LICENSE RENEWAL APPLICATION

VERMONT YANKEE
NUCLEAR POWER STATION

PREFACE

The following describes the information location, layout, and editorial conventions in the Vermont Yankee Nuclear Power Station (VYNPS) License Renewal Application (hereinafter referred to as "this application" or "the application"). Abbreviated names and acronyms used throughout the application are defined in the table at the end of this preface. Commonly understood terms (such as U.S.) and terms used only in referenced document numbers may not be identified in this table. Regulatory documents such as NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, and 10 CFR Part 54 - *Requirements for Renewal of Operating Licenses for Nuclear Power Plants* (the license renewal rule) are referred to by the document number, i.e., NUREG-1801 and 10 CFR 54, respectively. References to the UFSAR are to the VYNPS Updated Final Safety Analysis Report.

Section 1 provides administrative information required by 10 CFR 54.17 and 10 CFR 54.19.

Section 2 describes and justifies the methods used to determine the systems and structures within the scope of license renewal and the structures and components subject to aging management review. The results of the system and structure scoping are provided in Tables 2.2-1 through 2.2-4. Tables 2.2-1a, 2.2-1b and 2.2-3 list mechanical systems, electrical systems and structures, respectively, within the scope of license renewal. Tables 2.2-2 and 2.2-4 list the systems and structures, respectively, not in the scope of license renewal. Section 2 also provides descriptions of in-scope systems and structures and their intended functions with tables identifying components and commodities requiring aging management review and their component intended functions. References are provided to the results of the aging management review in Section 3. The descriptions of systems in Section 2 identify license renewal drawings that document the components subject to aging management review for mechanical systems. The drawings are provided in a separate submittal.

Section 3 describes the results of aging management reviews of mechanical, electrical and structural components requiring aging management review. Section 3 is divided into sections that address (1) the reactor vessel, internals, and reactor coolant system, (2) engineered safety features, (3) auxiliary systems, (4) steam and power conversion systems, (5) containment, structures, and component supports, and (6) electrical and instrumentation and controls. The tables in Section 3 provide a summary of information concerning aging effects requiring management and applicable aging management programs for component and commodity groups subject to aging management review. The information presented in the tables is based on the format and content of NUREG-1800, *Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants*, Revision 1, U. S. Nuclear Regulatory Commission, September 2005. The tables include comparisons with the evaluations documented in NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 1, U. S. Nuclear Regulatory Commission, September 2005.

Section 4 addresses time-limited aging analyses, as defined by 10 CFR 54.3. It includes identification of the component or subject and an explanation of the time-dependent aspects of the calculation or analysis. Section 4 demonstrates whether (1) the analyses remain valid for the period of extended operation, (2) the analyses have been projected to the end of the period of extended operation, or (3) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Section 4 also confirms that no 10 CFR 50.12 exemption involving a time-limited aging analysis as defined in 10 CFR 54.3 is required during the period of extended operation. The information in Section 4 fulfills the requirements in 10 CFR 54.21(c).

Appendix A, Updated Final Safety Analysis Report Supplement, provides a summary description of programs and activities for managing the effects of aging for the period of extended operation. A summary description of the evaluation of time-limited aging analyses for the period of extended operation is also included. Following issuance of the renewed license, the material contained in this appendix will be incorporated into the UFSAR. The information in Appendix A fulfills the requirements in 10 CFR 54.21(d).

Appendix B, Aging Management Programs, describes aging management programs and activities that will manage aging effects on components and structures within the scope of license renewal such that they will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. Appendix B contains a comparison of the VYNPS programs to the programs evaluated in NUREG-1801. The information in Section 2, Section 3, and Appendix B fulfills the requirements of 10 CFR 54.21(a).

Appendix C is the VYNPS response to BWRVIP Applicant Action Items. License renewal application action items identified in the corresponding NRC safety evaluation (SE) for each of the reports listed are addressed in this appendix.

Appendix D, Technical Specification Changes, concludes that no technical specification changes are necessary to manage the effects of aging during the period of extended operation. The information in Appendix D fulfills the requirements in 10 CFR 54.22.

Appendix E is the environmental information which fulfills the requirements of 10 CFR 54.23 and 10 CFR 51.53(c).

ABBREVIATIONS AND ACRONYMS

Abbreviation or Acronym	Description
AAC	Alternate AC
AC	alternating current
ACI	American Concrete Institute
AEC	Atomic Energy Commission
AISC	American Institute of Steel Construction
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
AWWA	American Water Works Association
B&PV	Boiler and Pressure Vessel
BWR	boiling water reactor
BWRVIP	Boiling Water Reactor Vessel and Internals Project
CASS	cast austenitic stainless steel
CBI	Chicago Bridge & Iron
CDF	core damage frequency
CEA	control element assembly
CFR	Code of Federal Regulations
CLB	current licensing basis
CMAA	Crane Manufacturers Association of America
CPPU	constant pressure power uprate
CST	condensate storage and transfer
CUF	cumulative usage factor
C_VUSE	Charpy upper-shelf energy

Abbreviation or Acronym	**Description**
DBA	design basis accident
DC	direct current
ECCS	emergency core cooling system
EDG	emergency diesel generator
EFPD	effective full power days
EFPY	effective full power years
EIC	electrical and instrumentation and control
ENO	Entergy Nuclear Operations, Inc.
Entergy VY	Entergy Nuclear Vermont Yankee, LLC
EPRI	Electric Power Research Institute
EQ	environmental qualification
ER	Applicant's Environmental Report—Operating License Renewal Stage
ESF	engineered safety features
FAP	fatigue action plan
ft-lb	foot-pound
FIV	flow-induced vibration
FP	fire protection
GALL	NUREG-1801, *Generic Aging Lessons Learned Report*
GDC	General Design Criterion
GL	Generic Letter
GSI	Generic Safety Issue
HELB	high-energy line break
HPCI	high pressure coolant injection

Abbreviation or Acronym	**Description**
HVAC	heating, ventilation, and air conditioning
I&C	instrumentation and controls
IASCC	irradiation-assisted stress corrosion cracking
ID	inside diameter
IGSCC	intergranular stress corrosion cracking
IN	Information Notice
INEL	Idaho National Engineering Laboratory
IPA	integrated plant assessment
IR	insulation resistance
ISG	Interim Staff Guidance
ISI	inservice inspection
ksi	1000 pounds per square inch
KV or kV	kilo-volt
KW	kilo-Watt
LOCA	loss of coolant accident
LPCI	low pressure coolant injection
LRA	license renewal application
MeV	mega-electron volt
MIC	microbiologically influenced corrosion
MWe	megawatts-electric
MWt	megawatts-thermal
N_2	nitrogen
NaOH	sodium hydroxide
NBVI	nuclear boiler vessel instrumentation

Abbreviation or Acronym	**Description**
n/cm^2	neutrons per square centimeter
NDE	non-destructive examinations
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NPS	nominal pipe size
NRC	Nuclear Regulatory Commission
NSSS	nuclear steam supply system
PASS	post-accident sampling system
pH	potential hydrogen
ppm	parts per million
P-T	pressure-temperature
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RCS	reactor coolant system
RHR	residual heat removal
RTD	resistance temperature detector
RV	reactor vessel
RVI	reactor vessel internals
RVID	reactor vessel integrity database
SBO	station blackout
SCC	stress corrosion cracking

Abbreviation or Acronym	Description
SER	Safety Evaluation Report
SFP	spent fuel pool
SIF	stress intensification factor
SRV	safety/relief valve
SS	stainless steel
SSC	system, structure, or component
SW	service water
TLAA	time-limited aging analysis (analyses)
USAS	USA Standard
UFSAR	Updated Final Safety Analysis Report
USE	upper-shelf energy
UT	ultrasonic testing
VYNPS	Vermont Yankee Nuclear Power Station
1/4 T	one fourth of the way through the vessel wall

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 ADMINISTRATIVE INFORMATION

Pursuant to Part 54 of Title 10 of the Code of Federal Regulations (10 CFR 54), this application seeks renewal for an additional 20-year term of the facility operating license for Vermont Yankee Nuclear Power Station (VYNPS). The facility operating license (DPR-28) expires at midnight March 21, 2012. The application applies to renewal of the source, special nuclear, and by-product materials licenses that are combined in the facility operating license.

The application is based on guidance provided by the U.S. Nuclear Regulatory Commission in NUREG-1800, *Standard Review Plan (SRP) for Review for License Renewal Applications for Nuclear Power Plants*, Revision 1, September 2005, and Regulatory Guide 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," Revision 1, September 2005, and guidance provided by NEI 95-10, *Industry Guidelines for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule*, Revision 6, June 2005.

The license renewal application is intended to provide sufficient information for the NRC to complete its technical and environmental reviews pursuant to 10 CFR Parts 54 and 51, respectively. The license renewal application is designed to allow the NRC to make the findings required by 10 CFR 54.29 in support of the issuance of a renewed facility operating license for VYNPS.

1.1 GENERAL INFORMATION

The following is the general information required by 10 CFR 54.17 and 10 CFR 54.19.

1.1.1 Name of Applicant

Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc.

1.1.2 Address of Applicant

440 Hamilton Avenue
White Plains, New York 10601

1.1.3 Description of Business of Applicant

Entergy Nuclear Vermont Yankee, LLC (Entergy VY), is engaged principally in the business of owning all or part of a nuclear power facility and selling electric energy at wholesale in the United States. Entergy Nuclear Operations, Inc. (ENO), is engaged principally in the business of operating nuclear power facilities.

1.1.4 Legal Status and Organization

Entergy VY, a Delaware limited liability company, is an indirect wholly owned subsidiary of Entergy Corporation, and an indirect wholly owned subsidiary of Entergy Nuclear Holding Company #3. The principal office is located in Vernon, Vermont. An additional office is located in Brattleboro, Vermont.

ENO, a Delaware corporation, is an indirect wholly owned subsidiary of Entergy Corporation, and a direct wholly owned subsidiary of Entergy Holding Company #2. The principal place of business is located in White Plains, New York.

Entergy VY and ENO are not owned, controlled, or dominated by any alien, a foreign corporation, or foreign government. Entergy VY and ENO make this application on their own behalf and are not acting as an agent or representative of any other person.

Entergy VY has no board of directors. It is governed by a management committee comprising Gary J. Taylor only.

The names and addresses of the principal officers of Entergy VY are as follows.

Gary J. Taylor Chief Executive Officer and Chief Nuclear Officer	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Leo P. Denault Executive Vice President and Chief Financial Officer	Entergy Corporation 500 Clinton Center Drive Clinton, Mississippi 39056
Steven C. McNeal Vice President and Treasurer	Entergy Corporation 20 Greenway Plaza Houston, TX 77046
Robert D. Sloan Executive Vice President, General Counsel and Secretary	Entergy Corporation 500 Clinton Center Drive Clinton, Mississippi 39056
Michael R. Kansler President - Entergy Nuclear Operations, Inc.	Entergy Nuclear Operations, Inc. 440 Hamilton Avenue White Plains, New York 10601
John T. Herron Sr. Vice President and Chief Operating Officer	Entergy Nuclear Operations, Inc. 440 Hamilton Avenue White Plains, New York 10601

The names and addresses of the directors of ENO are as follows.

Gary J. Taylor Chief Executive Officer and Chief Nuclear Officer	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Michael R. Kansler President - Entergy Nuclear Operations, Inc.	Entergy Nuclear Operations, Inc. 440 Hamilton Avenue White Plains, New York 10601
Leo P. Denault Executive Vice President and Chief Financial Officer	Entergy Corporation 500 Clinton Center Drive Clinton, Mississippi 39056

The names and addresses of the principal officers of ENO are as follows.

Gary J. Taylor Chief Executive Officer and Chief Nuclear Officer	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Leo P. Denault Executive Vice President and Chief Financial Officer	Entergy Corporation 500 Clinton Center Drive Clinton, Mississippi 39056
Steven C. McNeal Vice President and Treasurer	Entergy Corporation 20 Greenway Plaza Houston, TX 77046
Michael R. Kansler President - Entergy Nuclear Operations, Inc.	Entergy Nuclear Operations, Inc. 440 Hamilton Avenue White Plains, New York 10601
John T. Herron Sr. Vice President and Chief Operating Officer	Entergy Nuclear Operations, Inc. 440 Hamilton Avenue White Plains, New York 10601
Oscar Limpias Vice President, Engineering - Northeast	Entergy Nuclear Operations, Inc. 440 Hamilton Avenue White Plains, New York 10601
C. Randy Hutchinson Sr. Vice President, Business Development	Entergy Nuclear, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Robert D. Sloan Executive Vice President, General Counsel and Secretary	Entergy Corporation 500 Clinton Center Drive Clinton, Mississippi 39056

Michael A. Balduzzi Vice President - Pilgrim Nuclear Power Station	Pilgrim Nuclear Power Station 600 Rocky Hill Road Plymouth, Massachusetts 02360
Fred R. Dacimo Vice President - Indian Point Energy Center	Indian Point Energy Center Bleakley Avenue & Broadway Buchanon, New York 10511
Randall K. Edington Vice President - Operations Support	Cooper Nuclear Power Station 1200 Prospect Road P.O. Box 98 Brownsville, Nebraska 68321
Christopher J. Schwarz Vice President - Operations Support	Entergy Nuclear Operations, Inc 440 Hamilton Avenue White Plains, New York 10601
Theodore A. Sullivan Vice President - Fitzpatrick Nuclear Power Station	Fitzpatrick Nuclear Power Station 268 Lake Road East Lycoming, New York 13093
Jay K. Thayer Vice President - Vermont Yankee Nuclear Power Station	Entergy Nuclear Vermont Yankee Corporate Office P.O. Box 0500 185 Old Ferry Road Brattleboro, VT 05302-0500

1.1.5 Class and Period of License Sought

ENO requests renewal of the facility operating license for VYNPS (facility operating license DPR-28) for a period of 20 years. The license was issued under Section 104b of the Atomic Energy Act of 1954 as amended. License renewal would extend the facility operating license from midnight March 21, 2012, to midnight March 21, 2032.

This application also applies to renewal of those NRC source materials, special nuclear material, and by-product material licenses that are subsumed or combined with the facility operating license.

1.1.6 Alteration Schedule

ENO does not propose to construct or alter any production or utilization facility in connection with this renewal application.

1.1.7 Regulatory Agencies with Jurisdiction

The VYNPS license renewal will require approval of the Vermont Public Service Board. The address of this state commission is as follows.

Vermont Public Service Board
112 State Street (Chittenden Bank Building Drawer 20)
Montpelier, Vermont 05620-2701

Other regulatory agencies with jurisdiction over the station are listed below.

Federal Energy Regulatory Commission
888 First St. N. E.
Washington, DC 20426

Securities and Exchange Commission
450 Fifth Street NW
Washington, DC 20549

1.1.8 Local News Publications

The trade and news publications which circulate in the area surrounding VYNPS, and which are considered appropriate to give reasonable notice of the renewal application to those municipalities, private utilities, public bodies, and cooperatives that might have a potential interest in the facility, include the following.

Brattleboro Reformer
62 Black Mountain Road
Brattleboro, VT 05301

Greenfield Recorder
P.O. Box 1367
Greenfield, MA 01302

Keene Sentinel
60 West St.
Keene, NH 03431

Rutland Herald
27 Wales St.
P.O. Box 668
Rutland, VT 05702

1.1.9 Conforming Changes to Standard Indemnity Agreement

10 CFR 54.19(b) requires that license renewal applications include, "conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." The current indemnity agreement for VYNPS states in Article VII that the agreement shall terminate at the time of expiration of the license specified in Item 3 of the attachment to the agreement, which is the last to expire. Item 3 of the attachment to the indemnity agreement, as revised by Amendment No. 6, lists VYNPS operating license number DPR-28. ENO requests that conforming changes be made to Article VII of the indemnity agreement, and Item 3 of the attachment to that agreement, specifying the extension of agreement until the expiration date of the renewed VYNPS facility operating license sought in this application. In addition, should the license number be changed upon issuance of the renewal license, ENO requests that conforming changes be made to Item 3 of the attachment and other sections of the indemnity agreement as appropriate.

1.1.10 Restricted Data Agreement

This application does not contain restricted data or national security information, and ENO does not expect that any activity under the renewed license for VYNPS will involve such information. However, if such information were to become involved, ENO agrees that it will appropriately safeguard such information and not permit any individual to have access to, or any facility to possess, such information until the individual or facility has been approved under the provisions of 10 CFR Parts 25 or 95.

1.2 PLANT DESCRIPTION

The VYNPS site is located in the town of Vernon, Vermont, in Windham County on the west shore of the Connecticut River immediately upstream of the Vernon Hydroelectric Station. VYNPS employs a General Electric boiling water reactor nuclear steam supply system licensed to generate 1593 megawatts - thermal (MWt). The current facility operating license for VYNPS expires at midnight, March 21, 2012. The principal structures at VYNPS include a reactor building, primary containment, control building, radwaste building, intake structure, turbine building, cooling towers and main stack.

2.0 SCOPING AND SCREENING METHODOLOGY FOR IDENTIFYING STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW AND IMPLEMENTATION RESULTS

This chapter describes the process for identification of structures and components subject to aging management review in the Vermont Yankee Nuclear Power Station (VYNPS) integrated plant assessment (IPA). For those systems, structures, and components (SSCs) within the scope of license renewal, 10 CFR 54.21(a)(1) requires the license renewal applicant to identify and list structures and components subject to aging management review. Furthermore, 10 CFR 54.21(a)(2) requires that methods used to identify these structures and components be described and justified. Technical information in this chapter serves to satisfy these requirements.

The scoping and screening method is described in Section 2.1. This method is implemented in accordance with NEI 95-10, *Industry Guidelines for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule*, Revision 6, June 2005. The results of the assessment to identify the systems and structures within the scope of license renewal (plant level scoping) are in Section 2.2. The results of the identification of the components and structural components subject to aging management review (screening) are in Section 2.3 for mechanical systems, Section 2.4 for structures, and Section 2.5 for electrical and instrumentation and controls systems.

Table 2.0-1 gives the expanded definitions of intended functions used in this application for structures and components. The tables in the application may refer to either the intended function name or to the abbreviation.

The term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. If such components have unique tag numbers or the specific component has a function other than pressure boundary, then flow elements, orifices and thermowells are identified as a separate component type.

The term “heat exchanger (shell)” may include the bonnet/channel head and tubesheet. In cases where the bonnet/channel head and tubesheet provide a unique material and environment combination, they will be uniquely identified as a separate component type.

The general component type of “tank” includes components identified as tanks or accumulators on LRA drawings.

Table 2.0-1
Intended Functions: Abbreviations and Definitions

Abbreviation	Intended Function	Definition
CE	Conducts electricity	Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals.
EN	Shelter or protection	Provide shelter or protection to safety-related equipment (including radiation shielding and pipe whip restraint).
FB	Fire barrier	Provide rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant.
FC	Flow control	Provide flow control.
FD	Flow distribution	Provide for flow distribution or establish spray pattern.
FLB	Flood barrier	Provide protective barrier for internal/external flood events.
FLT	Filtration	Provide filtration.
FLV	Floodable volume	Maintain the boundary of a volume in which the core can be flooded and adequately cooled in the event of a breach in the nuclear system process barrier external to the reactor vessel.
HELB	HELB shielding	Provide shielding against high energy line breaks (HELB).
HS	Heat sink	Provide heat sink during station blackout or design basis accidents.
HT	Heat transfer	Provide heat transfer.
IN	Insulation (electrical)	Insulate and support an electrical conductor.
INS	Insulation	Provide insulating characteristics to reduce heat transfer
MB	Missile barrier	Provide missile (internal or external) barrier.
NA	Neutron absorption	Absorb neutrons.
PB	Pressure boundary	Provide pressure boundary. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary may include providing structural/seismic support for components outside the safety class pressure boundary.

Table 2.0-1
Intended Functions: Abbreviations and Definitions
(Continued)

Abbreviation	Intended Function	Definition
PLT	Plateout	Provide holdup and plateout of fission products
SNS	Support for Criterion (a)(2) equipment	Provide structural or functional support to nonsafety-related equipment whose failure could impact safety-related equipment (10 CFR 54.4(a)(2)).
SRE	Support for Criterion (a)(3) equipment	Provide structural or functional support to equipment required to meet the Commission’s regulations for the five regulated events in 10 CFR 54.4(a)(3).
SSR	Support for Criterion (a)(1) equipment	Provide structural or functional support for safety-related equipment.
STR	Structural integrity	Maintain structural integrity such that loose parts are not introduced into the system.

2.1 SCOPING AND SCREENING METHODOLOGY

2.1.1 Scoping Methodology

The license renewal rule (10 CFR 54) (Reference 2.1-1) defines the scope of license renewal. As stated in 10 CFR 54.4(a), systems, structures, and components (SSCs) are required to be included in the license renewal process if they are—

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

  (i) The integrity of the reactor coolant pressure boundary;
  (ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or
  (iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in §50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable.[1]

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

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

NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule* (Reference 2.1-5)**,** provides industry guidance for determining what SSCs are in the scope of license renewal. The process used to determine the systems and structures in the scope of license renewal for VYNPS followed the recommendations of NEI 95-10.

Consistent with NEI 95-10, the scoping process consisted of developing a list of plant systems and structures and identifying their intended functions. Intended functions are those functions that are the basis for including a system or structure within the scope of license renewal (as defined in 10 CFR 54.4(b)) and are identified by comparing the system or structure function with the criteria in 10 CFR 54.4(a).

1. VYNPS has amended its operating license (Reference 2.1-10) to allow use of an alternative source term for accident analyses in accordance with 10 CFR 50.67 (Reference 2.1-2).

The systems list was developed from the VYNPS component database and the structures list from a review of plant layout drawings and system code BLD in the component database.

For mechanical system scoping, a system was defined as the collection of components in the component database assigned to the system code. System intended functions were determined based on the functions performed by those components. Defining a system by the components in the database is generally consistent with the VYNPS maintenance rule scoping documents and safety classification procedure. For example, the seismic Class I portion of main steam piping is classified in the component database as part of system code NB (nuclear boiler), not in system code MS (main steam). Therefore, the Class 1 portion of main steam is evaluated as part of the NB system, not the MS system, and the NB system has the intended function of closing the main steam isolation valves when required. The MS system consists of non-Class 1 components and is not safety-related.

Functions for the structures and mechanical systems were identified based on reviews of applicable plant licensing and design documentation. These included the UFSAR, the VYNPS component database, safety classification documents, maintenance rule scoping basis documents, the fire hazards analysis, the Appendix R safe shutdown capability assessment, system and topical design basis documents, Technical Specifications, and various station procedures as necessary.

Each structure and mechanical system was evaluated against the criteria of 10 CFR 54.4 as described in the following sections. Section 2.1.1.1 discusses the evaluation against the safety-related criterion in 10 CFR 54.4(a)(1). Section 2.1.1.2 discusses the evaluation against the nonsafety-related SSCs affecting safety-related SSCs criterion, 10 CFR 54.4(a)(2). Section 2.1.1.3 discusses the evaluation against the regulated events criterion, 10 CFR 54.4(a)(3). The results of these evaluations for plant systems and structures are presented in Section 2.2.

Because the aging management review differed for mechanical and electrical equipment, the scoping of mechanical and electrical systems was treated differently. For the purposes of system level scoping, plant electrical and instrumentation and control systems are included in the scope of license renewal. Electrical and instrumentation and control components in mechanical systems were included in the evaluation of electrical systems. See Section 2.5 for additional information on electrical scoping and screening.

2.1.1.1 Application of Safety-Related Scoping Criteria

Systems and structures that perform safety functions as defined by the functions listed in 10 CFR 54.4(a)(1) are within the scope of license renewal. For VYNPS, system safety functions are identified in safety classification documents, the maintenance rule SSC basis documents for each system, and in design basis documents (DBDs) for those systems for which a DBD was written. Consideration was given to the safety objectives included in the UFSAR system descriptions, and objectives meeting the safety-related criterion of 10 CFR 54.4(a)(1) are identified as system intended functions.

A review of the VYNPS component database for safety-related components in systems not otherwise identified as having a safety function verified the list of safety-related systems. The controlling procedure for safety classification defines three safety classes. The safety classes correspond to the three safety-related criteria in 10 CFR 54.4(a)(1) and ensure that components meeting the criterion of 10 CFR 54.4(a)(1) are classified as safety-related. However, the criteria used at VYNPS for classifying components as safety-related is conservative with respect to the safety-related criterion in 10 CFR 54.4(a)(1). This results in safety class components in the component database that do not meet the criterion of 10 CFR 54.4(a)(1). Such conservatively classified components do not support a system safety function in accordance with 10 CFR 54.4(a)(1). For two systems (augmented offgas (AOG) and reactor water cleanup (RWCU)), components are designated as safety class at VYNPS because they prevent potential offsite exposure from exceeding VYNPS limits. With or without these components, offsite exposures will not exceed the limits referred to in 10 CFR 50.67. Certain fuel pool cooling system components are VYNPS safety class based on original installation requirements. Following the installation of the safety-related standby fuel pool cooling system, these components no longer perform a safety function. Other systems have components classified in a safety class based on a structural support function for safety-related equipment. This corresponds to the function identified in 10 CFR 54.4(a)(2) and systems with these components are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) (see Section 2.1.1.2.2).

Structural safety functions include providing containment or isolation to mitigate post-accident off-site doses and providing support or protection to safety-related equipment. Structures with safety functions were identified using the UFSAR (particularly Section 12), the maintenance rule document for buildings and structures, safety classification procedures, the fire hazards analysis, and the safe shutdown capability assessment.

Criterion (iii) of 10 CFR 54.4(a)(1) refers to "potential offsite exposures comparable to those referred to in §50.34(a)(1), §50.67(b)(2), or §100.11 of this chapter, as applicable." Section 50.34(a)(1) is not applicable to VYNPS as it concerns applicants for a construction permit who apply on or after January 10, 1997. VYNPS has amended its operating license (Reference 2.1-10) to allow use of an alternative source term for accident analyses in accordance with 10 CFR 50.67 (Reference 2.1-2). The change to 10 CFR 50.67 dose limits does not affect the VYNPS safety classification definition. The accident analyses with the alternative source term credits additional functions for the standby liquid control (SLC) and residual heat removal (RHR) systems: (1) the SLC system is credited with maintaining pH in the torus to prevent re-evolution of iodine, and (2) the drywell spray function of the RHR system is credited with particulate removal. These intended functions were included in the scoping evaluation.

2.1.1.2 Application of Criterion for Nonsafety-Related SSCs Whose Failure Could Prevent the Accomplishment of Safety Functions

This review identified nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of a safety function. The method used was based on guidance provided in Appendix F of NEI 95-10, Revision 6 (Reference 2.1-5). Consideration of hypothetical failures that could result from system interdependencies that are not part of the current licensing basis and that have not been previously experienced is not required.

The impacts of nonsafety-related SSC failures were considered as either functional or physical. A functional failure is one where the failure of a nonsafety-related SSC to perform its function impacts a safety function. A physical failure is one where a safety function is impacted by the loss of structural or mechanical integrity of a nonsafety-related SSC in physical proximity to a safety-related component.

2.1.1.2.1 Functional Failures of Nonsafety-Related SSCs

At VYNPS, SSCs required to perform a function in support of safety-related components are generally classified as safety-related and included in the scope of license renewal per Section 2.1.1.1. Engineering and licensing documents (UFSAR, maintenance rule scoping documents, and design basis documents) were reviewed to identify exceptions. The only exceptions are systems with components in the main condenser and MSIV leakage pathway. The accident analyses using the alternative source term credits the condenser and MSIV leakage pathway for hold-up and plate-out functions.

2.1.1.2.2 Physical Failures of Nonsafety-Related SSCs

Based on the license renewal rule and the guidance in Reference 2.1-5, physical failures of nonsafety-related SSCs in scope based on 10 CFR 54.4(a)(2) fit into the following categories:

- nonsafety-related SSCs directly connected to safety-related SSCs (typically piping systems); or
- nonsafety-related SSCs with the potential for spatial interaction with safety-related SSCs.

