

List of Item Numbers in the GALL Report
VII.F1. Control Room Area Ventilation System

Item Number in GALL	Description
VII.F1.1	**Duct**
VII.F1.1.1	Duct fittings, access doors, and closure bolts
VII.F1.1.2	Equipment frames and housing
VII.F1.1.3	Flexible collars between ducts and fans
VII.F1.1.4	Seals in dampers and doors
VII.F1.2	**Air handler heating/cooling**
VII.F1.2.1	Heating/cooling coils
VII.F1.3	**Piping**
VII.F1.3.1	Piping and fittings
VII.F1.4	**Filters**
VII.F1.4.1	Housing and supports
VII.F1.4.2	Elastomer seals

List of Item Numbers in the GALL Report
VII.F2. Auxiliary and Radwaste Area Ventilation System

Item Number in GALL	Description
VII.F2.1	**Duct**
VII.F2.1.1	Duct fittings, access doors, and closure bolts
VII.F2.1.2	Equipment frames and housing
VII.F2.1.3	Flexible collars between ducts and fans
VII.F2.1.4	Seals in dampers and doors
VII.F2.2	**Air handler heating/cooling**
VII.F2.2.1	Heating/cooling coils
VII.F2.3	**Piping**
VII.F2.3.1	Piping and fittings
VII.F2.4	**Filters**
VII.F2.4.1	Housing and supports
VII.F2.4.2	Elastomer seals

List of Item Numbers in the GALL Report
VII. F3. Primary Containment Area Ventilation System

Item Number in GALL	Description
VII.F3.1	**Duct**
VII.F3.1.1	Duct fittings, access doors, and closure bolts
VII.F3.1.2	Equipment frames and housing
VII.F3.1.3	Flexible collars between ducts and fans
VII.F3.1.4	Seals in dampers and doors
VII.F3.2	**Air handler heating/cooling**
VII.F3.2.1	Heating/cooling coils
VII.F3.3	**Piping**
VII.F3.3.1	Piping and fittings
VII.F3.4	**Filters**
VII.F3.4.1	Housing and supports
VII.F3.4.2	Elastomer seals

List of Item Numbers in the GALL Report
VII.F4. Diesel Generator Building Ventilation System

Item Number in GALL	Description
VII.F4.1	**Duct**
VII.F4.1.1	Duct fittings, access doors, and closure bolts
VII.F4.1.2	Equipment frames and housing
VII.F4.1.3	Flexible collars between ducts and fans
VII.F4.1.4	Seals in dampers and doors
VII.F4.2	**Air handler heating/cooling**
VII.F4.2.1	Heating/cooling coils
VII.F4.3	**Piping**
VII.F4.3.1	Piping and fittings

List of Item Numbers in the GALL Report
VII.G. Fire Protection

Item Number in GALL	Description
VII.G.1	**Intake structure**
VII.G.1.1	Fire barrier penetration seals
VII.G.1.2	Fire barrier walls, ceilings, and floors
VII.G.1.3	Fire rated doors
VII.G.2	**Turbine building**
VII.G.2.1	Fire barrier penetration seals
VII.G.2.2	Fire barrier walls, ceilings, and floors
VII.G.2.3	Fire rated doors
VII.G.3	**Auxiliary building**
VII.G.3.1	Fire barrier penetration seals
VII.G.3.2	Fire barrier walls, ceilings, and floors
VII.G.3.3	Fire rated doors
VII.G.4	**Diesel generator building**
VII.G.4.1	Fire barrier penetration seals
VII.G.4.2	Fire barrier walls, ceilings, and floors
VII.G.4.3	Fire rated doors
VII.G.5	**Primary containment**
VII.G.5.1	Fire barrier walls, ceilings, and floors
VII.G.5.2	Fire rated doors
VII.G.6	**Water-based fire protection system**
VII.G.6.1	Piping and fittings
VII.G.6.2	Filter, fire hydrants, mulsifier, pump casing, sprinkler, strainer, and valve bodies (including containment isolation valves)
VII.G.7	**Reactor coolant pump oil collection system**
VII.G.7.1	Tank
VII.G.7.2	Piping, tubing, and valve bodies
VII.G.8	**Diesel fire system**
VII.G.8.1	Diesel-driven fire pump and fuel supply line