(1) Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs

At VYNPS, certain components and piping outside of the safety class pressure boundary must be structurally sound in order to maintain the pressure boundary integrity of safety class piping. These components perform a structural support function.

For piping in this structural boundary, pressure integrity is not required; however, piping within the safety class pressure boundary depends on the structural boundary piping and supports in order for the system to fulfill its safety function. For VYNPS, the "structural boundary" is defined as the portion of a piping system outside the safety class pressure boundary, yet relied upon to provide structural support for the pressure boundary. The structural boundary is often shown on piping isometric drawings and is considered synonymous with the first seismic or equivalent anchor.

(2) Nonsafety-related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs

The following sections address the different modes of spatial interaction that were considered. Interactions can occur in the following forms:

- physical impact (e.g., seismic Class II/I) or flooding,
- pipe whip, jet impingement, or harsh environment resulting from a piping rupture, or
- damage due to leakage or spray from nonsafety-related SSCs.

Protective features (whip restraints, spray shields, supports, missile or flood barriers, etc.) are installed to protect safety-related SSCs against spatial interaction with nonsafety-related SSCs. Such protective features credited in the plant design are included within the scope of license renewal and are subject to aging management review. Protective features are typically associated with a structure and are addressed in the structural aging management reviews.

Physical Impact or Flooding

This category concerns potential spatial interaction of nonsafety-related SSCs falling on or otherwise physically impacting safety-related SSCs (e.g., by causing flooding) such that safety functions may not be accomplished.

Nonsafety-related supports for non-seismic or seismic II/I piping systems with a potential for spatial interaction with safety-related SSCs are subject to aging management review based on the criterion of 10 CFR 54.4(a)(2). These supports are addressed in a commodity fashion within the civil/structural section.

Based on earthquake experience data, including experience with aged pipe, the following conclusions can be made.

- No experience data exists of welded steel pipe segments falling due to a strong motion earthquake.
- Falling of piping segment is extremely rare and only occurs when there is a failure or unzipping of the supports.
- These observations hold for new and aged pipe.

Piping supports for Seismic II/I piping need to be intact in order to prevent physical impacts on safety-related equipment during a seismic event and as a result must be included within the scope of license renewal per 10 CFR 54.4(a)(2).

Therefore, as long as the effects of aging on the supports for these piping systems are managed, falling of piping sections, except for FAC failures, is not considered credible, and the piping section itself would not be in scope for 10 CFR 54.4(a)(2) due to the physical impact hazard (although the leakage or spray hazard may still apply).

Missiles can be generated from internal or external events such as failure of rotating equipment. Inherent nonsafety-related features that protect safety-related equipment from missiles require aging management review based on the criterion of 10 CFR 54.4(a)(2).

Overhead-handling systems whose structural failure could result in damage to any system that could prevent the accomplishment of a safety function meet the criteria of 10 CFR 54.4(a)(2) and are within the scope of license renewal.

Walls, curbs, dikes, doors, etc., that provide flood barriers to safety-related SSCs are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Pipe Whip, Jet Impingement, or Harsh Environments

Nonsafety-related portions of high energy lines were evaluated against the criterion of 10 CFR 54.4(a)(2). Documents reviewed included the UFSAR and the relevant topical design basis document. VYNPS high energy systems were evaluated to ensure identification of components that are part of nonsafety-related high energy lines that can effect safety-related equipment.

If a high-energy line break (HELB) analysis assumes that a nonsafety-related piping system does not fail or assumes failure only at specific locations, then that piping system is within the scope of license renewal per 10 CFR 54.4(a)(2) and subject to aging management review in order to provide reasonable assurance that those assumptions remain valid through the period of extended operation.

Spray or Leakage

Moderate and low energy systems have the potential for spatial interactions of spray and leakage. Nonsafety-related systems and nonsafety-related portions of safety-related systems with the potential for spray or leakage that could prevent safety-related SSCs from performing their required safety function are in the scope of license renewal and subject to aging management review.

Components that do not contain liquids cannot adversely affect safety-related SSCs due to leakage or spray. Operating experience indicates that nonsafety-related components containing only air or gas have experienced no failures due to aging that could impact the ability of safety-related equipment to perform required safety functions. There are no aging effects requiring management for these components when the environment is a dry gas. A system containing only air or gas is not in the scope of license renewal based on the potential for spray or leakage.

Nonsafety-related systems that contain water, oil, or steam with components located inside structures containing safety-related SSCs are potentially in scope for possible spatial interaction under criterion 10 CFR 54.4(a)(2). These systems were evaluated further to determine if system components were located in a space such that safety-related equipment could be affected by a component failure.

The review utilized a spaces approach for scoping of nonsafety-related systems with potential spatial interaction with safety-related SSCs. The spaces approach focuses on the interaction between nonsafety-related and safety-related SSCs that are located in the same space. A "space" is defined as a room or cubicle that is separated from other spaces by substantial objects (such as wall, floors, and ceilings). The space is defined such that any potential interaction between nonsafety-related and safety-related SSCs is limited to the space.

Structures housing safety-related equipment are assumed to also house nonsafety-related equipment within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2). These structures are considered to meet the criterion of 10 CFR 54.4(a)(2) as well as 10 CFR 54.4(a)(1).

2.1.1.3 Application of Criterion for Regulated Events

The scope of license renewal includes those systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63). This section discusses the approach used to identify the systems and structures in the scope of license renewal based on this criterion. The systems and structures that perform intended functions in support of these regulated events are identified in the descriptions in Sections 2.3, 2.4, and 2.5.

2.1.1.3.1 Commission's Regulations for Fire Protection (10 CFR 50.48)

Systems and structures in the scope of license renewal for fire protection include equipment based on functional requirements defined in 10 CFR 50.48 and Appendix R. SSCs credited with fire prevention, detection and mitigation in areas containing equipment important to safe operation of the plant are in scope as is equipment credited to achieve safe shutdown in the event of a fire. To establish this scope of equipment, a detailed review of the VYNPS current licensing basis for fire protection was performed and the systems and structures relied upon for compliance with the Commission's regulations were identified.

2.1.1.3.2 Commission's Regulations for Environmental Qualification (10 CFR 50.49)

10 CFR 50.49 defines electric equipment important to safety that is required to be environmentally qualified to mitigate certain accidents that result in harsh environmental conditions in the plant. 10 CFR 50.49 codified requirements for the environmental qualification of electrical equipment that had been presented in other regulatory documents such as IE Bulletin 79-01B. The VYNPS Environmental Qualification of Electric Components Program satisfies these requirements.

As described in Section 2.1.1 of this application, a bounding scoping approach is used for electrical equipment. Electrical systems and electrical equipment in mechanical systems are by default included in scope for license renewal. Consequently, the environmentally qualified equipment is in scope for license renewal.

2.1.1.3.3 Commission's Regulations for Pressurized Thermal Shock (10 CFR 50.61)

The rule concerning pressurized thermal shock (PTS), 10 CFR 50.61, requires that licensees evaluate the reactor vessel beltline materials against specific criteria to ensure protection from brittle fracture. As a boiling water reactor, VYNPS is not subject to this regulation.

2.1.1.3.4 Commission's Regulations for Anticipated Transients without Scram (10 CFR 50.62)

An anticipated transient without scram (ATWS) is an anticipated operational occurrence that is accompanied by a failure of the reactor trip system to shut down the reactor. The ATWS rule, 10 CFR 50.62, requires specific improvements in the design and operation of commercial nuclear power facilities to reduce the probability of failure to shut down the reactor following anticipated transients and to mitigate the consequences of an ATWS event.

Based on VYNPS current licensing bases for ATWS, mechanical system intended functions performed in support of 10 CFR 50.62 requirements were determined. As discussed in Section 2.1.1 of this report, a bounding approach to scoping is used for electrical equipment. Electrical and instrumentation and control (EIC) systems and electrical equipment in mechanical systems are by default included in scope for license renewal. Consequently, EIC equipment that supports the requirements of 10 CFR 50.62 is included in the scope of license renewal.

2.1.1.3.5 Commission's Regulations for Station Blackout (10 CFR 50.63)

10 CFR 50.63 requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout. A station blackout (SBO) is the loss of offsite and onsite AC electric power to the essential and non-essential switchgear buses in a nuclear power plant. It does not include the loss of AC power fed from inverters powered by station batteries. The objective of this requirement is to assure that nuclear power plants are capable of withstanding an SBO and maintaining adequate reactor core cooling and appropriate containment integrity for a required duration.

VYNPS credits the availability of an alternate AC power source, the Vernon Hydroelectric Station, to comply with the Commission's regulations for SBO. A 13.2 kV underground power line runs from the adjacent Vernon Hydroelectric Station to the Vernon tie transformer near the VYNPS cooling towers. From there, a 4160 V underground power line connects to the station switchgear. The Vernon tie transformer is capable of supplying the emergency bus load required.

Power from the Vernon Hydroelectric Station is normally available within ten minutes. However, for conditions where loss of AC power occurs due to a grid collapse, the Vernon Hydroelectric Station separates from the grid and shuts down. The time required to restart the Vernon Hydroelectric Station and supply the Vernon tie transformer is conservatively estimated at less than two hours. Therefore, VYNPS has been evaluated for an SBO coping duration of two hours. Systems required to support the two-hour coping duration are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(3).

Based on NRC guidance in NUREG-1800 (Reference 2.1-3), Section 2.5.2.1.1, certain switchyard components required to restore offsite power are conservatively included within the scope of license renewal even though those components are not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63).

2.1.2 Screening Methodology

Screening is the process for determining which components and structural elements require aging management review. The requirement for screening is found in 10 CFR 54.21, paragraph (a) of which reads as follows:

(1) For those systems, structures, and components within the scope of this part, as delineated in § 54.4, identify and list those structures and components subject to an aging management review. Structures and components subject to an aging management review shall encompass those structures and components—

(i) That perform an intended function, as described in § 54.4, without moving parts or without a change in configuration or properties. These structures and components include, but are not limited to, the reactor vessel, the reactor coolant system pressure boundary, steam generators, the pressurizer, piping, pump casings, valve bodies, the core shroud, component supports, pressure retaining boundaries, heat exchangers, ventilation ducts, the containment, the containment liner, electrical and mechanical penetrations, equipment hatches, seismic Category I structures, electrical cables and connections, cable trays, and electrical cabinets, excluding, but not limited to, pumps (except casing), valves (except body), motors, diesel generators, air compressors, snubbers, the control rod drive, ventilation dampers, pressure transmitters, pressure indicators, water level indicators, switchgears, cooling fans, transistors, batteries, breakers, relays, switches, power inverters, circuit boards, battery chargers, and power supplies; and

(ii) That are not subject to replacement based on a qualified life or specified time period.

(2) Describe and justify the methods used in paragraph (a)(1) of this section.

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

NEI 95-10 (Reference 2.1-5) provides industry guidance for screening structures and components to identify the passive, long-lived structures and components that support an intended function. The screening process for VYNPS followed the recommendations of NEI 95-10.

Within the group of systems and structures that are in scope, passive long-lived components or structural elements that perform intended functions require aging management review. Components or structural elements that are either active or are subject to replacement based on a qualified life do not require aging management review.

Although the requirements for the integrated plant assessment are the same for each system and structure, in practice the screening process differed for mechanical systems, electrical systems, and structures. The three separate screening processes are described below.

2.1.2.1 Screening of Mechanical Systems

For each mechanical system within the scope of license renewal, the screening process identified those components that are subject to aging management review. Section 2.3 presents the results for mechanical systems.

2.1.2.1.1 Identifying Components Subject to Aging Management Review

Within the system, long-lived passive components that perform or support an intended function without moving parts or a change in configuration or properties are subject to aging management review.

In making the determination that a component is passive, it is not necessary to consider the piece parts of the component. However, in the case of valves, pumps, and housings for fans and dampers, the valve bodies, pump casings, and housings perform an intended function by maintaining the pressure boundary and therefore are subject to aging management review.

If the component is not subject to replacement based on qualified life or specified time period, then it is considered long-lived. Replacement programs are based on vendor recommendations, plant experience, or any means that establishes a specific service life, qualified life, or replacement frequency under a controlled program. Components that are subject to replacement based on qualified life or specified time period (i.e., not long-lived) are not subject to aging management review.

Because flexible elastomer hoses/expansion joints are periodically replaced, these components are not long-lived and therefore not subject to aging management review. Safety-related instrument air solenoid valves that open to relieve pressure and fail to a safe position upon loss of pressure boundary do not require aging management review.

2.1.2.1.2 Identifying Components Subject to Aging Management Review Based on Support of an Intended Function for 10 CFR 54.4(a)(2)

As discussed in Section 2.1.1.2, systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) interact with safety-related systems in one of two ways: functional or physical. A functional failure is one where the failure of a nonsafety-related SSC to perform its function impacts a safety function. A physical failure is one where a safety function is impacted by the loss of structural or mechanical integrity of an SSC in physical proximity to a safety-related component.

Functional failures of nonsafety-related SSCs which could impact a safety function were identified only for those systems with components supporting the main condenser and MSIV leakage pathway. Screening for these components consisted of identifying the passive, long-lived components in the main condenser and MSIV leakage pathway. Components supporting this intended function that are subject to aging management review are listed in Table 2.3.4-1.

As discussed in Section 2.1.1.2, physical failures of nonsafety-related systems in scope based on 10 CFR 54.4(a)(2) fit into the following two categories:

- nonsafety-related systems or components directly connected to safety-related systems (typically piping systems and HVAC ducting which provide structural support); or

- nonsafety-related systems or components with the potential for spatial interaction with safety-related systems or components.

Passive, long-lived components in directly-connected systems were identified by a review of safety/nonsafety interfaces on LRA drawings and other flow diagrams. Nonsafety-related piping systems connected to safety-related systems were included up to the structural boundary or to a point that includes an adequate portion of the nonsafety-related piping run to conservatively include the first seismic or equivalent anchor. An equivalent anchor is a combination of hardware or structures that together are equivalent to a seismic anchor. A seismic anchor is defined as hardware or structures that, as required by the analysis, physically restrain forces and moments in three orthogonal directions. The physical arrangement as analyzed insures that the stresses that are developed in the safety-related piping and supports are within the applicable piping and structural code acceptance limits. If isometric drawings were not readily available to identify the structural boundary, connected lines were included to a point beyond the safety/nonsafety interface, such as a base-mounted component, flexible connection, or the end of a piping run (such as a drain line). This is consistent with the guidance in NEI 95-10, Appendix F.

The following modes of spatial interaction are described in Section 2.1.1.2.

Physical Impact or Flooding

The evaluation of physical interactions due to physical impact or flooding affects only structures and structural components. This includes overhead-handling systems whose failure could result in damage to a system that could prevent the accomplishment of a safety function as well as walls, curbs, dikes, doors, etc., that provide flood barriers to safety-related equipment. Structures and structural components are reviewed in Section 2.4.

Pipe Whip, Jet Impingement, or Harsh Environments

For pipe whip, jet impingement, or harsh environments, nonsafety-related portions of high-energy lines were reviewed. High-energy lines are defined as those lines whose service temperature is greater than or equal to 200°F or whose design pressure is greater than or equal to 275 psig. Such lines are included in the following systems.

- Inside the reactor building (including the main steam tunnel)
  - main steam (MS) system
  - core spray (CS) system
  - control rod drive (CRD) system
  - high pressure coolant injection (HPCI) system
  - reactor core isolation cooling (RCIC) system

- reactor water clean-up (RWCU) system
- residual heat removal (RHR) system
- house heating (HB) system
- feedwater (FW) system
- sampling (SPL) system
- standby liquid control (SLC) system

- Outside the reactor building
  - main steam (MS) system
  - house heating (HB) system
  - feedwater (FW) system
  - condensate (C) system
  - extraction steam (ES) system

Many of these high-energy lines are safety-related lines whose components are included in the system's aging management review. No further review of these components for 10 CFR 54.4(a)(2) was necessary.

The remaining high-energy lines, which are nonsafety-related, were evaluated to ensure components that can effect safety-related equipment are included in the aging management review for 10 CFR 54.4(a)(2). Components in these high-energy lines are included in the appropriate 2.3.3-13 system table.

Leakage or Spray

For nonsafety-related systems with the potential for spatial interaction with safety-related components, a spaces approach was used to identify components subject to aging management review. Components containing oil, steam or liquid and located in spaces containing safety-related equipment were subject to aging management review.

2.1.2.1.3 Mechanical System Drawings

License renewal drawings were prepared to indicate portions of systems that support system intended functions within the scope of license renewal (with the exception of those systems in scope for 10 CFR 54.4(a)(2) for physical interactions, as discussed below). In addition, the drawings identify components that are subject to aging management review. Boundary flags are used in conjunction with safety-to-nonsafety class breaks to identify the system intended function boundaries. Boundary flags are noted on the drawings as system intended function boundaries. All components within these boundary flags and class breaks support system intended functions within the scope of license renewal. Components subject to aging management review (i.e., passive, long-lived components that support system intended functions) are highlighted using color coding to indicate which system aging management review evaluated the components. Drawings that contain only highlighting (no boundary flags) indicate that all components on the drawing support system intended functions unless excluded by safety-to-nonsafety class breaks.

Safety-related instrument air solenoid valves that open to relieve pressure and fail to a safe position upon loss of pressure boundary do not require aging management review but do support a system intended function. To improve the legibility of the drawings these components are not marked individually on the drawing using boundary flags.

The determination of whether a component meets the 10 CFR 54.4(a)(2) scoping criterion is based on where a structural/seismic boundary exists, or where the component is located in a building, whether it contains liquid or gas, and its proximity to safety-related equipment. At VYNPS, a conservative spaces approach for scoping in accordance with 10 CFR 54.4(a)(2) included almost all mechanical systems within the scope of license renewal (see Table 2.3.3.13-A). Portions of these systems that are in scope for 10 CFR 54.4(a)(2) and subject to aging management review are described in Table 2.3.3.13-B. Providing drawings highlighting in-scope (a)(2) components would not provide significant additional information since the drawings do not indicate proximity of components to safety-related equipment and do not identify structural/ seismic boundaries.

2.1.2.2 Screening of Structures

For each structure within the scope of license renewal, the structural components and commodities were evaluated to determine those subject to aging management review. The screening process for structural components and commodities involved a review of design basis documents (drawings, etc.) to identify specific structural components and commodities that constitute the structure. Structural components and commodities subject to aging management review are those that perform an intended function without moving parts or a change in configuration or properties (i.e., passive), and are not subject to replacement based on qualified life or specified time period (i.e., long-lived). Since structures are inherently passive, and with few exceptions are long-lived, the screening of structural components and commodities was based primarily on whether they perform an intended function.

2.1.2.2.1 Structural Component and Commodity Groups

Structural components and commodities often have no unique identifiers such as those given to mechanical components. Therefore, grouping structural components and commodities based on materials of construction provided a practical means of categorizing them for aging management reviews. Structural components and commodities were categorized by the following groups based on materials of construction.

- steel

- threaded fasteners
- concrete
- fire barriers
- elastomers
- earthen structures
- flouropolymers and lubrite sliding surfaces

2.1.2.2.2 Evaluation Boundaries

Structural components and commodities that are attached to a structure or reside within a structure are generally categorized as either component supports or as other structural members.

Component Supports – Mechanical Components

The evaluation boundaries for mechanical component supports were established in accordance with rules governing inspection of component supports (i.e., ASME Section XI, Subsection IWF). Component support examination boundaries for integral and non-integral (i.e., mechanically attached) supports are defined in article IWF-3100, Figure IWF-1300-1. In general, the support boundary extends to the surface of the building structure, but does not include the building structure. Furthermore, the support boundary extends to include non-integral attachments to piping and equipment but excludes integral attachments to the same.

Component Supports – Electrical Components

Supports for electrical components include cable trays and conduit supports, electrical panels, racks, cabinets and other enclosures. The evaluation boundary for these items includes supporting elements, including mechanical or integral attachments to the building structure.

Other Structural Members

Evaluation boundaries for other structural members whose function is to carry dynamic loads caused by postulated design basis events are consistent with the method for establishing boundaries for supports specified above. That is, the boundary includes the structural component and the associated attachment to the building structure. The portion of the attachment embedded in the building structure is considered part of the structure.

2.1.2.2.3 Intended Functions

Structural components and commodities were evaluated to determine intended functions as they relate to license renewal. Structural component and commodity intended functions include providing shelter or protection; providing structural or functional support; and serving as barriers for fire, flood, or HELB. NEI 95-10 (Reference 2.1-5) provides guidelines for determining the intended functions of structures, structural components and commodities. These intended functions are included in Table 2.0-1.

2.1.2.3 Screening of Electrical and Instrumentation and Control Systems

2.1.2.3.1 Passive Screening

NEI 95-10, Appendix B, "Typical Structure, Component and Commodity Groupings and Active/ Passive Determinations for the Integrated Plant Assessment," identifies electrical commodities considered to be passive. The VYNPS electrical commodity groups were identified and cross-referenced to the appropriate NEI 95-10 commodity, which identified the passive commodity groups.

Two passive electrical and I&C commodity groups were identified that meet the 10 CFR 54.21(a)(1)(i) criterion (i.e., components that perform an intended function without moving parts or without a change in configuration):

- high voltage insulators, and
- cables and connections, bus, electrical portions of electrical and I&C penetration assemblies.

Other electrical and I&C commodity groups are active and do not require aging management review.

The pressure boundary function that may be associated with some electrical and I&C components identified in NEI 95-10 Appendix B (e.g., flow elements, vibration probes) was considered in the mechanical aging management reviews, as applicable. Electrical components are supported by structural commodities (e.g., cable trays, conduit and cable trenches), which are included in the structural aging management reviews.

2.1.2.3.2 Long-Lived Screening

Electrical components included in the Environmental Qualification of Electric Components Program per 10 CFR 50.49 are replaced based on qualified life and, therefore, per 10 CFR 54.21(a)(1)(ii) are not subject to aging management review. The result is that the aging management reviews involve only non-EQ electrical and I&C components. EQ evaluations are time-limited aging analyses and are addressed in Section 4.4.

2.1.2.4 Consumables

Consumables include such short-lived items as packing, gaskets, component seals, O-rings, structural sealants, oil, grease, component filters, system filters, fire extinguishers, fire hoses, and air packs. Items potentially treatable as consumables have been evaluated consistently with the information presented in Table 2.1-3 of NUREG-1800. Consumables have been divided into the following four categories for the purpose of license renewal: (a) packing, gaskets, component seals, and O-rings; (b) structural sealants; (c) oil, grease, and component filters; and (d) system filters, fire extinguishers, fire hoses, and air packs.

2.1.2.4.1 Packing, Gaskets, Component Seals, and O-Rings

Packing, gaskets, component mechanical seals, and O-rings are typically used to provide a leak-proof seal when components are mechanically joined together. These items are commonly found in components such as valves, pumps, heat exchangers, ventilation units or ducts, and piping segments.

Based on ANSI B31.1 and the ASME B&PV Code Section III, the subcomponents of pressure retaining components as shown above are not pressure-retaining parts. Therefore, these subcomponents are not relied on to form a pressure-retaining function and are not subject to aging management review.

2.1.2.4.2 Structural Sealants

Elastomers and other materials used as structural sealants are subject to aging management review if they are not periodically replaced and they perform an intended function, typically supporting a pressure boundary, flood barrier, or rated fire barrier.

Seals and sealants, including pressure boundary sealants, compressible joints and seals, seismic joint filler, and waterproofing membranes are included in the aging management review of bulk commodities (Section 2.4.6).

2.1.2.4.3 Oil, Grease, and Component Filters

Oil, grease, and component filters have been treated as consumables because either (1) they are periodically replaced or (2) they are monitored and replaced based on condition.

2.1.2.4.4 System Filters, Fire Extinguishers, Fire Hoses, and Air Packs

Components such as system filters, fire hoses, fire extinguishers, self-contained breathing apparatus (SCBA), and SCBA cylinders are considered to be consumables and are routinely tested, inspected, or replaced. Fire protection at VYNPS complies with the applicable safety standards (NFPA-10 for fire extinguishers; NFPA-1962 for fire hoses; 29 CFR 19.10, 29 CFR 19.26, 42 CFR 84, NUREG/CR-0041, and ANSI-Z88.2 for air packs), which specify performance and condition monitoring programs for these specific components. Fire hoses and fire extinguishers are inspected and hydrostatically tested periodically and must be replaced if they do not pass the test or inspection. SCBA and SCBA cylinders are inspected and periodically tested and must be replaced if they do not pass the test or inspection. Fire protection procedures specify the replacement criterion of these components that are routinely checked by tests or inspections to assure operability. Therefore, while these consumables are in the scope of license renewal, they do not require an AMR.

2.1.3 Interim Staff Guidance Discussion

As discussed in Reference 2.1-5, the NRC has encouraged applicants for license renewal to address proposed ISGs in the LRA. The NRC staff has identified several issues for which additional staff and industry guidance clarification may be necessary. However, with the exception of ISGs 9, 19B, and 23, these ISGs have been closed (Reference 2.1-6, Reference 2.1-7). Where necessary, additional guidance has been incorporated into revised NRC license renewal guidance documents.

ISG-19B, "Proposed Aging Management Program XI.M11-B, 'Nickel-alloy Base-metal Components and Welds in the Reactor Coolant Pressure Boundary,' for License Renewal," is applicable only to PWRs and therefore is not applicable to VYNPS.

The remaining ISGs are discussed below.

ISG-9 *Identification and Treatment of Structures, Systems and Components Which Meet 10 CFR 54.4(a)(2)*

10 CFR 54.4(a)(2) states that SSCs within the scope of license renewal shall include nonsafety-related SSCs whose failure could prevent the satisfactory accomplishment of any of the functions identified for safety-related SSCs.

The process used to identify the in-scope nonsafety-related SSCs under 10 CFR 54.4(a)(2), discussed in Section 2.1.1.2, is consistent with the guidance provided in NEI 95-10 Appendix F (Reference 2.1-5), which has been endorsed by the NRC in RG 1.188.

ISG-23 *Replacement Parts Necessary to Meet 10 CFR 50.48 (Fire Protection)*

A review for replacement parts necessary to meet 10 CFR 50.48 identified a spare cable in the reactor building that is used to repower the inboard shutdown cooling isolation valve for control room cable vault fires. This cable is an installed spare that is included in the aging management review of insulated cables and connections.

2.1.4 Generic Safety Issues

In accordance with the guidance in NEI 95-10, review of NRC generic safety issues as a part of the license renewal process is required to satisfy the finding required by 10 CFR 54.29. GSIs that involve an issue related to the license renewal aging management review or time-limited aging analysis evaluations are to be addressed in the LRA. Based on NUREG-0933 (Reference 2.1-4), Entergy identified the following GSIs to be addressed in this application.

GSI 168 Environmental Qualification of Electrical Equipment

This issue was resolved with no new requirements for licensees (Reference 2.1-8). The staff concluded that the existing equipment qualification process was adequate to ensure that I&C cables would perform their intended function. Environmental qualification evaluations of electrical equipment are identified as time-limited aging analyses for VYNPS and addressed in Section 4.4.

GSI 190 Fatigue Evaluation of Metal Components for 60-Year Plant Life

This GSI addresses fatigue life of metal components and was closed by the NRC (Reference 2.1-9). In the closure letter, however, the NRC concluded that licensees should address the effects of reactor coolant environment on component fatigue life as aging management programs are formulated in support of license renewal. Accordingly, the issue of environmental effects on component fatigue life is addressed in Section 4.3.3.

2.1.5 Conclusion

The methods described in Sections 2.1.1 and 2.1.2 were used at VYNPS to identify the systems, structures, and components that are within the scope of license renewal and to identify those structures and components requiring aging management review. The methods are consistent with and satisfy the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

2.1.6 References

2.1-1 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

2.1-2 10 CFR 50.67, “Accident Source Term.”

2.1-3 U. S. Nuclear Regulatory Commission, NUREG-1800, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, September 2005.

2.1-4 U. S. Nuclear Regulatory Commission, NUREG-0933, *A Prioritization of Generic Safety Issues*, Supplement 28, August 2004.

2.1-5 Nuclear Energy Institute, NEI 95-10, *Industry Guideline on Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule*, Revision 6, June 2005.

2.1-6 Kuo, P. T. (NRC) to A. Marion (NEI) and D. Lachbaum (Union of Concerned Scientists), “Status of Interim Staff Guidance Associated with License Renewal,” letter dated May 19, 2005.

2.1-7 Kuo, P. T. (NRC) to A. Marion (NEI) and D. Lachbaum (Union of Concerned Scientists), “Staff Resolution Associated with Interim Staff Guidance ISG-07 Proposed Staff Guidance on the Scoping of Fire Protection Equipment for License Renewal,” letter dated June 7, 2005.

2.1-8 Borchardt, R., to W. Travers, “Closeout of Generic Safety Issue (GSI) 168, ‘Environmental Qualification of Low-Voltage Instrumentation and Control Cables,’” memorandum dated August 14, 2003.

2.1-9 Thadani, A., Director, Office of Nuclear Regulatory Research, to W. Travers, Executive Director of Operations, “Closeout of Generic Safety Issue 190, ‘Fatigue Evaluation of Metal Components for 60 Year Plant Life,’” NRC memorandum dated December 26, 1999.

2.1-10 Ennis, R.B., USNRC, to M. Kansler, VYNPS, "Vermont Yankee Nuclear Power Station - Issuance of Amendment re: Alternative Source Term (TAC No. MC0253)," NVY-05-045, letter dated March 29, 2005.

2.2 PLANT LEVEL SCOPING RESULTS

Tables 2.2-1a, 2.2-1b, and 2.2-3 list the mechanical systems, electrical and instrumentation and control (EIC) systems, and structures, respectively, that are within the scope of license renewal for VYNPS. For mechanical systems, a reference is given to the section which describes the system. For EIC systems, no description is necessary since EIC systems are in scope by default (see Section 2.5). For structures, a reference is given to the section that includes the structure in the evaluation.

Tables 2.2-2 and 2.2-4 list the systems and structures, respectively, that do not meet the criteria specified in 10 CFR 54.4(a) and are therefore excluded from the scope of license renewal. For each item on these lists, the table also provides a reference (if applicable) to the section of the Updated Final Safety Analysis Report (UFSAR) that describes the system or structure. For structures with no description in the UFSAR, a brief description of the building function is given. None of these structures house safety-related equipment.

The list of systems used in these tables is based on the system codes used at VYNPS. The intended functions for these systems are identified in the referenced section.

As needed, system components are grouped functionally for the aging management review. For example, Class 1 components in various systems (e.g., the standby liquid control, system code SLC) are evaluated with the Class 1 reactor coolant system in Section 3.1.2.1.3, and containment penetrations from various systems are grouped into one containment penetrations review in Section 3.2.2.1.7. For each system, see the discussion under “Components Subject to Aging Management Review” for further information.

Nonsafety-related components whose failure could prevent satisfactory accomplishment of safety functions (10 CFR 54.4(a)(2)) due to the potential for a physical interaction (see Section 2.1.1.2) are evaluated together in an (a)(2) aging management review (AMR). The (a)(2) AMR includes nonsafety-related components with the potential for a spatial interaction with a safety-related system as well as components in safety-related systems outside the safety class pressure boundary, such as piping, valves, pumps, and support elements, that are required to be structurally sound in order to maintain the integrity of safety class piping.

Structural commodities associated with mechanical systems, such as pipe supports and insulation, are evaluated with the structural bulk commodities.

Components subject to aging management review are highlighted on license renewal drawings, with the exception of components in scope for 10 CFR 54.4(a)(2) for a physical interaction with safety-related equipment. The drawings are flagged as needed to indicate system intended function boundaries. For further discussion of license renewal drawings, see Section 2.1.2.1.3.

Table 2.2-1a
Mechanical Systems within the Scope of License Renewal

System Code	System Code Name	LRA Section
101	MS, ES, and AS Instruments	Section 2.3.4.4, 101 (Main Steam, Extraction Steam, and Auxiliary Steam Instruments)
105	SA and IA Instruments	Section 2.3.3.7, Instrument Air
AOG	Augmented Off-Gas	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
AS	Auxiliary Steam	Section 2.3.4.1, Auxiliary Steam
C	Condensate	Section 2.3.4.2, Condensate
CAD	Containment Air Dilution	Section 2.3.3.11, Primary Containment Atmosphere Control / Containment Atmosphere Dilution
CD	Condensate Demineralizer	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
CRD	Control Rod Drive	Section 2.3.1, Reactor Coolant System
CS	Core Spray	Section 2.3.2.2, Core Spray
CST	Condensate Storage and Transfer	Section 2.3.2.5, Reactor Core Isolation Cooling
CUFD	RWCU Filter Demineralizer	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
CW	Circulating Water	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
DG	Diesel Generator and Auxiliaries	Section 2.3.3.4, Emergency Diesel Generator
DLO	Diesel Lube Oil	Section 2.3.3.4, Emergency Diesel Generator
DW	Demineralized Water	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
FDW	Feedwater	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
FO	Fuel Oil	Section 2.3.3.6, Fuel Oil

Table 2.2-1a
Mechanical Systems within the Scope of License Renewal (Continued)

System Code	System Code Name	LRA Section
FP	Fire Protection	Section 2.3.3.8, Fire Protection—Water Section 2.3.3.9, Fire Protection—Carbon Dioxide
FPC	Fuel Pool Cooling	Section 2.3.3.5, Fuel Pool Cooling
FPFD	FPC Filter Demineralizer	Section 2.3.3.5, Fuel Pool Cooling
HB	House Heating Boiler	Section 2.3.3.10, Heating, Ventilation and Air Conditioning
HCU	Hydraulic Control Units	Section 2.3.1, Reactor Coolant System
HPCI	High Pressure Coolant Injection	Section 2.3.2.4, High Pressure Coolant Injection
HVAC	Heating, Ventilation and Cooling	Section 2.3.3.10, Heating, Ventilation and Air Conditioning
IA	Instrument Air	Section 2.3.3.7, Instrument Air
JDD	John Deere Diesel	Section 2.3.3.12, John Deere Diesel
MGLO	MG Lube Oil	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
MS	Main Steam	Section 2.3.4.3, Main Steam
N2	Nitrogen Supply	Section 2.3.3.7, Instrument Air
NB	Nuclear Boiler	Section 2.3.1, Reactor Coolant System
NM	Neutron Monitoring	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
PASS	Post-Accident Sampling System	Section 2.3.3.11, Primary Containment Atmosphere Control / Containment Atmosphere Dilution
PCAC	Primary Containment Atmosphere Control	Section 2.3.3.11, Primary Containment Atmosphere Control / Containment Atmosphere Dilution
PW	Potable Water	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)

Table 2.2-1a
Mechanical Systems within the Scope of License Renewal (Continued)

System Code	System Code Name	LRA Section
RBCCW	Reactor Building Closed Cooling Water	Section 2.3.3.3, Reactor Building Closed Cooling Water
RCIC	Reactor Core Isolation Cooling	Section 2.3.2.5, Reactor Core Isolation Cooling
RDW	Radwaste (Liquid and Solid)	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
RHR	Residual Heat Removal	Section 2.3.2.1, Residual Heat Removal
RHRSW	RHR Service Water	Section 2.3.3.2, Service Water
RIP	Equipment Retired in Place	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
RWCU	Reactor Water Clean-Up	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
SA	Service AIr	Section 2.3.3.7, Instrument Air
SBFPC	Standby Fuel Pool Cooling	Section 2.3.3.5, Fuel Pool Cooling
SBGT	Standby Gas Treatment	Section 2.3.2.6, Standby Gas Treatment
SC	Stator Cooling	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
SLC	Standby Liquid Control	Section 2.3.3.1, Standby Liquid Control
SPL	Sampling	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
SW	Service Water	Section 2.3.3.2, Service Water

Because of the bounding approach used for scoping electrical and I&C equipment, all electrical and I&C commodities contained in electrical and mechanical systems are in scope by default. Table 2.2-1b provides the list of electrical systems that do not include mechanical components that meet the scoping criteria of 10 CFR 54.4. Systems with mechanical components that meet the scoping criteria of 10 CFR 54.4 are listed in Table 2.2-1a. Descriptions of each electrical system are not provided. UFSAR Chapters 7 and 8 describe most I&C and electrical systems (ADS is described in Section 6.4.2). For further information, see Section 2.5, Scoping and Screening Results: Electrical and Instrumentation and Controls Systems.

Table 2.2-1b
EIC Systems within the Scope of License Renewal
(Bounding Approach)

System Code	System
115KV	115 kV Electrical
120AC	120 Volts AC & Vital AC
125DC	125 Volts DC Electrical
208AC	208 Volts AC Electrical
22KV	22K Volts Electrical
240AC	240 Volts AC Electrical
24DC	24 Volts DC Electrical
250DC	250 Volts DC Electrical
345KV	345K Volts Electrical
400DC	400 Volts DC Electrical
480AC	480 Volts AC Electrical
48DC	48 Volts DC Electrical
4KV	4K Volts AC Electrical
ADS	Auto Depressurization System
ARM	Area Rad Monitoring
ATM	Area Temperature Monitoring
COMM	Plant Communications

Table 2.2-1b
EIC Systems within the Scope of License Renewal
(Bounding Approach) (Continued)

System Code	System
FWC	Feedwater Controls
FPP	Freeze Protection
MC	Miscellaneous Computer and ERFIS
MET	Meteorological System
MISC	Miscellaneous Equipment
PCIS	Primary Containment Isolation System
PCP	Primary Containment Penetrations
PRM	Process Radiation Monitoring
RPS	Reactor Protection System
RR	Recirc Flow Control
RWA	River Water Analysis
SAFE	Safety Equipment and Supplies
S/L	Sentry Lights
SWYD	Offsite Power

Table 2.2-2
Mechanical Systems Not within the Scope of License Renewal

System Code	System	SAR Reference
103	HD and HV Instruments	None
107	CST and DW Instruments	None
AE	Air Evacuation	Section 11.4
AOGCW	AOG Cooling Water	Section 10.21 (advanced off-gas closed cooling water system)
BLD	Building (sewage system components)	None
CHEM	Chemistry Equipment and Supplies	None
CWP	Circulating Water Priming	Section 11.6.3 (condenser water box priming system)
ES	Extraction Steam	Section 11.5.4.3
H2	Hydrogen	None
HD	Heater Drain	Section 11.8.3.2
HV	Heater Vent	None
HWC	Hydrogen Water Chemistry	None
MUD	Make-up Demineralizer	Section 10.13 (station makeup water treatment system)
OIS	Oxygen Injection	None
SO	Seal Oil	None
SUPP	Support Equipment	Section 10.4 for various tools
TBCCW	Turbine Building Closed Cooling Water	Section 10.10
TG	Main Turbine Generator	Section 11.2
TLO	Turbine Lube Oil	None

Table 2.2-3
Structures within the Scope of License Renewal

Structure	Screening Results
Carbon dioxide tank foundation and enclosure	Section 2.4.5, Yard Structures
Condensate storage tank foundation, valve and instrument enclosure	Section 2.4.5, Yard Structures
Control building	Section 2.4.4, Process Facilities
Cooling towers	Section 2.4.4, Process Facilities
John Deere diesel building	Section 2.4.5, Yard Structures
Fuel oil storage tank and transfer pump house	Section 2.4.5, Yard Structures
Intake structure	Section 2.4.3, Intake Structure
Manholes, hand holes, trenches, valve pits, and duct banks	Section 2.4.5, Yard Structures
Nitrogen tank enclosure	Section 2.4.5, Yard Structures
Plant stack	Section 2.4.4, Process Facilities
Primary containment	Section 2.4.1, Primary Containment
Reactor building	Section 2.4.2, Reactor Building
Switchyard control house	Section 2.4.5, Yard Structures
Transformer support structures	Section 2.4.5, Yard Structures
Transmission towers	Section 2.4.5, Yard Structures
Turbine building	Section 2.4.4, Process Facilities
Vernon Hydroelectric Station	Section 2.4.5, Yard Structures

Table 2.2-4
Structures Not within the Scope of License Renewal

Structure (alternate name)	UFSAR Reference or Function
AOG building	Sections 9.4.5, 12.2.1.1.3
Boat storage	Provides space for storage of a boat.
Bottle shed	Stores oxygen bottles.
Bottle storage building	Stores gas bottles used primarily to charge the switchyard breakers. Also used as a storage area for materials and equipment that need to be kept out of the elements.
Chemical treatment building (circulating water chemical treatment building)	Houses chemical treatment equipment for the circulating water and service water systems.
Clean workshop (pipe storage building, pipe warehouse)	Used for radiologically clean work, including carpentry, welding, electrical work, insulators work, and storage for calibrated electrical equipment and clean tools. An addition to the building houses an air compressor room, electric utility room, gas manifold room and craft staging area.
Construction office building	Contains offices and a cafeteria.
Containment access building	Used for long-term equipment storage, vehicle parking and short-term combustible liquid drum storage.
Discharge structure	Section 12.2.6.3
Dog house	Originally used as a dog kennel; currently used as an outbuilding storage facility.
Drum storage	Stores 55 gallon drums.
Environmental laboratory (ELF, Aquatec bldg)	Used as a small laboratory and for related storage.
Flammable storage building	Stores flammable liquids.

Table 2.2-4
Structures Not within the Scope of License Renewal
(Continued)

Structure (alternate name)	UFSAR Reference or Function
Gatehouses 1, 2, and 3 (Gatehouse 1 is also known as the main gate.)	Gatehouse 1 is main gate to site. Gatehouse 2 controls access to protected area. It contains offices, a cafeteria, locker rooms and entrance/exit vestibules. Gatehouse 3 formerly controlled access to the site. It is now used as a training facility.
Hydrogen storage shed (CO2/H2 shed)	Stores hydrogen cylinders and carbon dioxide cylinders.
Low-level radwaste storage site	Section 9.3.3.4
Maintenance shop (storage shed)	Stores sand and salt for use during the winter.
Meteorological tower and house	UFSAR Appendix G
Warehouse (includes maintenance, security and dosimetry offices	Contains maintenance, security and dosimetry offices.
Office building (administration building, service building)	Sections 12.2.3, 12.2.1.1.3
Plant support building	Provides office space for management, engineering, and administrative personnel.
Power uprate building	Serves as office space for the power uprate project.
Quadplex office building	Serves as office space.
Radwaste building	Sections 9.2, 9.3, 12.2.1.1.3
Radwaste compactor building	Houses radwaste compactor.
Shipping and receiving building	Used to receive deliverables.
Spray pond	No longer in service. Original purpose was to limit blowdown temperatures during closed cycle operation of the circulating water system.
Storage barn	Houses rebuilt power transmission equipment.

Table 2.2-4
Structures Not within the Scope of License Renewal
(Continued)

Structure (alternate name)	UFSAR Reference or Function
Turbine storage facility	Stores contaminated turbine parts, including rotors.
Warehouse #1 (south warehouse, construction warehouse)	Houses offices and provides miscellaneous storage, including oil drums and other lubricants.
Warehouse #2 (north warehouse, permanent warehouse)	Houses miscellaneous materials such as cable spools, wood planks, oil drums, and metal materials. The majority of the building is a dedicated LSA (low specific activity) area. The warehouse is a radiation controlled area and houses a gaseous radwaste subsystem which permits incineration of slightly radioactive waste oil.
Warehouse and machine shop	Contains machine shop, stockroom/warehouse, water treatment, house heating boiler, air compressors, maintenance offices, and training offices.

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

2.3.1 Reactor Coolant System

System Description

The purpose of the reactor coolant system (RCS) is to house the reactor core and to contain and transport the fluids coming from or going to the reactor core. The RCS includes the reactor vessel and internals, the reactor recirculation system, control rod drive system, and Class 1 components that comprise the reactor coolant pressure boundary, including main steam and feedwater components. The Class I portion of main steam includes pressure relief valves, flow restrictors, and isolation valves. Two similar heat transfer loops connect in parallel to the reactor vessel. Each loop contains one recirculation outlet leg, one recirculation inlet manifold, and one recirculation pump.

This description of the reactor coolant system includes the nuclear boiler (NB) system, the control rod drive (CRD) system, and the hydraulic control unit (HCU) system associated with the CRDs.

The NB system consists of Class 1 components and non-Class 1 components associated with the nuclear boiler. The following subsystems are included.

Reactor Vessel and Internals

The reactor vessel is a welded vertical cylindrical pressure vessel with hemispherical heads. The cylindrical shell and hemispherical heads are fabricated of low alloy steel plate. The vessel bottom head is welded directly to the vessel shell. The flanged reactor vessel upper head is secured to the vessel shell by studs and nuts. The reactor vessel includes nozzles, safe ends, control rod drive penetrations, instrument penetrations, and a support skirt. (See also Section 2.3.1.1.)

Reactor vessel internals distribute the flow of coolant, locate and support the fuel assemblies, and provide an inner volume containing the core that can be flooded following a break in the nuclear system process barrier external to the reactor pressure vessel. (See also Section 2.3.1.2.)

Reactor Recirculation

Reactor recirculation provides a variable moderator (coolant) flow to the reactor core for adjusting reactor power level. Adjustment of the core coolant flow rate changes reactor power output, thus providing a means of following plant load demand without adjusting control rods. The recirculation system is designed with sufficient fluid and pump inertia that fuel thermal limits cannot be exceeded as a result of recirculation system malfunctions.

Main Steam (Class 1)

The reactor core is cooled by demineralized water which enters the lower portion of the core and boils as it flows upward around the fuel rods. The steam leaving the core is dried by steam separators and dryers in the upper portion of the reactor vessel. The steam is then directed to the turbine through four main steam lines. The steam supply for high pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) turbine operation is provided by connections to the main steam piping.

The nuclear system pressure relief system consists of three safety valves and four relief valves, in the drywell between the reactor vessel and the first isolation valve, which are designed to protect the nuclear system process barrier from damage due to overpressure. The safety valves provide protection against overpressure and discharge directly to the drywell. The relief valves, which discharge to the suppression pool, augment the safety valves and provide for manual or automatic depressurization of the system.

Each relief valve discharge is piped through its own discharge line to a point well below the minimum water level in the primary containment suppression pool. In the suppression pool, steam is directed from relief valve piping through a discharge device called a tee-quencher, which is a perforated section of pipe spanning a suppression pool bay. The tee-quencher permits a uniform distribution of condensing steam across a bay. To protect the primary containment boundary, the discharge lines are safety class from the torus penetration through the tee-quenchers, but not from the relief valves to the torus penetration.

Water in the line above the suppression pool water level would cause excessive pressure at the relief valve discharge when the valve again opened. For this reason, the relief valve discharge lines have 10" vacuum breakers to prevent water being drawn up into the line due to steam condensation following termination of relief valve operation.

The *automatic depressurization system (ADS)* actuates the relief valves to automatically depressurize the nuclear system in the event of a loss of coolant accident in which the HPCI system fails to deliver rated flow or where break flow exceeds HPCI capacity (intermediate break). The depressurization of the nuclear system allows low pressure standby cooling systems to supply enough cooling water to adequately cool the fuel.

Each steam line contains a venturi-type flow restrictor near the reactor vessel but downstream of the pressure relief and safety valves. The restrictors are designed to limit the loss of coolant resulting from a main steam line break outside primary containment. The coolant loss is limited so that reactor vessel water level remains above the top of the core during the time required for the main steam line isolation valves to close. This action protects the fuel barrier. These flow restrictors also provide the pressure differential for main steam flow indication.

Two main steam line isolation valves are installed on each main steam line. One valve in each line is inside primary containment, the other outside primary containment. These valves automatically isolate the nuclear system process barrier in the event a pipe break occurs downstream of the valves. This action limits the loss of coolant and the release of radioactive materials from the nuclear system. In the event that a main steam line break occurs inside primary containment, closure of the isolation valve outside the containment acts to seal primary containment.

Feedwater (Class 1)

Class 1 feedwater lines provide water to the reactor vessel entering near the top of the vessel downcomer annulus. Two feedwater lines divide and enter the vessel through four nozzles. Feedwater lines are also used for injection of HPCI and RCIC.

NBVIS

The nuclear boiler vessel instrumentation system (NBVIS) monitors reactor vessel parameters. The NBVIS is designed to perform the following: (1) initiate and provide trip signals to interfacing plant safety systems; (2) provide signals to interfacing plant nonsafety systems; and (3) provide plant process parameter information necessary for normal, transient, and abnormal (including post-accident) operation. The NBVIS instrument sensing lines, including restriction orifices and excess flow check valves are part of the reactor coolant pressure boundary (RCPB). EIC systems and subsystems are in scope and evaluated in Section 2.5.

The CRD and HCU systems comprise the control rod drive subsystem of the RCS.

Control Rod Drive

The control rod drives provide a means to control changes in core reactivity by incrementally positioning neutron absorbing control rods within the reactor core in response to manual control signals. The control rod drive subsystem is required to quickly shut down the reactor (scram) by rapidly inserting control rods into the core in response to a manual or automatic signal.

The CRD mechanism (drive), used for positioning the control rod in the reactor core, is a double-acting, mechanically latched, hydraulic cylinder using water from the condensate system as its operating fluid. The quality of the water within the CRD hydraulic system is maintained by filters and strainers upstream and downstream of the CRD water pumps. A series of stations containing the necessary valves and instrumentation maintains the flows and pressures at the required values within the CRD hydraulic system. The CRD system provides an alternate rod insertion (ARI) function to shut down the reactor should an abnormal transient not result in a scram (ATWS event).

HCU

The HCU system controls the water flow to the CRDs both for normal operation and during a reactor scram. Each HCU furnishes pressurized water upon signal to a control rod drive. The drive then positions its control rod as required. Water discharged from the drives during a scram flows through the HCUs to the scram discharge volume. Water discharged from a drive during a normal control rod positioning operation flows through its HCU and the exhaust header to the RWCU system discharge line.

The HCU system consists of 89 hydraulic control units, each in support of a control rod drive. The basic components in each HCU are manual, pneumatic, and electrically operated valves, an accumulator, filters, related piping, and electrical connections.

The NB system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide and maintain a high integrity RCPB inside and out to the first isolation outside primary containment.
- Contain and support the reactor core, reactor internals, reactor coolant moderator and reactivity control portions of the system.
- Provide overpressure protection.
- Provide means of emergency or alternate cooling via the core spray spargers and nozzles.
- Provide flow paths for ECCS injection into the vessel.
- Provide steam to HPCI and RCIC turbines (supply is upstream of the first MSIV).
- Close the MSIVs and main steam line drain valves when required.
- Limit loss of water from the reactor vessel before MSIV closure to protect fuel cladding barrier (function performed by the flow restrictors).
- Provide for primary containment isolation/boundary.
- Provide pressure relief via ADS.
- Provide steam quenching capabilities and primary containment integrity after a LOCA (relief valve discharge T-quenchers in the torus).

The NB system has the following intended functions for 10 CFR 54.4(a)(2).

- Provide holdup and plate-out of fission products that may leak through the closed MSIVs. This function is performed by components located in the main condenser and MSIV leakage pathway (main steam line drains) and supports the use of the alternative source term.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function (includes the steam dryers).

The NB system has the following intended functions for 10 CFR 54.4(a)(3).

- Use of ADS safety/relief valves and their discharge lines including T-quenchers and vacuum breakers is credited in the coping analysis for station blackout (10 CFR 50.63).
- Use of ADS and the MSIVs and main steam line drain valves when required is credited in the Appendix R safe shutdown capability assessment (10 CFR 50.48).

The CRD system has the following intended functions for 10 CFR 54.4(a)(1).

- Shut down the reactor when required by transient or accident conditions.
- Maintain integrity of reactor coolant pressure boundary.
- Support primary containment isolation.

The CRD system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CRD system has the following intended functions for 10 CFR 54.4(a)(3).

- Shut down the reactor when required by transient or accident conditions as credited for fire protection regulations (10 CFR 50.48) and in the station blackout coping analysis (10 CFR 50.63).
- Provide alternate rod insertion (ARI) during an ATWS event (10 CFR 50.62).

The HCU system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide for delivery of a pressurized water volume upon receipt of a valid initiation signal to fully insert a control rod during a scram.
- Provide for scram discharge through the HCUs to the scram discharge volume.

The HCU system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The HCU system has the following intended function for 10 CFR 54.4(a)(3).

- The HCU system is credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48) and in the station blackout coping analysis (10 CFR 50.63) as the scram function is credited.

UFSAR References

Chapter 3 discusses the reactor vessel, internals, and reactivity controls. Sections 4.1 through 4.6 discuss the RCS. Section 4.1 provides a general description. Section 3.4.5.3, particularly 3.4.5.3.2, discusses the HCU, and Sections 3.4, 3.5, and 7.18 discuss the control rod drives.

Components Subject to AMR

The reactor coolant system includes those systems and components that form the major portions of the nuclear system process barrier. These systems and components contain, or transport the fluids coming from, or going to the reactor core. The reactor coolant system includes the reactor vessel and reactor vessel internals. The reactor coolant system includes the following systems in their entirety: nuclear boiler, nuclear boiler instrumentation, reactor recirculation and control rod drive (hydraulic and mechanisms).

The RCS Class I piping evaluation boundary extends into portions of systems attached to the RCS. The Class I components of the systems listed below are reviewed with the RCS. The non-Class 1 portions of the systems listed below are reviewed as referenced.

- residual heat removal system (Section 2.3.2.1, RHR)
- core spray system (Section 2.3.2.2, CS)
- automatic depressurization system (Section 2.3.2.3, ADS)
- high pressure coolant injection system (Section 2.3.2.4, HPCI)
- reactor core isolation cooling system (Section 2.3.2.5, RCIC)
- standby liquid control system (Section 2.3.3.1, SLC)

VYNPS does not have an isolation condenser.

Fuel assemblies are not subject to aging management review because they are replaced after a limited number of cycles. Control rods are not subject to aging management review as they accomplish their intended function with a change in configuration.

The following non-Class I components of the NB system code are evaluated with other aging management reviews:

- components that support intended functions of other systems (evaluated with that system, e.g., the drywell sprays with the residual heat removal (RHR) system);
- automatic depressurization system (ADS) intended function and the associated non-Class 1 components (e.g., vacuum breakers, torus penetrations) (Section 2.3.2.3, Automatic Depressurization);
- containment penetrations that perform a containment isolation function (Section 2.3.2.7, Primary Containment Penetrations);
- components in the main condenser and MSIV leakage pathway (Section 3.4.2.1.1, Main Condenser and MSIV Leakage Pathway);

- remaining non-Class 1 components (Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)); and
- RCS supports (Section 2.4.2, Reactor Building).

The following non-Class 1 components of the CRD system code are reviewed as referenced.

- containment penetrations (Section 2.3.2.7, Primary Containment Penetrations)
- air components associated with the ARI function (Section 2.3.3.7, Instrument Air)
- nonsafety-related CRD components not reviewed elsewhere whose failure could prevent satisfactory accomplishment of safety functions (Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2))

Non-Class 1 components of the HCU system code are reviewed as referenced.

- scram pilot valves (Section 2.3.3.7, Instrument Air)
- nonsafety-related HCU components not reviewed elsewhere whose failure could prevent satisfactory accomplishment of safety functions (Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2))

Aging management review of the remaining RCS components is covered by three separate reviews:

- reactor vessel (Section 2.3.1.1),
- reactor vessel internals (Section 2.3.1.2), and
- reactor coolant pressure boundary (Section 2.3.1.3).

Tables 2.3.1-1, 2.3.1-2, and 2.3.1-3 list the components that require aging management review and their intended functions.

Tables 3.1.2-1, 3.1.2-2, and 3.1.2-3 provide the results of the aging management review for RCS components.

<u>License Renewal Drawings</u>

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191167	LRA-G-191170	LRA-G-191174
LRA-G-191168	LRA-G-191171	LRA-G-191178
LRA-G-191169	LRA-G-191172	LRA-G-191267

2.3.1.1 Reactor Vessel

The reactor vessel contains the nuclear fuel core, core support structures, control rods, and other parts directly associated with the core.