List of Item Numbers in the GALL Report
VII.H1. Diesel Fuel Oil System

Item Number in GALL	Description
VII.H1.1	**Piping**
VII.H1.1.1	Aboveground pipe and fittings
VII.H1.1.2	Underground pipe and fittings
VII.H1.2	**Valves**
VII.H1.2.1	Body and bonnet
VII.H1.2.2	Closure bolting
VII.H1.3	**Pump**
VII.H1.3.1	Casing
VII.H1.3.2	Closure bolting
VII.H1.4	**Tank**
VII.H1.4.1	Internal surfaces
VII.H1.4.2	External surfaces

List of Item Numbers in the GALL Report
VII.H2. Emergency Diesel Generator System

Item Number in GALL	Description
VII.H2.1	**Diesel engine cooling water subsystem**
VII.H2.1.1	Pipe and fittings
VII.H2.2	**Diesel engine starting air subsystem**
VII.H2.2.1	Pipe and fittings
VII.H2.2.2	Valves (hand and check)
VII.H2.2.3	Drain trap
VII.H2.2.4	Air accumulator vessel
VII.H2.3	**Diesel engine combustion air intake subsystem**
VII.H2.3.1	Piping and fittings
VII.H2.3.2	Filter
VII.H2.3.3	Muffler
VII.H2.4	**Diesel engine combustion air exhaust subsystem**
VII.H2.4.1	Piping and fittings
VII.H2.4.2	Muffler
VII.H2.5	**Diesel engine fuel oil subsystem**
VII.H2.5.1	Tanks (day and drip)

List of Item Numbers in the GALL Report
VII.I. Carbon Steel Components

Item Number in GALL	Description
VII.I.1	**Carbon steel components**
VII.I.1.1	External surfaces
VII.I.2	**Closure bolting**
VII.I.2.1	In high-pressure or high-temperature systems

List of Item Numbers in the GALL Report
VIII.A. Steam Turbine System

Item Number in GALL	Description
VIII.A.1	**Piping and fittings**
VIII.A.1.1	High-pressure (HP) turbine to moisture separator/reheater (MSR)
VIII.A.1.2	MSR to low-pressure (LP) turbine
VIII.A.2	**Valves (stop, control or governor, intermediate stop and control or combined intermediate, bypass or steam dumps, atmospheric dumps, main steam safety, or safety/relief)**
VIII.A.2.1	Body and bonnet

List of Item Numbers in the GALL Report
VIII.B1. Main Steam System (PWR)

Item Number in GALL	Description
VIII.B1.1	**Piping and fittings**
VIII.B1.1.1	Steam lines from steam generator to isolation valves (Group B or C)
VIII.B1.1.2	Steam lines from isolation valves to main turbine (Group D)
VIII.B1.1.3	Lines to feedwater (FW) and auxiliary feedwater (AFW) pump turbines
VIII.B1.1.4	Lines to moisture separator/reheater (MSR)
VIII.B1.1.5	Turbine bypass
VIII.B1.1.6	Steam drains
VIII.B1.2	**Valves (check, control, hand, motor operated, safety, and containment isolation valves)**
VIII.B1.2.1	Body and bonnet

List of Item Numbers in the GALL Report
VIII.B2. Main Steam System (BWR)

Item Number in GALL	Description
VIII.B2.1	**Piping and fittings**
VIII.B2.1.1	Steam lines to main turbine (Group B)
VIII.B2.1.2	Steam lines to main turbine (Group D)
VIII.B2.1.3	Lines to FW pump turbines
VIII.B2.1.4	Turbine bypass
VIII.B2.1.5	Steam drains
VIII.B2.1.6	Steam line to HPCI turbine
VIII.B2.1.7	Steam line to RCIC turbine
VIII.B2.2	**Valves (check, control, hand, motor-operated, and safety valves)**
VIII.B2.2.1	Body and bonnet