The major components of the reactor vessel include the reactor pressure vessel shell, bottom head, upper closure head, flanges, studs, nuts, nozzles and safe ends. The component evaluation boundaries are the welds between the safe ends and attached piping and the interface flanges for bolted connections. Thermal sleeves that are welded to vessel nozzles or safe ends are included in the review. Control rod drive stub tubes, control rod drive housings, and incore housings are also included as are the vessel support skirt, vessel interior welded attachments, and vessel exterior welded attachments.

Table 2.3.1-1 lists the mechanical components subject to aging management review and component intended functions for the reactor vessel and pressure boundary subcomponents of the control rod drive mechanisms.

Table 3.1.2-1 provides the results of the aging management review for reactor vessel and pressure boundary subcomponents of the control rod drive mechanisms.

2.3.1.2 Reactor Vessel Internals

The reactor vessel internals are designed to distribute the reactor coolant flow delivered to the vessel, to locate and support the fuel assemblies, and to provide an inner volume containing the core that can be flooded following a break in the nuclear system process barrier.

The reactor vessel internals include the control rod guide tubes, core plate, core spray lines in the vessel, differential pressure and standby liquid control line, feedwater spargers, fuel support pieces, incore guide tubes, incore dry tubes, local power range monitors, jet pump assemblies and jet pump instrumentation, shroud (including shroud stabilizers), shroud head and steam separator assembly, shroud support, steam dryer, surveillance sample holders, top guide, and vessel head spray line.

Table 2.3.1-2 lists the mechanical components subject to aging management review and component intended functions for the reactor vessel internals. The steam dryer is conservatively subject to aging management review based on NRC guidance.

Table 3.1.2-2 provides the results of the aging management review for the reactor vessel internals.

2.3.1.3 Reactor Coolant Pressure Boundary

The reactor coolant pressure boundary (RCPB) provides and maintains a high integrity pressure boundary and fission product barrier inside primary containment and out to the first isolation outside primary containment.

Class 1 piping attached to the vessel nozzles or safe ends, including the welded joints, Class 1 pumps, and Class 1 boundary isolation valves, are included in this review. Connected Class 2 piping that is not part of another aging management review is reviewed as far as needed to complete the RCS pressure boundary; this includes vents, drains, leakoff, sample lines, and instrumentation lines up to the transmitters. The evaluation boundaries of this review extend to any or all of the following.

- Outboard containment isolation valves on system piping which penetrates primary reactor containment, consistent with the Class 1 boundary.
- First normally closed isolation valve for piping which does not penetrate the containment. For instrumentation that does not have a normally closed isolation valve, to the instrument housing.
- Reactor coolant system safety and safety/relief valves up to the valve seat, i.e., normally pressurized components.
- Instrumentation root valves and associated instrumentation lines up to the instruments.

Table 2.3.1-3 lists the mechanical components subject to aging management review and component intended functions for the RCPB.

Table 3.1.2-3 provides the results of the aging management review for the RCPB.

Table 2.3.1-1
Reactor Vessel (RV)
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	
Closure flange studs, nuts, washers and bushings	Pressure boundary
Incore housing bolting • Flange • Flange bolts • Nut and washer	Pressure boundary
Other pressure boundary bolting • Flange bolts (N6A, N6B, N7) • CRD flange capscrews and washers	Pressure boundary
Heads and Shell	
Dome • Bottom head • Upper head	Pressure boundary
Flanges (closure) • Upper head • Vessel shell	Pressure boundary
Vessel shell • Intermediate beltline shell • Intermediate nozzle shell • Lower shell • Upper shell	Pressure boundary
Nozzles and Penetrations	
CRD housings	Pressure boundary
CRD stub tubes	Pressure boundary
Incore housings	Pressure boundary
Nozzles	Pressure boundary
Safe Ends, Thermal Sleeves, Flanges, and Caps	
CAP • CRD return line (N9)	Pressure boundary
Flanges	Pressure boundary

Table 2.3.1-1
Reactor Vessel (RV)
Components Subject to Aging Management Review
(Continued)

Component Type	Intended Function
Safe ends ≥ 4”	Pressure boundary
Safe ends < 4”	Pressure boundary
Thermal sleeves	Pressure boundary
Weld • SLC nozzle to safe end weld (N10)	Pressure boundary
Vessel Attachments and Supports	
Internal attachments	Support for Criterion (a)(1) equipment
Supports • Stabilizer pads • Support skirt	Support for Criterion (a)(1) equipment

Table 2.3.1-2
Reactor Vessel Internals (RVI)
Components Subject to Aging Management Review

Component Type	Intended Function
Control rod guide tubes	Support for Criterion (a)(1) equipment
Core plate assembly	Support for Criterion (a)(1) equipment
Core spray lines	Flow distribution
Fuel support pieces	Support for Criterion (a)(1) equipment
Incore dry tubes	Pressure boundary
Incore guide tubes	Support for Criterion (a)(1) equipment
Jet pump assemblies	Floodable volume
Jet pump castings	Floodable volume
Shroud	Floodable volume
Shroud repair hardware	Support for Criterion (a)(1) equipment
Shroud support	Support for Criterion (a)(1) equipment
Steam dryer	Structural integrity
Top guide	Support for Criterion (a)(1) equipment

Table 2.3.1-3
Reactor Coolant Pressure Boundary (RCPB)
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting (flanges, valves, etc.)	Pressure boundary
Condensing chambers	Pressure boundary
Detector (CRD)	Pressure boundary
Drive (CRD)	Pressure boundary
Driver mount (RR)	Pressure boundary
Filter housing (CRD)	Pressure boundary
Flow elements (RR), (SLC)	Pressure boundary
Orifices (instrumentation)	Pressure boundary
Piping and fittings < 4" NPS	Pressure boundary
Piping and fittings ≥ 4" NPS	Pressure boundary
Pump casing and cover (RR)	Pressure boundary
Pump cover thermal barrier (RR)	Pressure boundary
Restrictors (MS)	Flow control
Rupture disc (CRD)	Pressure boundary
Tank (CRD accumulator)	Pressure boundary
Thermowell	Pressure boundary
Valve bodies < 4" NPS	Pressure boundary
Valve bodies ≥ 4" NPS	Pressure boundary

2.3.2 Engineered Safety Features

The following systems are included in this section.

- residual heat removal
- core spray
- automatic depressurization
- high pressure coolant injection
- reactor core isolation cooling
- standby gas treatment
- primary containment penetrations

2.3.2.1 Residual Heat Removal

System Description

The purpose of the RHR system is to remove decay heat energy from the reactor under both operational and accident conditions.

The RHR system consists of two closed loops, each loop containing two pumps in parallel, one heat exchanger, and the necessary valves and instrumentation. The RHR heat exchanger in each loop is cooled by the RHR service water (RHRSW) system. The RHR system has the following modes of operation.

- low pressure coolant injection (LPCI) mode
- containment spray cooling (drywell spray and torus spray) mode
- suppression pool cooling mode
- shutdown cooling mode
- alternate shutdown cooling mode
- augmented fuel pool cooling mode
- emergency reactor vessel fill (RHRSW intertie) mode
- alternate shutdown mode

The LPCI mode takes suction from the suppression pool and injects flow into the core region of the reactor vessel through one of the two reactor recirculation loops. This mode of operation is designed to restore and maintain the water level of the reactor vessel following a loss of coolant accident.

The containment spray cooling mode takes suction from the suppression pool and injects flow into spray headers located in the drywell and suppression chamber. This mode of operation is designed to reduce containment pressure and temperature following a loss of coolant accident by cooling any non-condensables and condensing any steam which may be present.

The suppression pool cooling mode takes water from the suppression pool, passes it through the RHR heat exchangers, and returns flow to the suppression pool. This mode of operation is designed to remove heat which has been added to the suppression pool.

The shutdown cooling mode takes water from the reactor vessel via the reactor recirculation A loop suction piping, passes it through the RHR heat exchangers, and returns flow to the reactor through the recirculation lines. This mode of operation is designed to remove sensible and decay heat from the reactor during shutdown.

The alternate shutdown cooling mode provides a cooling path if the normal shutdown cooling path is inoperable. RHR pumps take water from the suppression pool, pass it through RHR heat exchangers and inject into the vessel via RHR injection valves. Relief valves on the steam lines are open to allow overflow to the suppression pool. This mode can be initiated from the control room.

The augmented fuel pool cooling mode takes water from the fuel pool cooling system, passes it through RHR heat exchangers, and returns flow to the fuel pool cooling system. This mode of operation is designed to assist in fuel pool cooling during reactor shutdown periods and the alternate cooling mode of operation and is not a safety function of RHR. (See Section 2.3.3.5, Fuel Pool Cooling.)

The emergency reactor vessel fill mode provides a cross-tie between the RHR service water system and RHR piping loop A. The RHRSW pumps take suction from the service water system and inject flow into the reactor vessel through RHR piping. This mode of operation is designed to provide a source of water to keep the reactor core covered (and fill containment) in the event that core standby cooling system (CSCS) pumps are lost due to loss of containment pressure or adequate core cooling cannot be assured. This mode is beyond the design basis mode of operation.

The alternate shutdown mode uses the RHR alternate shutdown panel to control the minimum valving required for vessel injection, torus cooling and shutdown cooling modes. This mode of operation is designed to achieve and maintain cold shutdown conditions during a postulated fire in the control room or cable vault which eliminates the normal means of control of the system.

The RHR system has the following mechanical intended functions for 10 CFR 54.4(a)(1).

- Provide manual or automatic low pressure core coolant injection (LPCI mode) to restore or maintain reactor inventory.
- Provide cooling to the suppression pool.
- Provide cooling to the drywell and suppression pool via spray headers.
- Remove particulate radionuclides from the drywell to the torus to limit dose following LOCAs involving fuel damage (newly credited function for drywell spray due to change to alternative source term).
- Provide isolation of lines penetrating primary containment.
- Provide reactor coolant pressure boundary.

The RHR system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The RHR system has the following intended function for 10 CFR 54.4(a)(3).

- RHR system operation is credited in the Appendix R safe shutdown capability analysis for fire protection (10 CFR 50.48).

UFSAR References

Sections 4.8 (RHR), 6.4.4 (LPCI)

Components Subject to AMR

The RHR aging management review includes components from the RDW system code and CS system code that are in the RHR system pressure boundary.

Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining RHR components are reviewed as listed below.

Table 2.3.2-1 lists the component types that require aging management review.

Table 3.2.2-1 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191168
LRA-G-191172
LRA-G-191177

2.3.2.2 Core Spray

System Description

The purpose of the CS system, in conjunction with other core standby cooling systems (CSCS), is to provide adequate core cooling for all design basis break sizes up to and including a double-ended break of the reactor recirculation system piping. The CS system provides protection to the core for a large break in the nuclear system when the RCIC and HPCI systems are unable to maintain reactor vessel water level. The protection provided by the CS system also extends to a small break in which the RCIC and HPCI systems are unable to maintain reactor vessel water level and automatic depressurization has operated to lower reactor vessel pressure so LPCI and the CS system can provide core cooling.

The CS system has two independent loops. Each loop consists of one centrifugal water pump driven by an electric motor, a spray sparger in the reactor vessel above the core, and piping and valves to convey water from the suppression pool (primary safety-related source) or condensate storage tank (backup source) to the sparger.

The CS system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide injection of water following loss of reactor coolant.
- Support primary containment isolation.
- Provide reactor coolant pressure boundary.

The CS system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CS system has the following intended function for 10 CFR 54.4(a)(3).

- The CS system is credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48).

- The CS system is credited in the station blackout coping analysis (10 CFR 50.63).

UFSAR References

Sections 6.3, 6.4.3

Components Subject to AMR

CS components in the residual heat removal system boundary are reviewed with the RHR system (Section 2.3.2.1). Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining CS components are reviewed as listed below.

Table 2.3.2-2 lists the component types that require aging management review.

Table 3.2.2-2 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawing.

LRA-G-191168

2.3.2.3 Automatic Depressurization

System Description

The purpose of the automatic depressurization system (ADS) is to actuate nuclear system pressure relief valves to automatically depressurize the nuclear system in the event of a loss of coolant accident in which the HPCI system fails to deliver rated flow or where break flow exceeds HPCI capacity (intermediate break). The depressurization of the nuclear system allows low pressure standby cooling systems to supply enough cooling water to adequately cool the fuel.

The ADS functions as one of the core standby cooling systems. The ADS, in combination with LPCI and CS, serves as a backup to the HPCI system.

The ADS operates four relief valves (also known as safety/relief valves, or SRVs) in the drywell between the reactor vessel and the first isolation valve, which, together with three safety valves, are designed to protect the nuclear system process barrier from damage due to overpressure. The relief valves discharge to the suppression pool in the torus and provide for manual or automatic depressurization of the system.

Each relief valve discharge is piped through its own discharge line to a point well below the minimum water level in the suppression pool. In the suppression pool, steam is directed from relief valve piping through a discharge device called a T-quencher, which is a perforated section of pipe spanning a suppression pool bay. The T-quencher permits a uniform distribution of condensing steam across a bay. The discharge lines are safety class from the torus penetration through the T-quenchers, but not from the relief valves to the torus penetration.

Water in the line above the suppression pool water level would cause excessive pressure at the relief valve discharge when the valve again opened. For this reason, the relief valve discharge lines have 10" vacuum breakers to prevent water being drawn up into the line due to steam condensation following termination of relief valve operation.

The mechanical components in the ADS are in the NB system code. System code ADS has only EIC components and is listed in Table 2.2-1b.

ADS has the following intended function for 10 CFR 54.4(a)(1).

- Provide reactor coolant system pressure relief.

ADS has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

ADS has the following intended function for 10 CFR 54.4(a)(3).

- ADS operation is credited in the coping analysis for station blackout (10 CFR 50.63).
- ADS operation is credited in the Appendix R safe shutdown capability analysis for fire protection (10 CFR 50.48).

UFSAR References

Sections 4.4 (part of the nuclear system pressure relief system) and 6.4.2

Components Subject to AMR

Class 1 components associated with the ADS function, including the relief valves, are reviewed with the RCS (Section 2.3.1). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining ADS components are reviewed as listed below.

Table 2.3.2-3 lists the component types that require aging management review.

Table 3.2.2-3 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawing.

LRA-G-191167

2.3.2.4 High Pressure Coolant Injection

System Description

The purpose of the HPCI system is to assure that the reactor core is adequately cooled in the event of a small break in the nuclear system and subsequent loss of coolant which does not result in rapid depressurization of the reactor vessel. It will perform this function simultaneously with a loss of normal auxiliary power. The HPCI system permits the reactor to be shut down while maintaining sufficient reactor vessel water inventory until the reactor vessel is depressurized. HPCI continues to operate until reactor vessel pressure is below the pressure at which low pressure coolant injection (LPCI) operation or core spray system operation can maintain core cooling.

The HPCI system consists primarily of a steam turbine assembly driving a constant-flow pump assembly and associated piping and valves. Two sources of water are available. The system initially is supplied from the condensate storage tank (preferred source) and automatically shifts to the suppression pool (primary safety-related source) on low tank level. The turbine steam supply is extracted from a main steam header upstream of the main steam isolation valves.

The HPCI system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide core cooling.
- Provide reactor coolant pressure boundary.
- Support primary containment isolation.

The HPCI system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The HPCI system has the following intended functions for 10 CFR 54.4(a)(3).

- Provide water for core cooling and reactor vessel makeup following certain Appendix R fires as credited for fire protection (10 CFR 50.48).
- The HPCI system is credited in the station blackout coping analysis (10 CFR 50.63).

UFSAR References

Section 6.3 and 6.4

Components Subject to AMR

Post-accident sampling system return lines are included in the HPCI aging management review. See Section 2.3.3.11.

Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining HPCI components are reviewed as listed below.

Table 2.3.2-4 lists the component types that require aging management review.

Table 3.2.2-4 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-5920-0870	LRA-G-191175 sheet 1
LRA-G-191167	LRA-G-191176 sheet 1
LRA-G-191169 sheets 1 and 2	LRA-191238
LRA-G-191172	

2.3.2.5 Reactor Core Isolation Cooling

System Description

This description includes the reactor core isolation cooling (RCIC) system and the condensate storage and transfer (CST) system.

The purpose of the RCIC system is to replace the normal makeup water sources to the reactor vessel following feedwater isolation with a simultaneous loss of normal auxiliary power. Under these circumstances, it operates automatically in time to prevent uncovering the core without the use of any core standby cooling systems.

The RCIC system consists of a steam turbine-driven pump designed to supply water from either the condensate storage tank or the suppression pool to the reactor via the feedwater spargers.

The purpose of the CST system is to provide a source of water to various plant systems. These include HPCI and RCIC systems (preferred source), core spray (as a backup source or for testing), the CRD system (backup source), and the spent fuel pool (fill and makeup source). The CST system connects to the condensate (C) system to provide for make-up or draw-off of condensate to or from the hotwell.

The CST system consists of the condensate storage tank, two condensate transfer pumps, and associated piping and valves.

The RCIC system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide makeup water to the reactor vessel during shutdown and isolation in order to prevent the release of radioactive materials to the environs as a result of inadequate core cooling.
- Maintain integrity of reactor coolant pressure boundary.
- Support primary containment isolation.

The RCIC system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The RCIC system has the following intended function for 10 CFR 54.4(a)(3).

- Control vessel cooldown following certain Appendix R fires for fire protection (10 CFR 50.48).
- The RCIC system is credited in the station blackout coping analysis (10 CFR 50.63)

The CST system has the following intended function for 10 CFR 54.4(a)(1).

- Provide a source of water from the condensate storage tank for HPCI and RCIC.

The CST system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CST system has the following intended function for 10 CFR 54.4(a)(3).

- The CST system is credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48).
- The CST system supply for RCIC and HPCI is credited in the station blackout coping analysis (10 CFR 50.63).

UFSAR References

Section 4.7 (RCIC) and Section 11.8.3.8 (condensate storage tank and condensate makeup and reject systems)

Components Subject to AMR

Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining RCIC and CST components are reviewed as listed below.

Table 2.3.2-5 lists the component types that require aging management review.

Table 3.2.2-5 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191167	LRA-G-191175, sheet 1
LRA-G-191168	LRA-G-191176, sheet 1
LRA-G-191174 sheet 1	LRA-G-191178, sheet 1
LRA-G-191174 sheet 2	

2.3.2.6 Standby Gas Treatment

System Description

The purpose of the SBGT system is to process gaseous effluent from the primary and secondary containment when required to limit the discharge of radioactive materials to the environs and limit exfiltration from the secondary containment during periods of primary containment isolation. This is accomplished by two trains, each capable of maintaining a negative pressure in the secondary containment and processing one net secondary containment volume of air per day through high efficiency filters. The system functions as part of the secondary containment system.

The SBGT system consists of two complete independent trains, each sized to handle the full system requirement, one a backup for the other. Each train includes a demister, electric heaters, two high efficiency particulate (HEPA) filters, carbon adsorber, fan, and miscellaneous valves.

The SBGT system has the following intended functions for 10 CFR 54.4(a)(1).

- Maintain a negative pressure in the reactor building so that any air leakage will be into the reactor building.
- Provide sufficient air filtration such that in the event of a design basis accident, release of gaseous contaminants will not result in doses which exceed the limits specified in 10 CFR 50.67.

The SBGT system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The SBGT system has no intended functions for 10 CFR 54.4(a)(3).

UFSAR References

Sections 1.6.2.15, 5.3.4

Components Subject to AMR

Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining SBGT components are reviewed as listed below.

Table 2.3.2-6 lists the component types that require aging management review.

Table 3.2.2-6 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191159 sheet 2	LRA-G-191238

2.3.2.7 Primary Containment Penetrations

System Description

The purpose of primary containment penetrations is to provide the capability for rapid isolation of all pipes or ducts which penetrate the primary containment by means which provide a containment barrier as effective as is required to maintain leakage within permissible limits.

Mechanical penetrations for systems with a system-level aging management review are reviewed with that system. The scope of this review is passive mechanical penetration components not included in other system reviews. This review includes only the containment penetration portion of these systems.

The grouping of containment isolation valves from various plant systems into one consolidated review is appropriate as indicated in NUREG-1800, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, Section 2.1.3.1.

Containment penetrations have the following intended function for 10 CFR 54.4(a)(1).

- Support primary containment isolation.

Containment penetrations have no intended functions for 10 CFR 54.4(a)(2) or (a)(3).

UFSAR References

Sections 5.2.2, 5.2.3.4, 5.2.3.5

Components Subject to Aging Management Review

This evaluation includes penetrations that are part of the control rod drive (CRD) system and nuclear boiler (NB) system, described in Section 2.3.1, and the radwaste (RDW) system and neutron monitoring (NM) system, described in Section 2.3.3.13. Remaining containment penetrations are reviewed with the systems with which they are associated.

The structural portions of penetrations are reviewed with the primary containment structure (Section 2.4.1). The internals of electrical penetration assemblies are reviewed with the electrical systems (Section 2.5).

Table 2.3.2-7 lists the component types that require aging management review.

Table 3.2.2-7 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191159 sheet 5	LRA-G-191175 sheet 1
LRA-G-191167	LRA-G-191175 sheet 2
LRA-G-191170	LRA-G-191177 sheet 1

Table 2.3.2-1
Residual Heat Removal (RHR) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Cyclone separator	Filtration Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Nozzle	Flow control Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-2
Core Spray (CS) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Cyclone separator	Filtration Pressure boundary
Flow nozzle	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-3
Automatic Depressurization System (ADS)
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-4
High Pressure Coolant Injection (HPCI) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bearing housing	Pressure boundary
Bolting	Pressure boundary
Drain pot	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Gear box	Pressure boundary
Governor housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Steam trap	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Turbine casing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-5
Reactor Core Isolation Cooling (RCIC) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Condenser	Pressure boundary
Drain pot	Pressure boundary
Filter housing	Pressure boundary
Flow indicator	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Steam heater	Pressure boundary
Steam trap	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Turbine casing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-6
Standby Gas Treatment System (SBGT)
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Duct	Pressure boundary
Fan housing	Pressure boundary
Filter	Filtration
Filter housing	Pressure boundary
Filter unit housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-7
Primary Containment Penetrations (PCP)
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

2.3.3 Auxiliary Systems

The following systems are included in this section.

- standby liquid control
- service water
- reactor building closed cooling water
- emergency diesel generator
- fuel pool cooling
- fuel oil
- instrument air
- fire protection—water
- fire protection—carbon dioxide
- heating, ventilation and air conditioning
- primary containment atmosphere control / containment atmosphere dilution
- John Deere diesel
- miscellaneous systems in scope for (a)(2)

2.3.3.1 Standby Liquid Control

System Description

The purpose of the standby liquid control (SLC) is to provide a method, independent of the control rods, to shut down the reactor from full power and maintain the reactor subcritical during cooldown. Maintaining subcriticality as the nuclear system cools assures that the fuel barrier is not threatened by overheating in the event that not enough control rods can be inserted to counteract the positive reactivity effects of a colder moderator.

The system, located in the reactor building, consists of a boron solution tank, a test water tank, two positive-displacement pumps, two explosive valves, an ion exchanger, a flush pump, and associated piping and valves. The liquid is piped into the reactor vessel and discharged near the bottom of the core shroud so it mixes with the cooling water rising through the core.

The SLC system was originally not required to meet safety design basis requirements of engineered safety feature systems because the SLC system was not required to mitigate the consequences of a design basis accident (DBA). However, VYNPS chose to classify the SLC system as safety-related. With the licensing change to the alternative source term, the SLC system is credited in the LOCA analysis.

In order for the system to have a high degree of reliability, the system was designed with many safety-related system features (e.g., components required for injection are designed to safety-related criteria) and is powered from a safety class electrical power source. Additionally, while the nonprocess portion of the system is designed to seismic Class II criteria, the process portion of the system is designed to seismic Class I.

The SLC system has the following intended functions for 10 CFR 54.4(a)(1).

- Buffer suppression pool pH to prevent iodine re-evolution following a postulated design basis LOCA (function required for alternative source term analysis).
- Provide injection of sodium pentaborate solution from the SLC tank into the reactor.
- Provide automatic isolation of the RWCU system upon SLC system initiation.
- Provide reactor coolant pressure boundary.
- Provide primary containment isolation.

The SLC system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The SLC system has the following intended function for 10 CFR 54.4(a)(3).

- Inject boron-10 into the reactor in a concentration and rate equivalent to that specified in the ATWS rule (10 CFR 50.62).

UFSAR References

Section 3.8

Components Subject to Aging Management Review

Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed with the RCS (Section 2.3.1). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining SLC components are reviewed as listed below.

Table 2.3.3-1 lists the component types that require aging management review.

Table 3.3.2-1 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawing.

LRA-G-191171

2.3.3.2 Service Water

System Description

This description includes the service water (SW) system and the residual heat removal service water system (RHRSW).

The purpose of the SW system is to provide cooling water to various normal and emergency operating loads.

The SW system consists of two parallel headers which supply cooling water to turbine and reactor auxiliary equipment. Each header is supplied by two pumps and provides cooling water to a reactor building closed cooling water heat exchanger, RHR corner room ventilation coolers, a diesel generator cooler, and an RHR heat exchanger (via the RHRSW pumps and piping). The standby fuel pool cooling system is normally supplied from the SW Train B header. The header and cross tie can be configured to be fed from the A header with B secured. Other turbine and reactor auxiliary equipment is supplied from a line tied into both headers.

The SW system may be lined up to supply various other systems:

(1) the hotwell emergency fill line via the turbine building supply header,
(2) the fire system through its cross-connect with the service water system,
(3) the nuclear boiler system through the RHRSW intertie, and
(4) the spent fuel pool for emergency fill through a branch line from SW Train B.

Those portions of the station service water supplying safeguard equipment and the unisolable portions of the service water system are of Class I seismic design.

The alternate cooling system (ACS) is not a system in the site component database; however, it is described in UFSAR Section 10.8 and is included in this evaluation for clarification as a mode of operating the service water system. The purpose of the ACS is to provide a source of cooling water upon loss of the service water pumps. The RHR system will operate in this mode as if the plant were being supplied with river water and will function to safely remove sensible and decay heat from the reactor.

The ACS provides an adequate heat sink to remove decay heat and sensible heat from the primary system so that the reactor can be safely shut down in the unlikely event of loss of Vernon Pond, flooding of the service water intake structure, or fire in the service water intake structure which disables all four service water pumps. It also provides an adequate heat sink for removing decay heat from spent fuel elements in the fuel pool and other miscellaneous heat loads while maintaining safe shutdown conditions for the scenarios described above. Adequate water storage facilities are available to accommodate system losses for a period of one week in the event of a loss of Vernon Pond.

During ACS operation, the following components from various systems are in use: cooling tower water deep basin, a cooling tower cell (CT2-1) and fan; RHRSW pumps and pump motor coolers; RHR motor coolers, RHR and diesel generator heat exchangers; ECCS room coolers (RRUs 7-8); and associated piping and valves. Cooling water is supplied by gravity flow from the cooling tower deep basin to the RHRSW pumps. Water is then pumped to the RHR and diesel generator heat exchangers, ECCS room coolers (RRUs 5-8), SFPCS heat exchangers, and auxiliary components, and, except for the RHRSW pump motor bearing coolers, returned to the cooling tower where the latent heat is transferred to the atmosphere. (RRUs 5 and 6 cooling function is nonsafety-related; however, the cooling units remain Safety Class 3 because of their service water pressure boundary interface.)

RHR pump seal coolers are normally supplied by RBCCW, not service water. However, in ACS operation, the seal coolers are manually realigned to be supplied by the ACS.

The ACS has the safety function of providing an alternate means of cooling in the unlikely event that the service water pumps become inoperable. The components included in the system are VYNPS Safety Class 3 but the system is not designed to accept the consequences of a design basis loss-of-coolant accident. It is also not single failure-proof.

The purpose of the RHRSW system is to transfer heat from the RHR system during normal operation and under accident conditions.

The RHRSW system consists of four RHRSW pumps, two RHR heat exchangers and the piping, valves, and instrumentation necessary to ensure system operation. The RHRSW pumps are supplied from the SW system. The cooling water is then pumped through the RHR heat exchangers and is returned to the SW system.

The RHRSW to RHR intertie consists of two motor-operated valves and a check valve in series between an RHRSW line and an RHR heat exchanger discharge line. Although not a safety design requirement of the RHRSW system, this safety-related intertie provides a defense-in-depth capability for the injection of filtered river water into the core in the event that no other reactor water sources are available.

The SW system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide cooling water to the EDG coolers, the RHRSW pumps, standby fuel pool cooling heat exchangers, RBCCW heat exchangers, and RHR corner room ventilation coolers. This includes the structural integrity functions for coils in RRUs 5 and 6.
- Provide isolation of major non-essential loads during and following DBAs.
- Provide heated water to prevent freezing in the deep basin.
- Maintain higher tube-to-shell heat exchanger pressure to limit radioactive releases.
- Support alternate cooling mode of operation during loss of Vernon Pond, a fire or flood in the intake structure, or an upstream dam failure.
- Provide secondary containment isolation.

The SW system has the following intended functions for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The SW system has the following intended functions for 10 CFR 54.4(a)(3).

- Use of the SW system and the ACS mode of operation are credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48).

The RHRSW system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide service water to the RHR heat exchangers during a DBA or normal shutdown.
- Maintain isolation of RHRSW from direct injection into the RHR flow path through the intertie.
- Provide service water to support the alternate cooling mode of operation should all service water pumps become inoperable.
- Maintain cooling water pressure on the RHR heat exchanger tube side (SW) higher than the shell side (RHR) pressure so that tube leakage does not allow RHR water into the SW system. Although this function does not meet the SR criterion of 10 CFR 54.4(a)(1), it is conservatively considered a safety function for purposes of evaluation.

The RHRSW system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The RHRSW system has the following intended functions for 10 CFR 54.4(a)(3).

- The RHRSW system is credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48).

UFSAR References

Sections 10.6, 10.7, and 10.8

Components Subject to Aging Management Review

The portion of the RHRSW system that supplies the RHR pump motor seal coolers during ACS operation is reviewed with RBCCW (Section 2.3.3.3). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining SW and RHRSW components are reviewed as listed below.

Table 2.3.3-2 lists the component types that require aging management review.

Table 3.3.2-2 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191159 sheets 1 and 2	LRA-G-191173 sheet 2
LRA-G-191172	LRA-5920-4147

2.3.3.3 Reactor Building Closed Cooling Water

System Description

The purpose of the RBCCW system is to supply demineralized water to the reactor building auxiliary equipment systems from a closed cooling loop. The RBCCW system is used to cool equipment which may contain radioactive fluids. The service water system provides the heat sink for the RBCCW system.

The RBCCW system is a closed cooling loop containing two 100% capacity heat exchangers and two 100% capacity pumps with a chemical feeder, an expansion (surge) tank, and associated valves and piping. RBCCW heat exchanger discharge is divided into four parallel cooling loops. One loop provides cooling water to equipment within primary containment. Primary containment isolation is achieved with a check valve on the inlet to primary containment, a motor-operated valve on the outlet from primary containment, and closed loop piping inside containment. The second loop provides cooling water to reactor water clean-up system nonregenerative heat exchangers, clean-up system pump coolers, sample coolers, and fuel pool heat exchangers. The third loop provides cooling water to residual heat removal (RHR) pump seal coolers, radwaste building holding pump coolers, control rod drive pump coolers, and fuel pool demineralizer air compressor heat exchanger. This loop can also be served during the alternate cooling mode of operation by manual repositioning of valves. The fourth loop provides cooling for the primary containment air compressor.

The RBCCW cooling function is not a safety function. Fuel pool cooling is not a safety function of RBCCW since the safety-related standby fuel pool cooling (SBFPC) system uses service water as a heat sink. RBCCW supplies the heat sink for the nonsafety-related fuel pool cooling (FPC) system. RHR pump seal cooling is normally provided by RBCCW, not service water. This function is not a safety function for RBCCW since RHR pump seal cooling is not required to support hot safe shutdown. However, if the service water pumps are inoperable and alternate cooling is in service (see description of alternate cooling mode in Section 2.3.3.2), the RHR pump seal coolers are manually aligned to the service water supplied by ACS. Under these conditions (loss of Vernon Pond, flooding of the service water intake structure, or fire in the service water intake structure which disables all four service water pumps), RHR pump seal cooling is a safety function provided by service water via ACS, and the RBCCW system piping which provides for seal cooling to be supplied by ACS performs the safety function of maintaining system integrity for the service water.

The RBCCW system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide a primary containment pressure boundary for RBCCW piping.
- Provide an isolation barrier from the service water system via the RBCCW heat exchanger tubes to prevent reactor building flooding.
- Provide flow path for service water to RHR pump seals during an alternate cooling scenario.

The RBCCW system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The RBCCW system has the following intended function for 10 CFR 54.4(a)(3).

- Provide flow path for service water to RHR pump seals during an alternate cooling scenario. Alternate cooling is credited for fire protection (10 CFR 50.48).

UFSAR References

Section 10.9

Components Subject to Aging Management Review

The portion of the RHRSW system that supplies the RHR pump motor seal coolers during ACS operation is reviewed with RBCCW. Reactor recirculation pump seal water coolers are reviewed with RBCCW.

Jacket water heat exchangers integral to the reactor recirculation pump covers are reviewed with the RCS (Section 2.3.1). The RBCCW heat exchanger tubes perform a pressure boundary function for the service water system and are therefore reviewed with SW (Section 2.3.3.2). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining RBCCW components are reviewed as listed below.

Table 2.3.3-3 lists the component types that require aging management review.

Table 3.3.2-3 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-191159 sheet 1	LRA-191159 sheet 3
LRA-191159 sheet 2	LRA-191159 sheet 5

2.3.3.4 Emergency Diesel Generator

System Description

This description includes the emergency diesel generator (DG) system and the diesel lube oil (DLO) system.

The purpose of the DG system is to provide Class 1E electrical power to the emergency buses in a loss of normal power (LNP) condition or a loss of coolant accident (LOCA) coincident with LNP/ degraded grid voltage at the emergency buses and to be available to provide Class 1E electrical power to the emergency buses in a LOCA with normal power available. The diesel generator and auxiliary systems will start and be in standby during a LOCA.

Two standby diesel-driven generators are provided. The diesel generator auxiliaries consist of air/jacket water cooling, starting air, fuel oil, lube oil, and combustion air and exhaust.

The purpose of the DLO system is to provide for storage of diesel lube oil and provide for pre-lube of the diesel generators.

The DLO system consists of two pre-lube oil pumps and two lube oil day tanks only (the DLO system in the component database has only these four components). Remaining components that supply the lube oil required during EDG operation are in the DG system.

The small AC motor-driven pre-lube pumps are provided for pre-lubing the engines prior to manual (non-emergency) starts to ensure adequate engine bearing life. During an emergency start, the pre-lube pumps do not operate, but they are required to maintain a pressure boundary.

The DG system has the following intended function for 10 CFR 54.4(a)(1).

- Provide a self-contained onsite AC power source capable of supplying emergency loads via 4kV vital buses for safe shutdown of the reactor following postulated accidents.

The DG system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The DG system has the following intended function for 10 CFR 54.4(a)(3).

- The DG system is credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48).

The DLO system has the following intended function for 10 CFR 54.4(a)(1).

- Provide lube oil for EDG operation.

The DLO system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The DLO system has the following intended function for 10 CFR 54.4(a)(3).

- Provide lube oil for EDG operation, which is credited for fire protection (10 CFR 50.48).

UFSAR References

Section 8.5

Components Subject to Aging Management Review

Components that supply fuel oil are reviewed with the fuel oil system (Section 2.3.3.6). While the tube and shell side of the jacket water, air coolant, and lube oil heat exchangers are included in this aging management review, the portions of the service water (SW) system beyond the service water inlet and outlet nozzles on the heat exchangers are reviewed with the service water system (Section 2.3.3.2). Remaining DG and DLO components are reviewed as listed below.

Table 2.3.3-4 lists the component types that require aging management review.

Table 3.3.2-4 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191160 sheet 7
LRA-5920-4150
LRA-5920-4147

2.3.3.5 Fuel Pool Cooling

System Description

VYNPS has a nonsafety-related normal fuel pool cooling system (FPC) that was part of the original plant configuration. In the late 1980's a safety-related standby fuel pool cooling subsystem was added (SBFPC). This description includes both systems plus the FPC filter-demineralizer (FPFD) system and the Boral in the spent fuel racks.

The purpose of the FPC system is to remove the decay heat released from the spent fuel elements. During normal operation, the system maintains a specified fuel pool water temperature, purity, water clarity, and water level. The system cools the fuel storage pool by transferring the spent fuel decay heat through heat exchanger(s) to the reactor building closed cooling water system.

The FPC system consists of two circulating pumps connected in parallel, two heat exchangers, and associated piping and valves. Water purity and clarity in the storage pool, reactor well, and dryer-separator storage pit are maintained by filter-demineralizers that are components in the FPFD system.

The purpose of the SBFPC system is to maintain pool temperature during a design basis accident (which includes concurrent loss-of-coolant accident, loss of off-site power, and single failure) or should an unusually high spent fuel decay heat load be placed in the pool.

The SBFPC system is a two-train, seismic Class I, safety-related system designed to prevent a single active failure from disabling both trains. The system consists of two pumps and two heat exchangers which are normally lined up as two parallel trains in a standby mode to the normal fuel pool cooling system. It is designed to be remotely placed in operation from the control room. This portion of the system cools the fuel storage pool by transferring the spent fuel decay heat to the service water system. The pumps circulate the pool water from the spent fuel storage pool, through the heat exchangers and back into the fuel pool.

The purpose of the FPFD is to maintain the purity of the spent fuel pool water. This is accomplished by minimizing corrosion product buildup and controlling water clarity; minimizing fission product contamination in the water; and providing a means for controlled removal of water from the fuel pool to the condensate storage and transfer system.

The system consists of two filter-demineralizers and associated equipment for replacing spent filter medium. Pool water circulates in a closed loop from the spent fuel storage pool or reactor well, through the heat exchangers(s) and filter demineralizer(s), and returning to the fuel pool or reactor well. The filter-demineralizers are located in the radwaste building.

Boral sheets are used in the spent fuel storage pool to provide neutron absorption.

The FPC system has the following intended function for 10 CFR 54.4(a)(1).

- Maintain fuel pool water level above the fuel.
- Support flow path for safety-related standby fuel pool cooling system. (The fuel pool cooling function of the FPC system is not a safety function.)

The FPC system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The FPC system has the following intended function for 10 CFR 54.4(a)(3).

- Support flow path for safety-related standby fuel pool cooling system, which is credited in the Appendix R analysis.

The SBFPC system has the following intended functions for 10 CFR 54.4(a)(1).

- Remove decay heat released from spent fuel elements.
- Provide an alternate source of water (service water crosstie) to the fuel pool to maintain adequate water level.

The SBFPC system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The SBFPC system has the following intended function for 10 CFR 54.4(a)(3).

- The system is credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48).

The FPFD system has no intended functions for 10 CFR 54.4(a)(1).

The FPFD system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The FPFD system has no intended functions for 10 CFR 54.4(a)(3).

Boral has the following intended function for 10 CFR 54.4(a)(1).

- Provide neutron absorption.

Boral has no intended functions for 10 CFR 54.4(a)(2) or (a)(3).

UFSAR References

Section 10.3 (Boral in the spent fuel pool storage racks), 10.5

Components Subject to Aging Management Review

Four SBFPC valves in the service water line associated with the spent fuel cooling heat exchangers are reviewed with the service water system (Section 2.3.3.2). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining FPC, SBFPC, FPFD, and Boral components are reviewed as listed below.

Table 2.3.3-5 lists the component types that require aging management review.

Table 3.3.2-5 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191173, sheets 1 and 2

2.3.3.6 Fuel Oil

System Description

The purpose of the fuel oil (FO) system is to supply fuel oil to the emergency diesel generators (EDGs) as well as the nonsafety-related diesel-driven fire pump, John Deere diesel, and house heating boiler.

The portion of the system related to the EDGs consists of a day tank and fuel transfer pump for each diesel, the fuel oil storage tank, and associated valves and piping. The diesel fire pump fuel oil day tank, John Deere diesel day tank, and house heating boiler fuel oil storage tank are not connected to the fuel oil storage tank. Normal makeup to the house heating boiler fuel oil storage tank is by tanker truck. Normal makeup to the diesel fire pump fuel oil day tank and John Deere diesel day tank is from a 500-gallon portable tank that is filled from the fuel oil storage tank.

The FO system has the following intended function for 10 CFR 54.4(a)(1).

- Provide fuel oil from the day tanks to the corresponding EDG and automatic makeup from the storage tank to the EDG day tanks such that a seven-day supply is available for one EDG.

The FO system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The FO system has the following intended function for 10 CFR 54.4(a)(3).

- Provide fuel oil for the diesel fire pump and the John Deere diesel in support of fire protection regulations (10 CFR 50.48).

UFSAR References

Section 8.5.4

Components Subject to Aging Management Review

The fuel oil components associated with the John Deere diesel engine (Section 2.3.3.12) are reviewed with the fuel oil system.

Table 2.3.3-6 lists the component types that require aging management review.

Table 3.3.2-6 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-191162, sheet 2

2.3.3.7 Instrument Air

System Description

This description includes the instrument air (IA) system, the service air (SA) system, the 105 system (SA and IA Instruments), and the nitrogen supply (N2) system.

The purpose of the instrument air (IA) system is to provide the station with a continuous supply of dry, oil-free air for pneumatic instruments and controls through a dual header system.

The compressed air of the IA system passes through two parallel branches, both of which contain (1) a prefilter, which filters the air to remove moisture droplets and particles of dirt, rust, and scale; (2) a desiccant dryer, which uses electrically operated heaters to reactivate wet desiccants; and (3) an after-filter, which functions like the prefilter.

The IA system includes the containment nitrogen supply which is described in the UFSAR as a separate nitrogen subsystem. This subsystem is also known as containment air. The purpose of containment nitrogen is to provide pneumatically operated components in the drywell with nitrogen when the primary containment is inerted such that any component leakage will not dilute the nitrogen atmosphere. This nitrogen source can be from either the N2 system (normal supply) or the containment air compressor (automatic backup supply). The gas from either source supplies a receiver tank and passes through a prefilter, nonvented dryers, and an after-filter before re-entering the containment for use in actuating components. When neither nitrogen supply is available or when the containment is not inerted, instrument air may be manually lined up to provide a secondary backup for the containment nitrogen. When the containment is not inerted, instrument air will be lined up to provide the primary source of pneumatic pressure.

Containment nitrogen supplies the reactor coolant system safety relief valves via a dedicated line entering primary containment. A backup supply is provided from a safety class nitrogen bottle station.

The IA system was originally of seismic design. It is currently classified as non-nuclear safety except for the RCS relief valve supply, the air receiver relief valve, primary containment boundaries, and reactor building railroad airlock inflatable seals.

The purpose of the SA system is to provide the station with the compressed air requirements for pneumatic instruments and controls and general station services. The instrument air system also supports this function.

The SA system includes four air compressors connected in parallel, each with a built-in intake filter-silencer, after-cooler, and moisture separator. The compressors discharge to two vertically mounted air receivers. Separate piping is provided at the discharge of the air receivers for the instrument air system and the service air system.

The purpose of the 105 system is to provide indication, alarm, and control functions for associated systems. This code is used in the component database for various instrumentation components related to service air and instrument air. Although the 105 system consists mainly of EIC components, certain mechanical components related to IA instrumentation are included as well.

The purpose of the N2 system is to provide nitrogen gas to the primary containment atmospheric control (PCAC) system to satisfy the primary containment purge and normal make-up requirements. Major pieces of equipment in the N2 system are a liquid nitrogen storage tank, three defrostable fan ambient vaporizers, an electric purge gas trim heater, and an electric make-up gas trim heater.

The N2 system is capable of supplying nitrogen gas at a sufficient volume and rate such that the primary containment oxygen concentration may be reduced from 21% to less than 4% within 24 hours. N2 equipment which performs the function is not required to mitigate the accident post-LOCA and therefore is not safety-related. The N2 system also provides nitrogen to drywell components via the containment instrument air system (part of the IA system). This nitrogen supply function is not safety-related. The safety-related function of nitrogen is an IA system function.

A relief valve on the containment air compressor receiver has the safety function of providing overpressure protection to prevent exceeding the maximum operating pressure differential for safety-related solenoid operated valves in the IA system. Therefore, the N2 system has the safety function of preventing overpressurization of IA system SOVs.

The IA system has the following intended functions for 10 CFR 54.4(a)(1).

- Isolate lines penetrating primary containment.
- Provide instrument air to outboard MSIVs and reactor building railroad airlock inflatable seals.
- Provide instrument air (or nitrogen) to operate safety relief valves and inboard MSIVs.
- Provide backup nitrogen to safety relief valves (SRV accumulators).
- Prevent over-pressurization of safety-related AOV solenoids.

The IA system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The IA system has the following intended functions for 10 CFR 54.4(a)(3).

- Provide instrument air (or nitrogen) to components relied upon for compliance with the Commission's regulations for fire protection (10 CFR 50.48).
- Provide instrument air (or nitrogen) to components relied upon in the coping analysis for station blackout (10 CFR 50.63).

The SA system has the following intended function for 10 CFR 54.4(a)(1).

- Prevent over-pressurization of safety-related AOV solenoids supplied by service air. This function is performed by two air receiver relief valves which are classified as Safety Class 3. Overpressure protection of the IA system is necessary to ensure that certain safety-related solenoid-operated valves do not exceed the design maximum operating differential pressure.

The SA system has no intended functions for 10 CFR 54.4(a)(2) or (a)(3).

The 105 system has the following intended function for 10 CFR 54.4(a)(1).

- Vent control air from the valve operators for containment air compressor containment isolation valves (FSO-105-1A/B).

The 105 system has no intended functions for 10 CFR 54.4(a)(2) or (a)(3).

The N2 system has the following intended function for 10 CFR 54.4(a)(1).

- Prevent overpressurization of safety-related IA system solenoid valves.

The N2 system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The N2 system has no intended functions for 10 CFR 54.4(a)(3).

UFSAR References

Section 10.14

Components Subject to Aging Management Review

The IA aging management review includes CRD and HCU components in the reactor coolant system with a direct IA system interface. These components support safety-related intended functions and intended functions for ATWS and fire protection. (See Section 2.3.1, discussion of CRD and HCU.)

Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining IA, SA, 105 system, and N2 components are reviewed as listed below.

Solenoid valves with the active function of venting air are not subject to aging management review as they do not have a passive function for license renewal.

Table 2.3.3-7 lists the component types that require aging management review.

Table 3.3.2-7 provides the results of the aging management review.

License Renewal Drawings

Additional details for the components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191160 sheets 3, 4, 6, and 8 LRA-G-191167

2.3.3.8 Fire Protection—Water

System Description

The purpose of the fire protection (FP) system is to provide fire protection for the station through the use of water, carbon dioxide, dry chemicals, foam, detection and alarm systems, and rated fire barriers, doors, and dampers. This section describes the fire protection—water system. The fire protection—CO2 system is described in the next section (Section 2.3.3.9).

Water for the FP system is provided by two vertical turbine-type pumps, one electric motor driven and one diesel driven. The pumps and drivers are located in the intake structure. They discharge to an underground piping system which serves the exterior and interior fire protection systems. The pressure in the system is maintained at approximately 100 psig by an interconnection to the service water system. A check valve in the connecting pipe prevents backflow. Through an interconnecting valve, the service water system can be used to provide water to fire protection components in the unlikely event both fire protection pumps are unavailable.

In the turbine building and reactor building, in addition to hose stations and deluge systems, a foam fire protection agent is available which can be used to combat fires at the fuel oil storage tank, turbine lube oil storage tank, main and auxiliary transformers, house heating boilers, the emergency diesel generators, and the recirc MG set. Foam concentrate is combined with water from the FP header to create a foam suitable for combating fires.

The FP—water system has no intended functions for 10 CFR 54.4(a)(1).

The FP—water system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The FP—water system has the following intended functions for 10 CFR 54.4(a)(3).

- Provide the capability to extinguish fires in vital areas of the plant (10 CFR 50.48).

<u>UFSAR References</u>

Section 10.11

<u>Components Subject to Aging Management Review</u>

The diesel fire pump fuel oil day tank is reviewed with the fuel oil system (Section 2.3.3.6). Fire barriers such as walls, doors, wall-mounted damper housings, wraps, and penetration seals are addressed in the structural aging management reviews. Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining FP—water system components are reviewed as listed below.

Fire hoses are not subject to aging management review since they are periodically inspected, hydrotested, and replaced.

Table 2.3.3-8 lists the component types that require aging management review.

Table 3.3.2-8 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191163 sheets 1 and 2 LRA-G-191159 sheet 1

2.3.3.9 Fire Protection—Carbon Dioxide

System Description

The purpose of the fire protection (FP) system is to provide fire protection for the station through the use of water, carbon dioxide, dry chemicals, foam, detection and alarm systems, and rated fire barriers, doors, and dampers. This section describes the fire protection—CO2 system. The fire protection—water system is described in the previous section (Section 2.3.3.8).

The cable vault and switchgear rooms are protected by fully automatic total flooding carbon dioxide suppression systems initiated by ionization detectors. Bottles located in the west switchgear room may also provide a backup or second shot to the cable vault if desired. The diesel fire pump fuel oil storage tank room is protected by a total flooding carbon dioxide suppression system initiated by heat detectors.

The automatic total flooding high pressure CO2 gas suppression systems for the cable vault and diesel fire pump fuel oil storage tank room include high pressure CO2 stored at ambient temperatures in steel CO2 tanks. Empty fixed piping systems are used to convey CO2 from the tanks to open nozzles in the fire area. The cable vault CO2 system (automatic total flooding system with CO2 tanks located in the cable vault) is cross-connected to the CO2 tanks located in the west switchgear room to provide back-up capability for cable vault fire protection.

The east and west switchgear rooms are protected by automatic total flooding low pressure CO2 systems. Low pressure CO2 is stored at approximately 0ºF in a storage tank located outside. Empty fixed piping systems are used to convey CO2 from the storage tank to open nozzles in the fire area.

The FP—CO2 system has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The FP—CO2 system has the following intended functions for 10 CFR 54.4(a)(3).

- Provide the capability to extinguish fires in vital areas of the plant (10 CFR 50.48).

UFSAR References

Section 10.11

Components Subject to Aging Management Review

Table 2.3.3-9 lists the component types that require aging management review.

Table 3.3.2-9 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191163 sheets 3 and 4

2.3.3.10 Heating, Ventilation and Air Conditioning

System Description

This description includes the HVAC systems and the house heating boiler (HB) system.

The purpose of HVAC systems is to maintain the general area environment for personnel and equipment. The HVAC system consists of several ventilation systems serving different areas of the plant. Each ventilation system is briefly described below.

Primary containment ventilation maintains drywell ambient temperature within acceptable ranges. The system consists of four reactor recirculation units, RRU-1, 2, 3 and 4, and associated dampers. Each recirculation unit contains two independently operable fans and air cooling coils supplied with water from reactor building closed cooling water (RBCCW). This system is normally operating. The recirculation units receive power from safety class sources and are diesel-backed, but are not relied upon post-accident.

Reactor building ventilation provides filtration and controls temperature, humidity, and migration of air from clean areas to areas of higher contamination, including exhaust to the plant stack. It also provides a means of purging the drywell. Reactor building ventilation includes *ECCS corner room ventilation,* with four recirculation units, RRU-5, 6, 7 and 8. Each recirculation unit contains a fan section and air cooling coils supplied with water from SW. During normal operation, this subsystem supplements the reactor building ventilation system to cool the corner rooms. During accidents, reactor building ventilation is isolated and only ECCS corner room ventilation is operating. RRUs 7 and 8 are the units qualified to ensure the core spray, residual heat removal (RHR) and RHR service water components are maintained within their temperature limits. RRUs 5 and 6 are not relied upon to maintain the room temperature following an accident.

Turbine building ventilation provides filtration and controls temperature, humidity, and migration of air from clean areas to areas of higher contamination. It provides for the exhaust of building air to the plant stack (normal intake and exhaust function) to provide a monitored release path.

Diesel generator room ventilation provides the necessary ventilation to support operation of the emergency diesel generators.

Control building ventilation maintains the environment in the main control room.

Service building ventilation provides filtration, controls temperature and humidity, and exhausts potentially contaminated areas to the plant stack. It maintains the hydrogen concentration well below 2% by volume in the HVAC equipment room (hydrogen is potentially generated from the AS-1 batteries).

Radwaste building ventilation provides filtration (including filtration of exhaust sent to the plant stack) and controls temperature, humidity, and migration of air from clean areas to areas of higher contamination.

AOG building ventilation provides filtration (including filtration of exhaust sent to the plant stack) and control of temperature and humidity.

Intake structure ventilation maintains a suitable environment for operating personnel and equipment, including the diesel-driven fire pump. Because the intake structure HVAC system is not required to maintain operability of the service water system pumps, it has no intended functions for 10 CFR 54.4(a)(1).

John Deere diesel building ventilation provides cooling for the John Deere diesel, which provides emergency lighting that is credited in the Appendix R safe shutdown capability assessment.

Ventilation systems in other areas maintain a suitable environment for operating personnel and equipment. They have no intended functions.

The purpose of the HB system is to provide a source of steam for space heating and process requirements during all phases of station operation. The HB system provides heat to the control room during normal operation. The system includes two 50% boilers, various heaters, steam traps, and associated valves and piping.

The HVAC system has the following intended functions for 10 CFR 54.4(a)(1).

<u>Primary containment ventilation</u>

- Provide a primary containment pressure boundary. This function is performed by the cooling coils.

<u>Reactor building ventilation</u>

- Support secondary containment by isolating normal ventilation exhaust paths under accident conditions.

- Provide HELB protection between the RCIC room and the equipment room via backdraft dampers for accident mitigation.
- Provide local fan coolers to maintain required operating temperatures in areas of high heat gain where ECCS equipment must operate when normal ventilation is shut down.

Diesel generator room ventilation

- Provide the necessary ventilation to support operation of the emergency diesel generators.

Control building ventilation

- Maintain a suitable environment in the main control room for operating personnel and safety-related equipment.
- Provide remote-manual isolation capability and recirculation mode for the main control room for accident mitigation.

The HVAC system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The HVAC system has the following intended functions for 10 CFR 54.4(a)(3).

- Provide ventilation for equipment credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48). This function is performed by the following.
  - reactor building ventilation (RRU-7 and RRU-8)
  - diesel generator room ventilation
  - control building ventilation
  - intake structure ventilation (for fire pumps)
  - John Deere diesel building ventilation

The HB system has the following intended function for 10 CFR 54.4(a)(1).

- Maintain control room ventilation system pressure boundary. This function is performed by two safety-related components: the reheat steam coils for the control room air supply system and the humidifier for the control room air supply.

The HB system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The HB system has the following intended function for 10 CFR 54.4(a)(3).

- Integrity of the safety-related components in the HB system is assumed in the Appendix R safe shutdown capability analysis (10 CFR 50.48) as the control room ventilation system is credited.

UFSAR References

Sections 5.2.3.7 (primary containment ventilation), 5.3.5 (reactor building normal ventilation), 10.7.6 (ECCS room coolers), 10.12

Components Subject to Aging Management Review

The HVAC aging management review includes duct-mounted fire protection dampers that are part of the FP system.

Because the primary containment ventilation cooling coils contain reactor building closed cooling water, they are reviewed with RBCCW (Section 2.3.3.3). Emergency core cooling systems (ECCS) corner room ventilation recirculation units RRU-5 and -6 are reviewed with SW (Section 2.3.3.2). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining HVAC and HB components are reviewed as listed below.