List of Item Numbers in the GALL Report
VIII.C. Extraction Steam System

Item Number in GALL	Description
VIII.C.1	**Piping and fittings**
VIII.C.1.1	Lines to feedwater heaters
VIII.C.1.2	Steam drains
VIII.C.2	**Valves**
VIII.C.2.1	Body and bonnet

List of Item Numbers in the GALL Report
VIII.D1. Feedwater Systems (PWR)

Item Number in GALL	Description
VIII.D1.1	**Main feedwater line**
VIII.D1.1.1	Pipe and fittings (Group B, C, or D)
VIII.D1.2	**Valves (control, check, hand, safety, and containment isolation valves)**
VIII.D1.2.1	Body and bonnet
VIII.D1.3	**Feedwater pump (steam turbine and motor driven)**
VIII.D1.3.1	Casing
VIII.D1.3.2	Suction and discharge lines

List of Item Numbers in the GALL Report
VIII.D2. Feedwater Systems (BWR)

Item Number in GALL	Description
VIII.D2.1	**Main feedwater line**
VIII.D2.1.1	Pipe and fittings (Group B or D)
VIII.D2.2	**Valves (control, check, and hand valves)**
VIII.D2.2.1	Body and bonnet
VIII.D2.3	**Feedwater pump (steam turbine and motor driven)**
VIII.D2.3.1	Casing
VIII.D2.3.2	Suction and discharge lines

List of Item Numbers in the GALL Report
VIII.E. Condensate System

Item Number in GALL	Description
VIII.E.1	**Condensate lines**
VIII.E.1.1	Piping and fittings
VIII.E.2	**Valves**
VIII.E.2.1	Body and bonnet
VIII.E.3	**Condensate pumps (main and booster pumps)**
VIII.E.3.1	Casing
VIII.E.4	**Condensate coolers/condensers**
VIII.E.4.1	Tubes
VIII.E.4.2	Tubesheet
VIII.E.4.3	Channel head
VIII.E.4.4	Shell
VIII.E.5	**Condensate storage**
VIII.E.5.1	Tank
VIII.E.6	**Condensate cleanup system**
VIII.E.6.1	Piping and fittings
VIII.E.6.2	Demineralizer
VIII.E.6.3	Strainer

List of Item Numbers in the GALL Report
VIII.F. Steam Generator Blowdown System (PWR)

Item Number in GALL	Description
VIII.F.1	**Blowdown lines**
VIII.F.1.1	Pipe and fittings (Group B)
VIII.F.1.2	Pipe and fittings (Group D)
VIII.F.2	**Valves (including containment isolation valves)**
VIII.F.2.1	Body and bonnet
VIII.F.3	**Blowdown pump**
VIII.F.3.1	Casing
VIII.F.4	**Blowdown heat exchanger**
VIII.F.4.1	Tubes
VIII.F.4.2	Tubesheet
VIII.F.4.3	Channel head and access cover
VIII.F.4.4	Shell and access cover

List of Item Numbers in the GALL Report
VIII.G. Auxiliary Feedwater (AFW) System (PWR)

Item Number in GALL	Description
VIII.G.1	**Auxiliary feedwater piping**
VIII.G.1.1	Pipe and fittings (above ground)
VIII.G.1.2	Pipe and fittings (buried)
VIII.G.2	**AFW pumps (steam turbine and motor driven)**
VIII.G.2.1	Casing
VIII.G.2.2	Suction and discharge lines
VIII.G.3	**Valves (control, check, hand, and containment isolation valves)**
VIII.G.3.1	Body and bonnet
VIII.G.4	**Condensate storage (emergency)**
VIII.G.4.1	Tank
VIII.G.5	**Bearing oil coolers** (for steam turbine pump)
VIII.G.5.1	Shell
VIII.G.5.2	Tubes
VIII.G.5.3	Tubesheet

List of Item Numbers in the GALL Report
VIII.H. Carbon Steel Components

Item Number in GALL	Description
VIII.H.1	**Carbon steel components**
VIII.H.1.1	External surfaces
VIII.H.2	**Closure bolting**
VIII.H.2.1	In high-pressure or high-temperature systems