Table 2.3.3-10 lists the component types that require aging management review.

Table 3.3.2-10 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191237 sheets 1 and 2
LRA-G-191248
LRA-G-191238

2.3.3.11 Primary Containment Atmosphere Control / Containment Atmosphere Dilution

System Description

This description includes the primary containment atmosphere control (PCAC) system, the containment atmosphere dilution (CAD) system, and the post-accident sampling system (PASS).

The purpose of the PCAC system is to ensure that the containment atmosphere remains inerted with nitrogen during station power operation. The PCAC system provides the means to establish and maintain the required differential pressure between the drywell and torus. System instrumentation monitors key drywell and torus parameters, including drywell and torus temperatures, pressure, and moisture; drywell to torus differential pressure; and torus water level.

The PCAC system consists of piping, valves, and instrumentation used to receive nitrogen from the N2 system and control the inerting of the primary containment atmosphere. The system also includes the primary containment vent and purge piping and valves, torus to drywell vacuum breakers and associated piping, torus vent rupture disk, torus level instrument root valves and tubing, primary containment pressure instrument root valves and tubing, nitrogen supply subsystem containment isolation valves, and drywell airlock equalization valves and associated piping.

The PCAC system (with the N2 system) limits the concentration of oxygen in the primary containment to levels low enough (less than four percent oxygen) that ignition of hydrogen produced by metal-water reaction will not occur following a LOCA. The N2 and PCAC systems provide the capability to establish and maintain a drywell-to-torus differential pressure of at least 1.7 psid during power operation to ensure that suppression pool structural limits are not exceeded in the event of a LOCA blowdown. Both of these functions are readiness functions which ensure required initial conditions for primary containment. Post-accident hydrogen control, if necessary, is provided by the CAD system.

The purpose of the CAD system is to limit the concentration of oxygen in primary containment such that ignition of hydrogen and oxygen produced by a metal-water reaction following a loss of coolant accident will not occur.

The CAD system consists of two nitrogen injection subsystems, two vent subsystems, and two hydrogen/oxygen analyzers. Each injection subsystem contains piping for connection of a temporary manifold and nitrogen supply which can direct nitrogen into the drywell, the suppression chamber, or both. Each vent subsystem directs containment atmosphere to the standby gas treatment system. Each hydrogen/oxygen analyzer pump can pump gas from one or all three drywell or suppression chamber sample points through its respective analyzer and back to the suppression chamber or reactor building ventilation exhaust system.

The post-accident sampling system (PASS) is included in this evaluation. The purpose of PASS is to provide representative samples of reactor coolant for analysis which would be indicative of the extent and development of core damage.

PASS includes a sample panel which is the sample collection point and sample lines with remote operated isolation valves which are operable from the sample panel location. Sample panel components include pressure and temperature gages, collection and dilution cylinders, isolation and control valves, sample cooler, liquid and gas septums, and a vacuum pump.

The PCAC system has the following intended functions for 10 CFR 54.4(a)(1).

- Support primary containment isolation.
- Prevent primary containment overpressure via the torus vent rupture disk.
- Force (not prevent) vapor suppression from the drywell to the torus through the downcomers and prevent backflow of torus water to the drywell via torus/drywell vacuum breakers if torus pressure exceeds drywell pressure.
- Provide vacuum protection for the torus (torus/reactor building vacuum breakers).

The PCAC system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The PCAC system has no mechanical intended functions for 10 CFR 54.4(a)(3).

The CAD system has the following intended functions for 10 CFR 54.4(a)(1).

- Inject nitrogen into containment.
- Vent containment atmosphere to the standby gas treatment system following any accident that could result in unacceptable levels of hydrogen.
- Support primary containment isolation.

The CAD system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CAD system has no intended functions for 10 CFR 54.4(a)(3).

PASS has the following intended function for 10 CFR 54.4(a)(1).

- Support primary containment isolation. (PASS does not have an intended function of maintaining the integrity of the reactor coolant pressure boundary because the related Class 1 components are in the NB system, not the PASS system.)

PASS has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

PASS has no intended functions for 10 CFR 54.4(a)(3).

UFSAR References

Section 5.2.3.6 discusses the PCAC vacuum breakers. Section 5.2.6 describes the PCAC system as it functions in combination with the N2 system under the system name, "primary containment inerting." Section 5.2.7 discusses CAD. Section 10.20 discusses PASS.

Components Subject to AMR

PASS return (purge) lines are reviewed with HPCI (Section 2.3.2.4). Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Remaining PCAC, CAD, and PASS components are reviewed as listed below.

The nitrogen sources used by the CAD system to inject nitrogen following an accident are short-lived, temporary sources and therefore not subject to aging management review.

Table 2.3.3-11 lists the component types that require aging management review.

Table 3.3.2-11 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G-191165	LRA-G-191175 sheet 1
LRA-G-191172	LRA-G-191238
	LRA-VY-E-75-002

2.3.3.12 John Deere Diesel

System Description

The John Deere diesel (JDD) is a nonsafety-related skid-mounted engine powering a generator that supplies back-up electric power to plant lighting. It is located in a separate structure identified as the John Deere diesel building. The diesel is electrically started utilizing batteries and does not require cooling water from other plant systems. Its license renewal purpose is to provide power to lighting panels credited as emergency lighting in the Appendix R safe shutdown capability analysis.

The JDD has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The JDD has the following intended function for 10 CFR 54.4(a)(3).

- Supply power for emergency lighting credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48).

UFSAR References

None

Components Subject to AMR

Table 2.3.3-12 lists the component types that require aging management review.

Table 3.3.2-12 provides the results of the aging management review.

License Renewal Drawings

None

2.3.3.13 Miscellaneous Systems in Scope for (a)(2)

As discussed in Section 2.1.1.2, systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) interact with safety-related systems in one of two ways: functional or physical. A functional failure is one where the failure of a nonsafety-related SSC to perform its function impacts a safety function. A physical failure is one where a safety function is impacted by the loss of structural or mechanical integrity of an SSC in physical proximity to a safety-related component.

2.3.3.13.1 Functional Support

Functional failures of nonsafety-related SSCs which could impact a safety function were identified only for those systems with components supporting the main condenser and MSIV leakage pathway. The following systems, described as referenced, contain components which support this function.

- augmented offgas (described below)
- auxiliary steam (Section 2.3.4.1)
- condensate (Section 2.3.4.2)
- main steam (Section 2.3.4.3)
- sampling (described below)
- 101 (main steam, extraction steam, and auxiliary steam instruments) (Section 2.3.4.4)

System Description

The augmented offgas and sampling systems are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) for functional support and are described below.

Augmented Offgas

The purpose of the augmented offgas (AOG) system is to collect, process, and discharge radioactive gaseous wastes to the atmosphere through the plant stack during normal operation. The system reduces the released quantities of gaseous and particulate radioactive material from the site to as low as practical levels during normal operation.

The AOG system includes subsystems that dispose of gases from the main condenser air ejectors, the start up vacuum pump, and the gland seal condenser. The advanced off-gas subsystem includes a dual hydrogen dilution and recombiner subsystem, a dual moisture removal/dryer subsystem, a single charcoal adsorber subsystem, and dual vacuum pumps. The processed gases are routed to the plant stack for dilution and elevated release to the atmosphere. The various subsystems are continuously monitored by radiation monitors.

Sampling

The purpose of the sampling (SPL) system is to provide a means for sampling and testing various process fluids in the station in centralized locations. Fluids and gases are sampled continuously or periodically from equipment or systems which reflect the performance of the station.

The SPL system consists of sampling panels which generally contain individual grab sample connections, conductivity elements, conductivity indicating transmitters, and various sample conditioning equipment, including sample coolers, pressure reducing valves, temperature and pressure indicators.

The AOG and SPL systems have no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

The AOG and SPL systems have the following intended functions for 10 CFR 54.4(a)(2).

- Provide holdup and plate-out of fission products that may leak through the closed MSIVs. This function is performed by components located in the main condenser and MSIV leakage pathway and supports use of the alternative source term.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

UFSAR References

Section 9.4 describes the AOG system as the "gaseous radwaste system."

Section 10.17 describes the sampling system.

Components Subject to AMR

Components that support the holdup and plate-out function are evaluated with steam and power conversion systems supporting this function (see Section 2.3.4, Steam and Power Conversion Systems). Table 2.3.4-1 lists the component types in the MSIV leakage pathway that require aging management review. The AMR results are provided in Section 3.4.2.1.1, Main Condenser and MSIV Leakage Pathway and Table 3.4.2-1.

Components that support the physical interaction function are evaluated in Section 2.3.3.13.2. Table 2.3.3-13-1 (AOG) and Table 2.3.3-13-41 (SPL) lists the component types that require aging management review. The AMR results are provided in Section 3.3.2.1.13, Miscellaneous Systems in Scope for 10 CFR 54.4(a)(2), and Table 3.3.2-13-1 (AOG) and Table 3.3.2-13-41 (SPL).

License Renewal Drawings

License renewal drawings for the main condenser and MSIV leakage pathway are listed in Section 2.3.4.4.

The determination of whether a component meets the criterion of 10 CFR 54.4(a)(2) for physical interactions is based on where it is located in a building and its proximity to safety-related equipment or where a structural/seismic boundary exists. This information is not provided on flow diagrams and as a result highlighting drawings would not provide useful information in determining if components are required to be included for 10 CFR 54.4(a)(2) and subject to aging management review.

2.3.3.13.2 Physical Interactions

This section summarizes the scoping and screening results based on 10 CFR 54.4(a)(2) because of the potential for physical interactions with safety-related equipment.

Nonsafety-Related Systems or Components Directly Connected to Safety-Related Systems

At VYNPS, certain components and piping outside the safety class pressure boundary must be structurally sound in order to maintain the pressure boundary integrity of safety class piping. Each mechanical system safety-related to nonsafety-related interface was reviewed to identify the components located between the safety-related/nonsafety-related interface and the first equivalent anchor or structural boundary. These component types and their material/environment combinations are evaluated in this section and systems containing such components are included in Table 2.3.3.13-A. Some of these components are classified as VYNPS "safety class" in the component database; however, they do not meet the criterion of 10 CFR 54.4(a)(1) and are included in this review of nonsafety-related equipment connected to safety-related systems.

Nonsafety-Related Systems or Components with the Potential for Spatial Interaction with Safety-Related Systems or Components

The following modes of spatial interaction are described in Section 2.1.1.2.

Physical Impact or Flooding

The evaluation of interactions due to physical impact or flooding resulted in the inclusion of structures and structural components. Structures and structural components are reviewed in Section 2.4.

Pipe Whip, Jet Impingement, or Harsh Environments

Systems containing nonsafety-related high energy lines that can effect safety-related equipment are included in this review. These systems are included in the system list in Table 2.3.3.13-A.

Leakage or Spray

For VYNPS, nonsafety-related systems and nonsafety-related portions of safety-related systems containing steam or liquid are considered within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) if the following criteria are met:

- the components are located in a space containing safety-related components, and
- the potential exists for spatial interaction from leakage or spray.

These systems are listed in Table 2.3.3.13-A.

The following systems are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) for physical interactions and are described in the referenced sections.

Table 2.3.3.13-A
Systems within the Scope of License Renewal based on the Potential for Physical Interaction with Safety-Related Components (10 CFR 54.4(a)(2))

System Code	System Name	Section with System Description
AOG	Augmented Offgas	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
C	Condensate	Section 2.3.4.2, Condensate
CAD	Containment Air Dilution	Section 2.3.3.11, Primary Containment Atmosphere Control / Containment Atmosphere Dilution
CD	Condensate Demineralizer	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
CRD	Control Rod Drive	Section 2.3.1, Reactor Coolant System
CS	Core Spray	Section 2.3.2.2, Core Spray
CST	Condensate Storage and Transfer	Section 2.3.2.5, Reactor Core Isolation Cooling
CUFD	RWCU Filter Demineralizer	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
CW	Circulating Water	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)

Table 2.3.3.13-A
Systems within the Scope of License Renewal based on the Potential for Physical Interaction with Safety-Related Components (10 CFR 54.4(a)(2))
(Continued)

System Code	System Name	Section with System Description
DG	Diesel Generator & Auxiliaries	Section 2.3.3.4, Emergency Diesel Generator
DLO	Diesel Lube Oil	Section 2.3.3.4, Emergency Diesel Generator
DW	Demineralized Water	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
FDW	Feedwater	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
FO	Fuel Oil	Section 2.3.3.6, Fuel Oil
FP	Fire Protection	Section 2.3.3.8, Fire Protection—Water
FPC	Fuel Pool Cooling	Section 2.3.3.5, Fuel Pool Cooling
FPFD	FPC Filter Demineralizer	Section 2.3.3.5, Fuel Pool Cooling
HB	House Heating Boiler	Section 2.3.3.10, Heating, Ventilation and Air Conditioning
HCU	Hydraulic Control Units	Section 2.3.1, Reactor Coolant System
HPCI	High Pressure Coolant Injection	Section 2.3.2.4, High Pressure Coolant Injection
HVAC	Heating, Ventilation and Air Condition	Section 2.3.3.10, Heating, Ventilation and Air Conditioning
IA	Instrument Air	Section 2.3.3.7, Instrument Air
MGLO	MG Lube Oil	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
N2	Nitrogen Supply	Section 2.3.3.7, Instrument Air
NB	Nuclear Boiler	Section 2.3.1, Reactor Coolant System
NM	Neutron Monitoring	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
PASS	Post-Accident Sampling System	Section 2.3.3.11, Primary Containment Atmosphere Control / Containment Atmosphere Dilution
PCAC	Primary Containment Atmosphere Control	Section 2.3.3.11, Primary Containment Atmosphere Control / Containment Atmosphere Dilution
PW	Potable Water	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
RBCCW	Reactor Building Closed Cooling Water	Section 2.3.3.3, Reactor Building Closed Cooling Water

Table 2.3.3.13-A
Systems within the Scope of License Renewal based on the Potential for Physical Interaction with Safety-Related Components (10 CFR 54.4(a)(2))
(Continued)

System Code	System Name	Section with System Description
RCIC	Reactor Core Isolation Cooling	Section 2.3.2.5, Reactor Core Isolation Cooling
RDW	Radwaste, Liquid and Solid	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
RHR	Residual Heat Removal	Section 2.3.2.1, Residual Heat Removal
RHRSW	RHR Service Water	Section 2.3.3.2, Service Water
RIP	Equipment Retired in Place	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
RWCU	Reactor Water Clean-Up	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
SBFPC	Standby Fuel Pool Cooling	Section 2.3.3.5, Fuel Pool Cooling
SBGT	Standby Gas Treatment	Section 2.3.2.6, Standby Gas Treatment
SC	Stator Cooling	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
SLC	Standby Liquid Control	Section 2.3.3.1, Standby Liquid Control
SPL	Sampling	Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2)
SW	Service Water	Section 2.3.3.2, Service Water

System Description

The following systems are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) for physical interactions and are not described elsewhere in the application. Each system has the following intended function.

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function. As applicable, this includes the structural/seismic support function for components outside the safety class pressure boundary.

Components in these systems supporting this intended function are those nonsafety-related, fluid-filled components located in spaces containing safety-related SSCs. A “space” is defined as a room or cubicle that is separated from other “spaces” by substantial objects (such as wall, floors, and ceilings). The space is defined such that potential interaction between nonsafety-related and safety-related SSCs is limited to the space. Nonsafety-related systems and components that contain water, oil, or steam, and are in spaces with safety-related SSCs are in scope and subject to aging management review under criterion 10 CFR 54.4(a)(2), unless located in an excluded room.

Components that support this intended function are evaluated in this section and the results are provided in Section 3.3.2.1.13, Miscellaneous Systems in Scope for 10 CFR 54.4(a)(2), and the series 3.3.2-13-xx tables.

These systems have no intended functions for 10 CFR 54.4(a)(1) or (a)(3) unless specified below. For systems with intended functions that meet additional scoping criteria, the other intended functions are noted in the descriptions below with a reference to the section where the affected components are evaluated (e.g., circulating water).

Condensate Demineralizer

The purpose of the CD system is to maintain the required purity of feedwater supplied to the reactor. The system functions to minimize corrosion product input to the nuclear system so as not to affect fuel performance, accessibility of nuclear system components, or the capacity required of the reactor water cleanup system. The CD system protects the nuclear system against the entry of foreign materials such as could occur due to condenser leaks.

The system uses finely ground, mixed ion-exchange resins deposited upon the tubular elements of pressure precoat type filters (the filter-demineralizer units). The condensate demineralizers consist of five filter-demineralizer units (including an installed spare) operating in parallel. All are normally operated but are sized such that four units can support operation. The system and auxiliaries include a precoat system, a body feed system, a backwash system, holding pumps and effluent strainers for each unit, and associated piping and valves.

RWCU Filter Demineralizer

The purpose of the CUFD system is to provide for filtration and clean-up of reactor water.

The CUFD is the filter-demineralizer portion of the RWCU system and consists of the filter/demineralizer tanks and associated piping and valves.

Circulating Water

The purpose of the CW system is to provide the main condensers with a heat sink for steam condensation. Heat removal in the condensers is accomplished by providing a continuous supply of cooling water pumped from and returned to the Connecticut River or by recirculation flow pumped through cooling towers.

Flow is provided by three vertical circulating water pumps in the intake structure. Trash racks and traveling water screens protect the circulating water pumps from debris. During cold weather, recirculation of water from the discharge structure to the intake structure will prevent icing at the screens and intakes. Two cooling towers have the capacity to remove the total heat load from the circulating water. Three vertical circulating water booster pumps provide the necessary head to permit cooling tower operation and the associated recirculation mode.

In addition to the intended function for 10 CFR 54.4(a)(2) listed above, the CW system has the following intended function for 10 CFR 54.4(a)(1).

- Support the alternate cooling mode of operation. This function is performed by a safety-related cooling tower cell and fan and the cooling tower deep basin. This mode of operation provides an alternate means of cooling in the unlikely event of the loss of Vernon pond, flooding of the service water intake structure, or fire in the service water intake structure which disables all four service water pumps.

The safety-related structures (the ACS cooling tower cell and the deep basin) are evaluated in Section 2.4.4, Process Facilities. The cooling tower fan (CT-2-1) performs its intended function with moving parts and is therefore not subject to aging management review.

Demineralized Water

The purpose of the DW system is to provide treated makeup water for various plant components, such as the condensate storage tank, spent fuel pool, RBCCW, and TBCCW. This supply function is not a safety function.

The DW system consists of the demin water transfer system beginning with the demin water storage tank, including the tank, demineralized water transfer pumps, and associated piping and valves, but not including the condensate storage tank or components in the CST system.

Feedwater

The purpose of the FDW system is to provide demineralized water from the condensate system to the reactor vessel at a rate sufficient to maintain adequate reactor vessel water level.

The FDW system consists of three reactor feedwater pumps, four high pressure feedwater heaters (two per train), and associated valves and piping. The low pressure heaters are components in the condensate (C) system.

The UFSAR description of feedwater in Section 11.8 includes the Class 1 portion. These components are NB system components and are evaluated with the RCS (Section 2.3.1).

MG Lube Oil

The purpose of the MGLO system is to provide lubrication to the reactor recirculation pump motor generator set during its operation.

The MGLO system contains lube oil pumps, heat exchangers, and associated piping and valves.

Neutron Monitoring

The purpose of the NM system is to provide indication of neutron flux, which can be correlated to thermal power level, for the entire range of flux conditions that may exist in the core. The system consists of incore neutron detectors and out-of-core electronic monitoring equipment. The source range monitors (SRM) and the intermediate range monitors (IRM) provide flux level indications during reactor startup and lower power operation. The local power range monitors and average power range monitors (APRM) allow assessment of local and overall flux conditions during power range operation. Rod block monitors are provided to prevent rod withdrawal when reactor power should not be increased at the existing reactor coolant flow rate. The traversing incore probe system (TIPS) provides a means to calibrate the individual neutron monitoring sensors.

The safety function of the NM system is to detect conditions in the core that threaten the overall integrity of the fuel barrier due to excessive power generation and provide signals to the reactor protection system so that the release of radioactive material from the fuel barrier is limited. These signals are provided from the IRM and APRM and are covered by the evaluation of EIC systems and components.

The mechanical portion of the NM system has the following intended function for 10 CFR 54.4(a)(1) in addition to the intended function for 10 CFR 54.4(a)(2) listed above.

- Provide containment isolation for the traveling in-core probe guide tubes. TIP penetrations form part of the primary containment boundary.

Primary containment isolation components are included in Section 2.3.2.7, Primary Containment Penetrations.

Potable Water

The purpose of the PW system is to provide a sufficient supply of treated water suitable for drinking and for sanitary purposes. Water is supplied to such items as lavatories, service sinks, combination emergency showers and eyewash, kitchen sinks, bench sinks, showers, and wall hydrants.

Radwaste, Liquid and Solid

The purpose of the liquid radwaste system is to collect potentially radioactive liquid wastes, treat them, and return the processed radioactive liquid wastes to the station for reuse. The solid radwaste system collects and processes radioactive solid wastes for temporary on-site storage and off-site shipment for permanent disposal. The RDW system provides monitoring and indication of drywell floor and equipment drain sump pump-out rate for reactor coolant leak detection.

The liquid radwaste portion of the system consists of floor and equipment drains for handling potentially radioactive wastes and tanks, piping, pumps, process equipment, instrumentation, and auxiliaries necessary to collect, process, store, and dispose of potentially radioactive wastes. A small portion of the system connected to the RHR system maintains the RHR system pressure boundary.

In addition to the intended function for 10 CFR 54.4(a)(2) listed above, the RDW system has the following intended functions for 10 CFR 54.4(a)(1). These functions are performed by the liquid radwaste portion of the RDW system. The solid radwaste portion has no safety functions.

- Maintain the RHR system pressure boundary.
- Support primary containment isolation.

RHR system pressure boundary components are included in Section 2.3.2.1, Residual Heat Removal. Primary containment isolation components are included in Section 2.3.2.7, Primary Containment Penetrations.

Equipment Retired in Place

This system designation in the component database is used for obsolete equipment. It has no safety-related components and no system intended functions; however, certain components are required to maintain structural integrity as they are attached to safety-related components and provide structural support.

Reactor Water Clean-Up

The purpose of the RWCU system is to maintain high reactor water purity to limit chemical and corrosive action and to remove corrosion products to limit impurities available for neutron flux activation.

The RWCU system purifies the reactor coolant water by continuously removing a portion of the reactor recirculation flow from the suction side of a recirculation pump, sending the removed flow through filter-demineralizer units to undergo mechanical filtration and ion exchange processes, and returning the processed fluid back to the reactor via the feedwater line. The filter-demineralizer portion is a separate system, the reactor water CUFD system.

The major equipment of the system consists of two cleanup recirculation pumps and regenerative and nonregenerative heat exchangers.

In addition to the intended function for 10 CFR 54.4(a)(2) listed above, the RWCU system has the following intended functions for 10 CFR 54.4(a)(1).

- Maintain integrity of RCIC pressure boundary. This function is performed by RWCU components in the RCIC flowpath.
- Isolate the system on receipt of a standby liquid control system actuation signal.
- Support primary containment.
- Maintain integrity of reactor coolant pressure boundary.

Components in the RCIC flowpath are included in Section 2.3.2.5, Reactor Core Isolation Cooling. The portion of the RWCU system that functions as part of the RCPB is included in Section 2.3.1.3, Reactor Coolant Pressure Boundary. The RCPB components also isolate the system on a SLC signal and provide containment isolation.

Stator Cooling

The purpose of the SC system is to provide cooling for the stator winding of the main generator. The system permits generator loads to be changed with minimum variation of stator winding temperature. The stator copper is in direct contact with low conductivity water which is, in turn, automatically temperature and pressure controlled. Therefore, average copper temperature can be kept essentially constant, practically eliminating thermal stress cycling of the insulation.

The system consists of a control cabinet and skid-mounted equipment which includes a storage tank, two pumps, two coolers, a temperature control valve, a pressure control valve, filters, a deionizer, and the piping to supply coolant to, and return from, the generator stator winding and the exciter static rectifiers.

UFSAR References

The following table lists the UFSAR references for systems described in this section.

System Code	System Name	UFSAR Section
CD	Condensate Demineralizer	Section 11.7
CUFD	RWCU Filter Demineralizer	Section 4.9
CW	Circulating Water	Sections 10.8, 11.6, 11.9
DW	Demineralized Water	None[1]
FDW	Feedwater	Section 11.8
MGLO	MG Lube Oil	None
NM	Neutron Monitoring	Sections 1.6.2.2, 1.6.4.1.3, and 7.5
PW	Potable Water	Section 10.15 (potable and sanitary water system)
RDW	Radwaste, Liquid and Solid	Sections 9.2 and 9.3
RIP	Equipment Retired in Place	None
RWCU	Reactor Water Clean-Up	Section 4.9
SC	Stator Cooling	None

1. Section 10.13 describes the "station makeup water treatment system." However, the components described in Section 10.13 are in the MUD system, not the DW system.

Components Subject to AMR

The following table summarizes the components subject to aging management review for each system within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) for potential physical interactions with safety-related equipment. Components are subject to aging management review if their location is such that safety-related equipment could be impacted by component failure.

Table 2.3.3.13-B
Description of Nonsafety-Related System Components Subject to Aging Management Review Based on 10 CFR 54.4(a)(2) for Physical Interactions

System Code	Nonsafety-Related Components Subject to AMR
AOG	Portion of the system associated with the plant stack loop seal
C	Portion of the system at the ECCS keep-full station in the turbine building, as well as the area on elevation 252 in the turbine building where service water piping runs along the wall. Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
CAD	Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
CD	Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
CRD	Portion of the system in the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
CS	Portion of the system in the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
CST	Portion of the system in the CST valve and instrument enclosure, the primary containment building, and the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
CUFD	Portion of the system in the reactor building
CW	Portion of the system in cooling tower #2 cell 1.
DG	Portion of the system in the diesel generator rooms in the turbine building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
DLO	Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
DW	Portion of the system in the control building, the reactor building, and at the diesel generator rooms in the turbine building and in the CST valve and instrument enclosure. Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
FDW	Portion of the system in the reactor building and in primary containment

Table 2.3.3.13-B
Description of Nonsafety-Related System Components Subject to Aging Management Review Based on 10 CFR 54.4(a)(2) for Physical Interactions
(Continued)

System Code	Nonsafety-Related Components Subject to AMR
FO	Portion of the system in the fuel oil transfer pump house. Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
FP	Portion of the system in cooling tower #2 cell 1 and the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
FPC	Portion of the system in the primary containment building and reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
FPFD	Portion of the system in the reactor building
HB	Portion of the system in the CST valve and instrument enclosure, the control building, the reactor building, and at the diesel generator rooms in the turbine building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
HCU	Portion of the system in the reactor building
HPCI	Portion of the system in the primary containment building and reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
HVAC	Portion of the system in the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
IA	The portion of the system in the reactor building that requires aging management review due to potential spatial interaction are the cooling and lubrication subcomponents for the containment air compressor (C-2-1A) and its precooler and aftercooler, as well as the air dryer towers (tanks), drain piping, valves, and traps associated with the containment air dryer (D-2-1A), as well as the drain piping, valves, and traps associated with the air receiver tank and knock-out drum (TK-55-1A and TK-154-1A). Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
MGLO	Portion of the system in the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.

Table 2.3.3.13-B
Description of Nonsafety-Related System Components Subject to Aging Management Review Based on 10 CFR 54.4(a)(2) for Physical Interactions
(Continued)

System Code	Nonsafety-Related Components Subject to AMR
N2	Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
NB	Portion of the system in the primary containment building and the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
NM	Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
PASS	Portion of the system in the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
PCAC	Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
PW	Portion of the system in the "A" diesel generator room in the turbine building
RBCCW	Portion of the system in primary containment and reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
RCIC	Portion of the system in the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
RDW	Portion of the system in the CST valve and instrument enclosure, service water pump area of the intake structure, plant stack, primary containment building, and reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
RHR	Portion of the system in the primary containment building and reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
RHRSW	Portion of the system in the and reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
RIP	Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.

Table 2.3.3.13-B
Description of Nonsafety-Related System Components Subject to Aging Management Review Based on 10 CFR 54.4(a)(2) for Physical Interactions
(Continued)

System Code	Nonsafety-Related Components Subject to AMR
RWCU	Portion of the system in the primary containment building and reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
SBFPC	Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
SBGT	Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
SC	Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
SLC	Portion of the system in the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
SPL	Portion of the system in the reactor building and plant stack Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.
SW	Portion of the system in the service water pump area of the intake structure and the reactor building Components outside the safety class pressure boundary, yet relied upon to provide structural/seismic support for the pressure boundary.

Series 2.3.3-13-xx tables list the component types that require aging management review for 10 CFR 54.4(a)(2) based on potential for physical interactions.

Series 3.3.2-13-xx tables provide the results of the aging management review for 10 CFR 54.4(a)(2) based on potential for physical interactions.

Table 2.3.3.13-C
10 CFR 54.4(a)(2) Aging Management Review Tables

System Code	System Name	Series 2.3.3-13-xx Table	Series 3.3.2-13-xx Table
AOG	Augmented Off Gas	Table 2.3.3-13-1	Table 3.3.2-13-1
C	Condensate	Table 2.3.3-13-2	Table 3.3.2-13-2
CAD	Containment Air Dilution	Table 2.3.3-13-3	Table 3.3.2-13-3
CD	Condensate Demineralizer	Table 2.3.3-13-4	Table 3.3.2-13-4
CRD	Control Rod Drive	Table 2.3.3-13-5	Table 3.3.2-13-5
CS	Core Spray	Table 2.3.3-13-6	Table 3.3.2-13-6
CST	Condensate Storage and Transfer	Table 2.3.3-13-7	Table 3.3.2-13-7
CUFD	RWCU Filter Demineralizer	Table 2.3.3-13-8	Table 3.3.2-13-8
CW	Circulating Water	Table 2.3.3-13-9	Table 3.3.2-13-9
DG	Diesel Generator & Auxiliaries	Table 2.3.3-13-10	Table 3.3.2-13-10
DLO	Diesel Lube Oil	Table 2.3.3-13-11	Table 3.3.2-13-11
DW	Demineralized Water	Table 2.3.3-13-12	Table 3.3.2-13-12
FDW	Feedwater	Table 2.3.3-13-13	Table 3.3.2-13-13
FO	Fuel Oil	Table 2.3.3-13-14	Table 3.3.2-13-14
FP	Fire Protection	Table 2.3.3-13-15	Table 3.3.2-13-15
FPC	Fuel Pool Cooling	Table 2.3.3-13-16	Table 3.3.2-13-16
FPFD	FPC Filter Demineralizer	Table 2.3.3-13-17	Table 3.3.2-13-17
HB	House Heating Boiler	Table 2.3.3-13-18	Table 3.3.2-13-18
HCU	Hydraulic Control Units	Table 2.3.3-13-19	Table 3.3.2-13-19
HPCI	High Pressure Coolant Injection	Table 2.3.3-13-20	Table 3.3.2-13-20
HVAC	Heating, Ventilation and Air Condition	Table 2.3.3-13-21	Table 3.3.2-13-21
IA	Instrument Air	Table 2.3.3-13-22	Table 3.3.2-13-22

Table 2.3.3.13-C
10 CFR 54.4(a)(2) Aging Management Review Tables
(Continued)

System Code	System Name	Series 2.3.3-13-xx Table	Series 3.3.2-13-xx Table
MGLO	MG Lube Oil	Table 2.3.3-13-23	Table 3.3.2-13-23
N2	Nitrogen Supply	Table 2.3.3-13-24	Table 3.3.2-13-24
NB	Nuclear Boiler	Table 2.3.3-13-25	Table 3.3.2-13-25
NM	Neutron Monitoring	Table 2.3.3-13-26	Table 3.3.2-13-26
PASS	Post-Accident Sampling System	Table 2.3.3-13-27	Table 3.3.2-13-27
PCAC	Primary Containment Atmosphere Control	Table 2.3.3-13-28	Table 3.3.2-13-28
PW	Potable Water	Table 2.3.3-13-29	Table 3.3.2-13-29
RBCCW	Reactor Building Closed Cooling Water	Table 2.3.3-13-30	Table 3.3.2-13-30
RCIC	Reactor Core Isolation Cooling	Table 2.3.3-13-31	Table 3.3.2-13-31
RDW	Radwaste, Liquid and Solid	Table 2.3.3-13-32	Table 3.3.2-13-32
RHR	Residual Heat Removal	Table 2.3.3-13-33	Table 3.3.2-13-33
RHRSW	RHR Service Water	Table 2.3.3-13-34	Table 3.3.2-13-34
RIP	Equipment Retired in Place	Table 2.3.3-13-35	Table 3.3.2-13-35
RWCU	Reactor Water Clean-Up	Table 2.3.3-13-36	Table 3.3.2-13-36
SBFPC	Standby Fuel Pool Cooling	Table 2.3.3-13-37	Table 3.3.2-13-37
SBGT	Standby Gas Treatment	Table 2.3.3-13-38	Table 3.3.2-13-38
SC	Stator Cooling	Table 2.3.3-13-39	Table 3.3.2-13-39
SLC	Standby Liquid Control	Table 2.3.3-13-40	Table 3.3.2-13-40
SPL	Sampling	Table 2.3.3-13-41	Table 3.3.2-13-41
SW	Service Water	Table 2.3.3-13-42	Table 3.3.2-13-42

License Renewal Drawings

None. The determination of whether a component meets the 10 CFR 54.4(a)(2) scoping criterion is based on where a structural/seismic boundary exists, or where the component is located in a building, whether it contains liquid or gas, and its proximity to safety-related equipment. At VYNPS, a conservative spaces approach for scoping in accordance with 10 CFR 54.4(a)(2) included almost all mechanical systems within the scope of license renewal (see Table 2.3.3.13-A). Portions of these systems that are in scope for 10 CFR 54.4(a)(2) and subject to aging management review are described in Table 2.3.3.13-B. Providing drawings highlighting in-scope (a)(2) components would not provide significant additional information since the drawings do not indicate proximity of components to safety-related equipment and do not identify structural/ seismic boundaries.

Table 2.3.3-1
Standby Liquid Control (SLC) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Gauge	Pressure boundary
Heater	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-2
Service Water (SW) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Coil	Heat transfer Pressure boundary
Expansion joint	Pressure boundary
Fan housing	Support of criterion (a)(1) equipment
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Heat exchanger (tubesheets)	Pressure boundary
Indicator	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Suction barrel	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-3
Reactor Building Closed Cooling Water (RBCCW) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Flow switch housing	Pressure boundary
Heat exchanger (housing)	Support of criterion (a)(1) equipment
Heat exchanger (tubes)	Pressure boundary
Piping	Pressure boundary
Thermowell	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-4
Emergency Diesel Generator (EDG) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heat exchanger (tubesheets)	Pressure boundary
Heater housing	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Silencer	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Turbocharger	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-5
Fuel Pool Cooling (FPC) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Neutron absorber (Boral)	Neutron absorption
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-6
Fuel Oil (FO) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flame arrestor	Flow control
Flex hose	Pressure boundary
Injector housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-7
Instrument Air (IA) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Piping	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-8
Fire Protection (FP) Water System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Filter	Filtration
Filter housing	Pressure boundary
Flow nozzle	Pressure boundary & flow control
Gear box	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer
Heat exchanger (tubes)	Pressure boundary
Heater housing	Pressure boundary
Nozzle	Pressure boundary & flow control
Orifice	Pressure boundary & flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Silencer	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Turbocharger	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-9
Fire Protection (FP) CO_2 System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Coil	Pressure boundary
Filter housing	Pressure boundary
Heater housing	Pressure boundary
Nozzle	Flow control Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Siren body	Pressure boundary
Strainer	Filtration Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-10
Heating, Ventilation and Air Conditioning (HVAC) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Compressor housing	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Expansion joint	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (housing)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heater housing	Pressure boundary
Humidifier housing	Pressure boundary
Louver housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-11
Primary Containment Atmosphere Control (PCAC) and Containment Atmosphere Dilution (CAD) System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Diaphragm	Pressure boundary
Dryer	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger	Heat transfer Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-12
John Deere Diesel (JDD) System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (radiator)	Heat transfer Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heater housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Silencer	Pressure boundary
Tubing	Pressure boundary
Turbocharger	Pressure boundary

Table 2.3.3-13-1
Augmented Offgas (AOG) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-2
Condensate (C) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-3
Containment Air Dilution (CAD) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Duct	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-4
Condensate Demineralizer (CD) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Piping	Pressure boundary
Strainer housing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-5
Control Rod Drive (CRD) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-6
Core Spray (CS) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Bearing housing	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-7
Condensate Storage and Transfer (CST) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-8
RWCU Filter Demineralizer (CUFD) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-9
Circulating Water (CW) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-10
Diesel Generator and Auxiliaries (DG)
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Compressor housing	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-11
Diesel Lube OIl (DLO)
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Piping	Pressure boundary
Tubing	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-12
Demineralized Water (DW) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-13
Feedwater (FDW) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-14
Fuel Oil (FO) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-15
Fire Protection (FP) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-16
Fuel Pool Cooling (FPC) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-17
Fuel Pool Cooling Filter Demineralizer (FPFD) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-18
House Heating Boiler (HB) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Steam trap	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-19
Hydraulic Control Units (HCU)
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-20
High Pressure Coolant Injection (HPCI) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-21
Heating, Ventilation & Air Conditioning (HVAC) Systems
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Heat exchanger (tubes)	Pressure Boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-22
Instrument Air (IA) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Compressor housing	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Trap	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-23
MG Lube Oil (MGLO) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-24
Nitrogen Supply (N2) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-25
Nuclear Boiler (NB) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-26
Neutron Monitoring (NM) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-27
Post-Accident Sampling System (PASS) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-28
Primary Containment Atmosphere Control (PCAC) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Piping	Pressure boundary
Orifice	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-29
Potable Water (PW) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-30
Reactor Building Closed Cooling Water (RBCCW) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-31
Reactor Core Isolation Cooling (RCIC) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Rupture disk	Pressure Boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-32
Radwaste System, Liquid & Solid (RDW)
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-33
Residual Heat Removal (RHR) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-34
RHR Service Water (RHRSW) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-35
Equipment Retired in Place (RIP)
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-36
Reactor Water Clean-Up (RWCU) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

**Table 2.3.3-13-37
Standby Fuel Pool Cooling (SBFPC) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function[1]
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-38
Standby Gas Treatment (SBGT) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Piping	Pressure boundary
Sight glass	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-39
Stator Cooling (SC) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Cooler	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-40
Standby Liquid Control (SLC) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-41
Sampling (SPL) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Table 2.3.3-13-42
Service Water (SW) System
Nonsafety-Related Systems and Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[1]
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

1. For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes providing structural/seismic support for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

2.3.4 Steam and Power Conversion Systems

The following systems are included in this section.

- auxiliary steam
- condensate
- main steam
- 101 (main steam, extraction steam, and auxiliary steam instruments)

These systems are within the scope of license renewal primarily due to their support of the MSIV leakage pathway. Components in the MSIV leakage pathway are credited with dose reduction under accident conditions for offsite dose and control room habitability considerations. The MSIV leakage pathway starts at the main steam piping at the outlets of the MSIVs and includes the piping and components up to and including the main condenser. Within the boundary are the turbine stop valves, turbine bypass valves, and drain lines for the main steam lines. The components included in this evaluation are from various system codes that interface with the main condenser and MSIV leakage pathway: AOG, AS, C, MS, NB, SPL, and 101. The AOG and SPL systems are described in Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2). The NB system is described in Section 2.3.1, Reactor Coolant System. NB components in main steam line drains are in the MSIV leakage pathway. The remaining systems are described below.

2.3.4.1 Auxiliary Steam

System Description

The purpose of the auxiliary steam (AS) system is to provide steam from main steam piping to the steam jet air ejector for maintaining main condenser vacuum.

The AS system consists of the steam jet air ejector and associated equipment.

The AS system has no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

The AS system has the following intended function for 10 CFR 54.4(a)(2).

- Provide holdup and plate-out of fission products that may leak through the closed MSIVs. This function is performed by components located in the main condenser and MSIV leakage pathway and supports use of the alternative source term.

UFSAR References

Section 11.4 describes AS as part of the main condenser gas removal system and main turbine sealing system.

Components Subject to Aging Management Review

Components in the main condenser and MSIV leakage pathway are reviewed as listed below.

Table 2.3.4-1 lists the component types that require aging management review.

Table 3.4.2-1 provides the results of the aging management review.

License Renewal Drawings

License renewal drawings for the main condenser and MSIV leakage pathway are listed in Section 2.3.4.4.

2.3.4.2 Condensate

The purpose of the condensate (C) system is to receive condensed steam from the condenser and supply it to the reactor feedwater system as well as various other components and systems, such as the air ejector condensers, steam packing exhausters, and CRD pumps.

The C system consists of a single train with three parallel pumps drawing condensate from the two main condenser hotwells. The system includes the main condenser. During normal operation, all three pumps are operated to provide sufficient condensate flow capacity and net positive suction head to the reactor feedwater pumps during full power operation. Condensate flow to the reactor feed pumps passes through two parallel strings of low-pressure feedwater heaters with three heaters in each string. Condensate flow exiting the low-pressure heaters is provided to a common reactor feed pump suction header.

The C system has no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

The C system has the following intended functions for 10 CFR 54.4(a)(2).

- Provide holdup and plate-out of fission products that may leak through the closed MSIVs. This function is performed by components located in the main condenser and MSIV leakage pathway and supports use of the alternative source term.

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

UFSAR References

Section 11.8

Components Subject to Aging Management Review

Nonsafety-related portions that have the potential to adversely affect safety-related systems or components [10 CFR 54.4(a)(2)] are reviewed with miscellaneous systems in scope for (a)(2) (Section 2.3.3.13). Components in the main condenser and MSIV leakage pathway are reviewed as listed below.

Table 2.3.4-1 lists the component types that require aging management review.

Table 3.4.2-1 provides the results of the aging management review.

License Renewal Drawings

License renewal drawings for the main condenser and MSIV leakage pathway are listed in Section 2.3.4.4.

The determination of whether a component meets the 10 CFR 54.4(a)(2) scoping criterion is based on where a structural/seismic boundary exists, or where the component is located in a building, whether it contains liquid or gas, and its proximity to safety-related equipment. At VYNPS, a conservative spaces approach for scoping in accordance with 10 CFR 54.4(a)(2) included almost all mechanical systems within the scope of license renewal (see Table 2.3.3.13-A). Portions of these systems that are in scope for 10 CFR 54.4(a)(2) and subject to aging management review are described in Table 2.3.3.13-B. Providing drawings highlighting in-scope (a)(2) components would not provide significant additional information since the drawings do not indicate proximity of components to safety-related equipment and do not identify structural/ seismic boundaries.

2.3.4.3 Main Steam

The purpose of the main steam (MS) system is to complete the transmission of steam from the seismic Class I steam piping to the main turbine at a controlled pressure during normal operation. The MS system consists of nonsafety-related components. (The NB system contains the seismic Class I portion of main steam, which extends from the reactor vessel to the restraint at the second MSIV. The MS system consists of the non-seismic Class I components beyond this point.)

The MS system includes the turbine stop and control valves. A low point drain line is provided downstream of each turbine control valve. These lines allow continuous draining of the steam line low points through an orificed header to the condenser hotwell. The MS system has the ability to bypass the turbine when needed. The main turbine bypass system includes two valve chests, each with five automatically operated regulating bypass valves that are proportionally controlled by the turbine pressure regulator and control system. The bypass system is opened whenever the permitted admission of steam into the turbine is less than the amount of steam generated by the reactor. The MS system provides main turbine sealing steam.

The MS system has no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

The MS system has the following intended functions for 10 CFR 54.4(a)(2).

- Provide holdup and plate-out of fission products that may leak through the closed MSIVs. This function is performed by components located in the main condenser and MSIV leakage pathway and supports use of the alternative source term.

UFSAR References

Sections 11.4 (sealing steam) and 11.5 describe main steam.

Components Subject to Aging Management Review

Components in the main condenser and MSIV leakage pathway are reviewed as listed below.

Table 2.3.4-1 lists the component types that require aging management review.

Table 3.4.2-1 provides the results of the aging management review.

License Renewal Drawings

License renewal drawings for the main condenser and MSIV leakage pathway are listed in Section 2.3.4.4.

2.3.4.4 101 (Main Steam, Extraction Steam, and Auxiliary Steam Instruments)

The purpose of the 101 system (main steam, extraction steam, and auxiliary steam instruments) is to provide indication, alarm, and control functions for its associated systems. This system code includes various instrumentation components related to main steam, extraction steam, and auxiliary steam. Although the 101 system consists mainly of EIC components, certain mechanical components related to the instrumentation are included as well.

The 101 system has no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

The 101 system has the following intended function for 10 CFR 54.4(a)(2).

- Provide holdup and plate-out of fission products that may leak through the closed MSIVs. This function is performed by components located in the main condenser and MSIV leakage pathway and supports use of the alternative source term.

UFSAR References

None

Components Subject to Aging Management Review

Components in the main condenser and MSIV leakage pathway are reviewed as listed below.

Table 2.3.4-1 lists the component types that require aging management review.

Table 3.4.2-1 provides the results of the aging management review.

License Renewal Drawings

Additional details for components in the main condenser and MSIV leakage pathway subject to aging management review are provided in the following license renewal drawings.

LRA-191156	LRA-191169 sheet 1
LRA-191164	LRA-191174 sheet 1
LRA-191167	LRA-33600-A-217

Table 2.3.4-1
Main Condenser and MSIV Leakage Pathway
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Bolting	Pressure boundary
Condenser	Plateout
Orifice	Pressure boundary
Expansion joint	Plateout
Heat exchanger (tubes)	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Steam trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

Structures within the scope of license renewal are primary containment (Section 2.4.1), the reactor building (Section 2.4.2), the intake structure (Section 2.4.3), process facilities (the alternate cooling cell and deep basin, the control building, the plant stack, and the turbine building) (Section 2.4.4), and various yard structures (Section 2.4.5). Structural commodities (piping and conduit supports, electrical cabinets, tank foundations, etc.) are addressed in the bulk commodities review (Section 2.4.6).

2.4.1 Primary Containment

Description

The primary containment limits the release of fission products in the event of a postulated design basis accident so that off-site doses would not exceed the values specified in 10 CFR 50.67. Primary containment is located inside the reactor building.

The primary containment is a General Electric Mark I containment consisting of a drywell (which encloses the reactor vessel and recirculation system), a pressure suppression chamber (commonly known as the torus), and a connecting vent system. When operating at power, the containment is flooded with nitrogen to preclude the availability of oxygen.

The drywell surrounds the reactor vessel and primary systems. The torus, a toroidal structure containing water, is located below the drywell. The vent system connecting the drywell to the torus terminates below the water surface of the torus. Access to the drywell is provided by the steel drywell head and personnel hatch located on it as well as a double door air lock, equipment hatch, and one control rod drive access hatch. Access to the torus is provided by two personnel hatches.

Concrete floor slabs, structural steel floors, and platforms are provided inside the drywell as required.

The design of the primary containment conforms to applicable codes and specifications listed in UFSAR Section 12.2.

The major structural components of primary containment are described below.

Drywell

The drywell is a carbon steel structure that houses the reactor pressure vessel and its associated components. A reinforced concrete support structure, founded on bedrock, is an integral part of the drywell support system. Above the transition zone between the spherical and cylindrical portions, the drywell is separated from the reactor building reinforced concrete by a two-inch gap. This gap allows for drywell thermal expansion.

Shielding over the top of the drywell is provided by removable, segmented, reinforced concrete shield plugs located on the reactor building refuel floor. The reinforced concrete drywell floor contains the drywell floor drain and equipment drain sumps, and supports the reactor pedestal.

Torus

The torus is a toroidal-shaped carbon steel pressure vessel below and encircling the drywell. The torus is anchored to the reinforced concrete foundation slab of the reactor building.

Reactor Vessel and Drywell Bellows

The reactor vessel refueling bulkhead has two bellows constructed of stainless steel. The bellows have backing plates, spring seals, and removable guard rings. The drywell to reactor building bellows assembly is similar to the reactor vessel refueling bulkhead bellows assembly.

Shield Wall

The shield wall (also known as the sacrificial shield wall) is a high density, steel reinforced, concrete cylindrical structure surrounding the vessel. The concrete is contained by inner and outer steel liner plates that are also used to attach various system supports.

The sacrificial shield wall provides lateral support for the reactor vessel to accommodate both seismic forces and jet forces resulting from the breakage of any pipe attached to the vessel. Eight pairs of stabilizers provide lateral support for the sacrificial shield wall. The stabilizers consist of steel pipes welded to the top of the sacrificial shield wall and bolted to fittings on the primary containment wall.

Primary containment has the following intended functions for 10 CFR 54.4(a)(1), (a)(2), and (a)(3).

- Limit the release of radioactive fission products in the event of a postulated design basis accident.
- Provide support, shelter and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. Primary containment houses equipment credited for fire protection (10 CFR 50.48).
- Provide a heat sink during a design basis accident.
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

UFSAR References

Sections 5.1.2 and 5.2

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to primary containment are included in this review. Those that are common to VYNPS in-scope systems and structures (i.e., anchors, embedments, equipment supports, instrument panels, racks, cable trays, and conduits) are reviewed with the bulk commodities (Section 2.4.6).

Table 2.4-1 lists the component types that require aging management review.

Table 3.5.2-1provides the results of the aging management review.

2.4.2 Reactor Building

Description

The purpose of the reactor building is to contain airborne fission products, in the event of a design basis accident, such that leakage of these fission products to the environment will be within the dose limits specified in 10 CFR 50.67 and to support and protect the reactor and associated systems.

The reactor building completely encloses the primary containment. It also houses the refueling and reactor servicing equipment (platforms and cranes), new and spent fuel storage facilities, and other reactor auxiliary or service equipment, including the reactor core isolation cooling system, standby gas treatment system, reactor cleanup demineralizer system, standby liquid control system, control rod drive system equipment, the reactor core and containment cooling systems, and electrical equipment components.

The reactor building is seismic Class I, constructed of monolithic reinforced concrete floors and walls to the refueling level. Above the refueling level, the structure consists of steel framing covered by insulated sealed siding and roof decking. The siding and roofing can withstand a limited internal overpressure before pressure relief is obtained by venting through blowout panels.

A biological shield wall, which is an integral part of the reactor building encircles the primary containment. This shield wall protects the containment vessel and the reactor system against potential missiles generated external to primary containment and provides shielding to reduce dose to personnel.

The reactor building bridge crane services the reactor and refueling area. The reactor building bridge crane is designed seismic Class II. The crane supports are designed seismic Class I. The crane bridge and trolley wheels are provided with seismic holddown lugs to assure crane stability in the event of a maximum hypothetical earthquake.

The new fuel storage vault is part of the seismic Class I reactor building and houses new fuel storage racks. Each new fuel storage rack is designed as seismic Class I while loaded with fuel.

The spent fuel storage pool in the reactor building is lined with stainless steel. The pool liner is seam-welded ASTM-A240, Type 304 stainless steel with pipe sleeves that are welded to the liner plate on both sides of the plate. The spent fuel storage racks are made of a welded assembly of individual storage cells consisting of Type 304L stainless steel boxes welded to each other.

The seismic Class I refueling platform is used as the principal means of transporting fuel assemblies back and forth between the reactor well and the storage pool. The platform travels on tracks extending along each side of the reactor well and fuel pool.

Concrete floor slabs, structural steel floors, and platforms are provided inside the reactor building as required. Support for these structures is provided by concrete or structural steel columns, supported by the reactor building base slab and walls.

The reactor building has the following intended functions for 10 CFR 54.4(a)(1), (a)(2), and (a)(3).

- Provide support, shelter and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. The reactor building houses equipment credited for anticipated transients without scram (10 CFR 50.62), for station blackout (10 CFR 50.63), and for fire protection (10 CFR 50.48).
- Provide secondary containment.
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

UFSAR References

Sections 5.3 and 12.2.2. Section 10.4 describes the refueling platforms and cranes.

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to the reactor building are included in this review. Those that are common to VYNPS in-scope systems and structures (i.e., anchors, embedments, equipment supports, instrument panels, racks, cable trays, and conduits) are reviewed with the bulk commodities (Section 2.4.6).

Table 2.4-2 lists the component types that require aging management review.

Table 3.5.2-2 provides the results of the aging management review.

2.4.3 Intake Structure

Description

The purpose of the intake structure is to support and protect equipment that draws water from the intake canal. The intake structure, located east of the station on the riverbank, is divided into two rooms: the service water pump room (which also contains the diesel and electric fire pumps) and the circulating water pump room. The area housing the service water pumps is seismic Class I. The remaining structure is seismic Class II.

The intake structure is a reinforced concrete and steel structure founded entirely on bedrock. The structure has three pump bays for the vertical circulating water pumps and two service water bays for four service water pumps, and two fire water pumps. Three roller gates and one sluice gate are also located within the intake structure. Recirculation of warm discharge water is provided to keep the intake bays and service water bays free of ice. Recirculation is provided by a concrete pipe connecting the discharge structure to the intake structure. All bays are provided with trash racks and stop log guides, traveling screens, and fine screen guides. Interconnection of the three pump bays is provided by removing stop logs in center walls.

Concrete floor slabs, structural steel floors, and platforms are provided in the intake structure as required. Support for these structures is provided by concrete or structural steel columns, supported by the intake structure base slab and walls.

The intake structure has the following intended functions for 10 CFR 54.4(a)(1), (a)(2), and (a)(3).

- Provide support, shelter and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. The intake structure houses equipment credited for fire protection (10 CFR 50.48).

UFSAR References

Sections 10.6.5, 10.11.3, 12.2.6

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to the intake structure are included in this review. Those that are common to VYNPS in-scope systems and structures (i.e., anchors, embedments, equipment supports, instrument panels, racks, cable trays, and conduits) are reviewed with the bulk commodities (Section 2.4.6).

Table 2.4-3 lists the component types that require aging management review.

Table 3.5.2-3 provides the results of the aging management review.

2.4.4 Process Facilities

Description

Process facilities are buildings and structures related to power generation and supporting processes. They are designated as either seismic Class I or seismic Class II. Concrete floor slabs, structural steel floors, and platforms are provided inside these facilities as required. Support for these structures is provided by concrete or structural steel columns, supported by base slabs and walls.

Process facilities with intended functions for license renewal are described below.

Alternate Cooling Cells and Cooling Tower No. 2 Deep Basin

The purpose of alternate cooling cell No. 2-1 and cooling tower No. 2 deep basin is to provide a heat sink to remove decay heat and sensible heat from the primary system so that the reactor can be safely shut down in the event the service water pumps are not available. Alternate cooling cell No. 2-1, adjoining cooling cell 2-2, and cooling tower No. 2 deep basin support and protect structures necessary to provide the heat sink.

The deep basin and the alternate cooling cell (with the adjoining cell) are seismic Class I. The cooling cells are constructed of treated wood with plastic fill and drift eliminators.

Cooling tower No. 2 deep basin, located beneath the west cooling tower, is a reinforced concrete structure constructed on bedrock.

Control Building

The control building, houses instrumentation and switches required for station operation. Major instrumentation is located in the main control room. The cable vault and east and west switchgear rooms occupy the lower levels of the building.

The control building is a seismic Class I reinforced concrete structure. The building is founded on bedrock and internal and external walls are either concrete or masonry.

Plant Stack

The plant stack (or main stack) discharges gases to the atmosphere from portions of the turbine building, reactor building, radwaste building, standby gas treatment system, and the advanced off-gas system. The height of the stack ensures an elevated release point. An enclosure at the base of the plant stack contains monitoring equipment.

The plant stack is an unlined, freestanding, tapered, reinforced concrete cylinder with a circular base foundation mat supported on steel pilings. The stack is designed to seismic Class I criteria.

Turbine Building

The turbine building houses the turbine generator and associated auxiliaries including the condensate, feedwater, diesel generator and water treatment systems. Portions of the turbine building support and protect the emergency diesel generators and fuel oil day tank areas. These portions are designed to meet seismic Class I requirements. The service area, machine shop, and warehouse area are in this building, but are not subject to aging management review as they perform no intended functions for license renewal.

The superstructure of the building consists of steel framing with insulated metal siding and roof decking. A bridge crane provides service for the generator and related equipment. The turbine building siding contains blowout panels that vent the turbine building during certain high energy line breaks or tornado conditions. A removable steel wall on the north end of the turbine acts as a missile shield. A reinforced concrete radiation shield wall is provided along the west side of the turbine.

The emergency diesel generator room concrete and masonry walls and concrete foundations are seismic Class I design.

Process facilities have the following intended functions for 10 CFR 54.4(a)(1), (a)(2), and (a)(3).

- Provide support, shelter and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. Process facilities house equipment credited for fire protection (10 CFR 50.48).
- Provide for an elevated release (plant stack)
- Provide shelter and protection for operations personnel during design basis accidents (control room)

- Provide a heat sink to remove decay heat and sensible heat from the primary system so that the reactor can be safely shut down in the event the service water pumps are not available (alternate cooling cell No. 2-1 and cooling tower No. 2 deep basin).

UFSAR References

Control building: Section 12.2.5

Cooling tower structures: Sections 10.8, 11.9(cooling tower water system), and 12.2.6.4

Plant stack: Section 12.2.4

Turbine building: Section 12.2.3

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to the process facilities are included in this review. Those that are common to VYNPS in-scope systems and structures (i.e., anchors, embedments, equipment supports, instrument panels, racks, cable trays, and conduits) are reviewed with the bulk commodities (Section 2.4.6).

Table 2.4-4 lists the component types that require aging management review.

Table 3.5.2-4 provides the results of the aging management review.

2.4.5 Yard Structures

Description

Yard structures are structures at VYNPS not contained within primary containment, the reactor building, the intake structure, or process facilities.

A brief description of yard structures within the scope of license renewal is provided below.

Condensate Storage Tank Foundation and Enclosure Structure

The condensate storage tank is located near the southeast corner of the turbine building. The tank is supported by a reinforced concrete foundation to which it is anchored by grouted anchors along its outer edge. It is surrounded on four sides by a reinforced concrete berm wall and part of this area is contained within an enclosure located on the south side of the tank. The carbon steel enclosure houses safety-related equipment associated with the condensate storage and transfer system.

Fuel Oil Storage Tank Foundation and Transfer Pump House

The fuel oil storage tank holds make-up fuel for the emergency diesel generator day tanks. A fuel oil transfer pump house contains the fuel oil pumps. The tank foundation and pump house, located southeast of the turbine building, are constructed entirely of reinforced concrete. Tornado protection is provided for the fuel oil tank. A dike designed to contain the total tank contents surrounds the tank.

Liquid Nitrogen (N2) Storage Tank Foundation and Enclosure

The liquid nitrogen storage tank enclosure is designed as a seismic Class I structure to ensure that instantaneous introduction of a high nitrogen gas concentration into the air entering the diesel generator air intake does not occur if the storage tank fails. A restraining wall is installed around the base of the tank to collect liquid nitrogen and minimize surface area to limit the boil off rate of spilled nitrogen. The tank, located adjacent to the east side of the reactor building, is supported by a reinforced concrete foundation and structural steel support columns to meet seismic design requirements.

Low Pressure Carbon Dioxide (CO2) Tank Foundation and Enclosure

The reinforced concrete CO2 tank (TK-115-1) foundation is located adjacent to the northeast corner of the switchgear room. Electrical and mechanical equipment associated with the tank is housed in a metal enclosure for protection against the environment.

John Deere Diesel Building

The John Deere diesel powers emergency lighting credited for alternate shutdown in the Appendix R safe shutdown capability analysis. The diesel is located north of the turbine building in a pre-engineered metal enclosure for protection from the environment. The diesel is anchored to a reinforced concrete foundation.

Startup Transformer Foundation

The start-up transformers (T-3A & B) located on the west side of the turbine building are supported by reinforced concrete pedestals raised above a crushed rock bed. The startup transformers provide power during recovery from station blackout.

Switchyard Relay House

The switchyard control house, also known as the switchyard relay house, is a single-story structure in the main switchyard which houses relays that control the off-site 115 kV lines. It is a prefabricated metal building supported on a reinforced concrete slab foundation. There are three sets of batteries, with associated chargers, located in the building. The building is non-seismic and provides protection for equipment in the building required for recovery from station blackout.

Trenches, Manholes and Duct Banks

The purpose of the trenches, manholes and duct banks located throughout the VYNPS site is to support and protect plant equipment. Trenches, manholes and duct banks that shelter or support equipment in the scope of license renewal are also in scope. Trenches that are within the scope of license renewal are the condensate storage tank and service water pipe trenches, the cooling tower No. 2 basin valve and pipe trench, and the diesel generator cable trench. Duct banks are provided for routing of electrical cables between buildings and in the switchyard area. These structural components are constructed of reinforced and non-reinforced concrete.

Vernon Tie Transformer Foundation

The Vernon tie transformer is located on a reinforced concrete slab approximately fifty feet northwest of the west cooling tower. The slab is formed on a gravel and sand base to minimize frost heaving. The Vernon tie transformer is credited for station blackout.

Vernon Dam and Hydroelectric Station

Vernon Dam, located on the Connecticut River, is constructed of concrete and steel. It is used for hydro-electric generation and is VYNPS' alternate source of AC power in the event of a station blackout (SBO). The dam and powerhouse are founded on compact rock. The associated power block superstructure comprises reinforced concrete, masonry brick and structural steel. The dam is not part of the site structures owned by VYNPS. Dam inspections are regulated by the Federal Energy Regulatory Commission (FERC), which licenses the dam and associated power block.

Transmission Towers

VYNPS transmission towers are of galvanized steel construction supported on reinforced concrete foundations. In-scope towers are the 115 kv tower (located in the 115 KV switchyard), the 115KV angle tower (located west of the turbine building), and the 115/ 345 KV shared tower (located in the 345 KV switchyard). The transmission towers are within the scope of license renewal based on their function during recovery from station blackout.

Yard structures have the following intended functions for 10 CFR 54.4(a)(1), (a)(2), and (a)(3).

- Provide support, shelter and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. Yard structures house and support equipment credited for station blackout (10 CFR 50.63) and for fire protection (10 CFR 50.48).

- Maintain integrity such that the diesel generators are not affected in the event of a nitrogen tank failure (liquid nitrogen storage tank enclosure).

UFSAR References

None

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to the in-scope yard structures are included in this review. Those that are common to VYNPS in-scope systems and structures (i.e., anchors, embedments, equipment supports, instrument panels, racks, cable trays, and conduits) are reviewed with the bulk commodities (Section 2.4.6).

Table 2.4-5 lists the component types that require aging management review.

Table 3.5.2-5 provides the results of the aging management review.

2.4.6 Bulk Commodities

Description

Bulk commodities subject to aging management review are structural components or commodities that perform or support intended functions of in-scope systems, structures and components (SSCs). Bulk commodities unique to a specific structure are included in the review for that structure (Sections 2.4.1 through 2.4.5). Bulk commodities common to VYNPS in-scope SSCs (e.g., anchors, embedments, pipe and equipment supports, instrument panels and racks, cable trays, and conduits) are addressed in this section.

Bulk commodities have the following intended functions for 10 CFR 54.4(a)(1), (a)(2), and (a)(3).

- Provide support, shelter and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal.

Insulation may have the specific intended functions of (1) controlling the heat load during design basis accidents in areas with safety-related equipment, or (2) maintaining integrity such that falling insulation does not damage safety-related equipment (reflective metallic type reactor vessel insulation).

UFSAR References

None

Components Subject to Aging Management Review

Insulation is subject to aging management review if it performs an intended function as described above.

Table 2.4-6 lists the component types that require aging management review.

Table 3.5.2-6 provides the results of the aging management review.

Table 2.4-1
Primary Containment (PC)
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
Bellows (reactor vessel and drywell)	Pressure boundary Support for Criterion (a)(1) equipment
CRD removal hatch	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell head	Flood Barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell shell	Flood Barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell shell protection panels (jet deflectors)	Missile barriers Shelter or protection
Drywell sump liner	Support for Criterion (a)(1) equipment
Drywell to torus vent line bellows	Pressure boundary Support for Criterion (a)(1) equipment
Drywell to torus vent system	Pressure boundary Support for Criterion (a)(1) equipment
Equipment hatch	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Personnel airlock	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment

Table 2.4-1
Primary Containment (PC)
Components Subject to Aging Management Review (Continued)

Component	Intended Function[1]
Primary containment electrical penetrations	Pressure boundary Support for Criterion (a)(1) equipment
Primary containment mechanical penetrations (includes those with bellows)	Pressure boundary Support for Criterion (a)(1) equipment
Reactor vessel support assembly	Support for Criterion (a)(1) equipment
Reactor vessel stabilizer supports	Support for Criterion (a)(1) equipment
Sacrificial shield wall lateral supports	Support for Criterion (a)(1) equipment
Sacrificial shield wall (steel portion)	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Structural steel: plates, columns and beams	Support for Criterion (a)(1) equipment
Torus electrical penetrations	Pressure boundary Support for Criterion (a)(1) equipment
Torus external supports (columns, saddles)	Support for Criterion (a)(1) equipment
Torus manway	Pressure boundary Support for Criterion (a)(1) equipment
Torus mechanical penetrations	Pressure boundary Support for Criterion (a)(1) equipment
Torus ring girders	Support for Criterion (a)(1) equipment
Torus shell	Heat sink Pressure boundary Support for Criterion (a)(1) equipment
Torus thermowells	Pressure boundary Support for Criterion (a)(1) equipment
Vent header support	Support for Criterion (a)(1) equipment
Concrete	
Drywell sump	Flood barrier Support for Criterion (a)(1) equipment
Equipment hatch concrete plug	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment

Table 2.4-1
Primary Containment (PC)
Components Subject to Aging Management Review (Continued)

Component	Intended Function[1]
Floor slabs, walls	Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Foundation	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Reactor vessel support pedestal	Support for Criterion (a)(1) equipment
Sacrificial shield wall (concrete portion)	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Elastomers and other materials	
Drywell floor liner seal	Shelter and protection Support for Criterion (a)(1) equipment
Primary containment electrical penetration seals and sealant	Pressure boundary Support for Criterion (a)(1) equipment
Fluoropolymers and Lubrite Sliding Surfaces	
Lubrite sliding supports	Support for Criterion (a)(1) equipment

1.Intended functions are defined in Table 2.0-1

Table 2.4-2
Reactor Building (RB)
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
Blowout or blow-off panels	Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Equipment lock (sliding doors)	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Metal partition walls	Fire barrier Shelter or protection
Metal siding	Fire barrier Shelter or protection Pressure boundary
New fuel storage racks	Shelter or protection Support for Criterion (a)(1) equipment
RCIC steel enclosure	Fire barrier Shelter or protection Support for Criterion (a)(2) equipment
Reactor building crane, rails, and girders	Support for Criterion (a)(2) equipment
Refueling platform	Support for Criterion (a)(2) equipment
Spent fuel pool gates	Shelter or protection Support for Criterion (a)(1) equipment
Spent fuel pool liner plate	Shelter or protection Support for Criterion (a)(1) equipment
Spent fuel pool storage racks	Support for Criterion (a)(2) equipment
Structural steel: beams, columns, plates, trusses	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

Table 2.4-2
Reactor Building (RB)
Components Subject to Aging Management Review (Continued)

Component	Intended Function[1]
Concrete	
Beams, columns, floor slabs, and interior walls	Fire barrier Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Biological shield wall	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Exterior walls below elev 254’	Flood barrier Pressure boundary Support for Criterion (a)(1) equipment
Exterior walls above elev 254’	Fire barrier Missile barrier Pressure boundary Support for Criterion (a)(1) equipment
Foundations	Flood barrier Pressure boundary Support for Criterion (a)(1) equipment
Masonry walls	Fire barrier Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
New fuel storage vault	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Spent fuel pool bottom slab and walls	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Sump	Support for Criterion (a)(1) equipment

1.Intended functions are defined in Table 2.0-1

Table 2.4-3
Intake Structure (IS)
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
Metal siding	Support for Criterion (a)(3) equipment
Structural steel: beams, columns, plates	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Concrete	
Beams, columns, floor slabs and interior walls	Fire barrier Flood barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Exterior walls below grade (SW- area)	Support for Criterion (a)(1) equipment
Exterior walls below grade (CWS- area)	Flood barrier Support for Criterion (a)(2) equipment
Exterior walls above grade (CWS area)	Support for Criterion (a)(2) equipment
Exterior walls above grade (SW- area)	Fire barrier Flood barrier Missile barrier Support for Criterion (a)(1) equipment
Foundations	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Interior walls below grade	Flood barrier Support for Criterion (a)(1) equipment
Masonry walls	Fire barrier Shelter or protection Support for Criterion (a)(3) equipment
Roof slab	Fire barrier Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

1.Intended functions are defined in Table 2.0-1

Table 2.4-4
Process Facilities
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
Blowout or blow-off panels	Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Control room ceiling support system	Support for Criterion (a)(2) equipment
Crane rails and girders	Support for Criterion (a)(2) equipment
Metal partition walls	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Metal siding	Shelter or protection Pressure boundary
Steel piles	Support for Criterion (a)(2) equipment
Structural steel	Support for Criterion (a)(2) equipment
Structural steel: beams, columns, plates	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Turbine north shield wall	Missile barrier
Concrete	
Beams, columns, floor slabs and interior walls	Fire barrier Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Exterior walls above grade	Flood barrier Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

Table 2.4-4
Process Facilities
Components Subject to Aging Management Review (Continued)

Component	Intended Function[1]
Exterior walls below grade	Heat sink Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Foundation (cooling tower)	Heat sink Shelter or protection Support for Criterion (a)(2) equipment
Foundations	Flood barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Masonry walls	Fire barrier Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(3) equipment
Plant stack	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Roof slabs	Fire barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(2) equipment
Turbine west shield wall	Shelter or protection
Elastomer and other materials	
Cooling cell No. 2-1	Heat sink Support for Criterion (a)(2) equipment
Cooling cell No. 2-2	Support for Criterion (a)(2) equipment
Cooling tower fill	Heat sink
Pipe supports	Support for Criterion (a)(2) equipment

1.Intended functions are defined in Table 2.0-1

Table 2.4-5
Yard Structures
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
CST enclosure	Shelter or protection
CO_2 tank enclosure	Support for Criterion (a)(3) equipment
Fuel oil transfer pump house structural steel	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
John Deere diesel building	Support for Criterion (a)(3) equipment
N_2 tank steel supports	Support for Criterion (a)(2) equipment
N_2 tank enclosure	Support for Criterion (a)(2) equipment
Switchyard relay house	Support for Criterion (a)(3) equipment
Transmission towers	Support for Criterion (a)(3) equipment
Vernon dam structural steel	Support for Criterion (a)(3) equipment
Concrete	
CST enclosure walls	Missile barrier Shelter or protection Support for Criterion (a)(2) equipment
Duct banks	Shelter or protection
Foundations (tanks, startup transformer, switchyard relay house, transmission towers, Vernon tie transformer, John Deere diesel building)	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Fuel oil tank exterior walls above grade	Missile barrier Support for Criterion (a)(1) equipment
Fuel oil tank exterior walls below grade	Missile barrier Support for Criterion (a)(1) equipment
Fuel oil transfer pump house exterior walls	Flood barrier Missile barrier Support for Criterion (a)(1) equipment
Fuel oil transfer pump house roof slab	Missile barrier Support for Criterion (a)(1) equipment
Manholes and handholes	Shelter or protection

Table 2.4-5
Yard Structures
Components Subject to Aging Management Review (Continued)

Component	Intended Function[1]
N_2 tank restraining wall	Support for Criterion (a)(2) equipment
Trenches	Flood barrier Missile barrier Shelter or protection Shelter for Criterion (a)(1) equipment
Vernon Dam external walls above/below grade	Support for Criterion (a)(3) equipment
Vernon Dam external walls, floor slabs and interior walls	Support for Criterion (a)(3) equipment
Vernon Dam masonry walls	Support for Criterion (a)(3) equipment

1.Intended functions are defined in Table 2.0-1

Table 2.4-6
Bulk Commodities
Components Subject to Aging Management Review

Component	Intended Function[1]
Steel and Other Metals	
Anchorage / embedments	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Base plates	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Battery racks	Support for Criterion (a)(1) equipment
Cable tray	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Cable tray support	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Component and piping supports ASME Class 1, 2, 3 and MC	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Component and piping supports	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Conduit	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Conduit support	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Damper framing	Fire barrier
Electrical and instrument panels and enclosures	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Fire doors	Fire barrier
Fire hose reels	Support for Criterion (a)(3) equipment

Table 2.4-6
Bulk Commodities
Components Subject to Aging Management Review (Continued)

Component	Intended Function[1]
Flood curbs	Flood barrier Shelter or protection
Flood, pressure and specialty doors	Flood barrier Missile barrier Pressure boundary Shelter or protection
HVAC duct supports	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Instrument line supports	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Instrument racks, frames and tubing trays	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Manway hatches and hatch covers	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Mirror insulation	Insulation Support for Criterion (a)(2) equipment
Missile shields	Missile barrier Shelter or protection
Monorails	Support for Criterion (a)(2) equipment
Penetration sleeves (mechanical/electrical not penetrating primary containment boundary)	Flood barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Pipe whip restraints	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Stairway, handrail, platform, decking, and ladder (including torus catwalk)	Support for Criterion (a)(2) equipment

Table 2.4-6
Bulk Commodities
Components Subject to Aging Management Review (Continued)

Component	Intended Function[1]
Vents and louvers	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Threaded Fasteners	
Anchor bolts	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
ASME Class 1, 2, 3 and MC Supports bolting	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Structural bolting	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete	
Equipment pads/foundations	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Fire proofing	Fire barrier
Flood curbs	Flood barrier
Manway hatches and hatch covers	Fire barrier Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Missile shields	Missile barrier
Support pedestals	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Elastomers and Other Materials	
Fire stops	Fire barrier Pressure boundary

Table 2.4-6
Bulk Commodities
Components Subject to Aging Management Review (Continued)

Component	Intended Function[1]
Fire wrap	Fire barrier
Insulation	Insulation Support for Criterion (a)(2) equipment
Penetration sealant (fire, flood, radiation)	Fire barrier Flood barrier Pressure boundary Shelter or protection Support for Criterion (a)(2) equipment
Seals and gaskets (doors, manways and hatches	Pressure boundary Support for Criterion (a)(1) equipment
Seismic isolation joint	Fire barrier Support for Criterion (a)(1) equipment
Water stops	Flood barrier

1.Intended functions are defined in Table 2.0-1

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROL SYSTEMS

Description

As stated in Section 2.1.1, plant electrical and instrument and control systems are included in the scope of license renewal as are electrical and instrumentation and control (I&C) components in mechanical systems. The default inclusion of plant electrical and I&C systems in the scope of license renewal reflects the method used for the integrated plant assessments (IPA) of electrical systems, which is different from the methods used for mechanical systems and structures.

The basic philosophy used in the electrical and I&C components IPA is that components are included in the review unless they are specifically screened out. When used with the plant spaces approach, this method eliminates the need for unique identification of every component and its specific location. This assures components are not excluded from an aging management review.

The electrical and I&C IPA began by grouping the total population of components into commodity groups. The commodity groups include similar electrical and I&C components with common characteristics. Component level intended functions of the commodity groups were identified.

During the IPA, commodity groups and specific plant systems were eliminated from further review as the intended functions of commodity groups were examined.

In addition to the plant electrical systems, certain switchyard components required to restore offsite power following a station blackout were conservatively included within the scope of license renewal even though those components are not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for station blackout (SBO) (10 CFR 50.63). This offsite power system is described below.

The purpose of the offsite power system (Figure 2.5-1) is to provide the electrical interconnection between the VYNPS generator and the offsite transmission network. The system also provides the electrical interconnections between the offsite network and the station auxiliary buses, as well as other buildings and facilities on site. The offsite power system is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(3).

UFSAR References

Additional details for electrical commodities can be found in UFSAR Chapters 7 and 8.

Evaluation Boundaries

Plant electrical and instrument and control systems are included in the scope of license renewal as are electrical and instrumentation and control (I&C) components in mechanical systems. Furthermore, portions of offsite systems are included in the evaluation boundaries.

VYNPS uses the Vernon Hydroelectric Station as an AAC source to satisfy the requirements of 10 CFR 50.63 for response to an SBO. Under this approach, AC power from the Vernon station is supplied to an emergency bus until offsite or onsite power is available. Specifically, the path includes the switchyard circuit breakers near the Vernon Dam that feed the Vernon tie transformer, switchyard bus and insulators, and cables and connections in the circuit to the emergency bus and structures.

The offsite power source required to support SBO recovery actions is the source fed through the start-up transformers. Specifically, the path includes the 115 kV switchyard circuit breaker feeding the start-up transformers, the start-up transformers, the circuit breaker-to-transformers and transformer-to-onsite electrical distribution interconnections, and the associated control circuits and structures.

Components Subject to AMR

As discussed in Section 2.1.2.3.1, VYNPS electrical commodity groups correspond to two of the commodity groups identified in NEI 95-10. The two commodity groups are

- high voltage insulators, and
- cables and connections, bus, electrical portions of electrical and I&C penetration assemblies

The commodity group cables, connections, bus, and electrical portions of I&C penetration assemblies is further divided into the following.

- cable connections (metallic parts)
- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements
- electrical cables and connections subject to 10 CFR 50.49 EQ requirements
- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits
- fuse holders - insulation material
- fuse holders - metallic clamp
- inaccessible medium-voltage (4.16kV to 22kV) cables (e.g., installed underground in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements
- metal enclosed bus connections
- metal enclosed bus - enclosure assemblies
- metal enclosed bus insulation / insulators
- switchyard bus

- transmission conductors
- uninsulated ground conductors

Each of these commodity groups is subject to aging management review with the following exceptions.

- Electrical cables and connections subject to 10 CFR 50.49 EQ requirements are not subject to aging management review since the components are replaced based on qualified life.
- Fuse holders with metallic clamps are either part of a complex active assembly or part of circuits that perform no license renewal intended function.
- Metal enclosed bus connections, enclosure assemblies, and insulators were evaluated and do not support a license renewal intended function.

Table 2.5-1 lists the component types that require aging management review.

Table 3.6.2-1 provides the results of the aging management review.

Table 2.5-1
Electrical and Instrumentation and Control (EIC) Systems Components Subject to Aging Management Review

Structure and/or Component/ Commodity	Intended Function[1]
Cable connections (metallic parts)	CE
Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements	CE
Electrical cables not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits	CE
Fuse holders (insulation material)	IN
High voltage insulators	IN
Inaccessible medium-voltage (4.16kV to 22kV) cables (e.g., installed underground in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	CE
Switchyard bus	CE
Transmission conductors	CE

1. Intended functions are defined in Table 2.0-1.

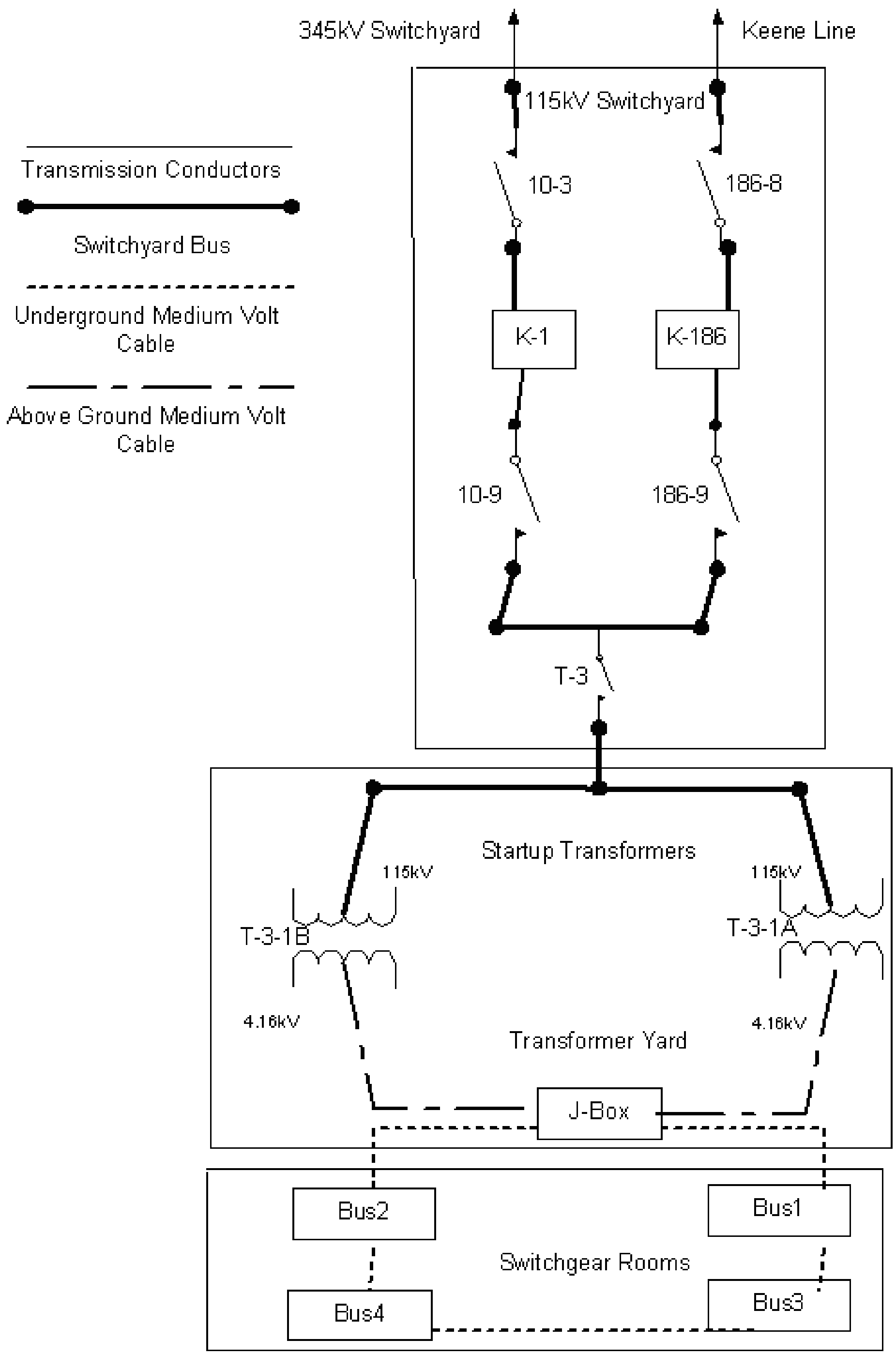

Figure 2.5-1
SBO Offsite Power Scoping Diagram

3.0 AGING MANAGEMENT REVIEW RESULTS

This section provides the results of the aging management review (AMR) for structures and components identified in Section 2 as subject to aging management review. Tables 3.0-1, 3.0-2, and 3.0-3 provide descriptions of the mechanical, structural, and electrical service environments, respectively, used in the AMRs to determine aging effects requiring management.

Results of the AMRs are presented in the following two table types.

- **Table 3.x.1** where

  3 indicates the table pertaining to a Chapter 3 aging management review,

  x indicates the table number from NUREG-1801 (Reference 3.0-2), Volume 1, and

  1 indicates that this is the first table type in Section 3.x.

  For example, in the reactor coolant system subsection, this is Table 3.1.1, and in the engineered safety features subsection, this is Table 3.2.1. For ease of discussion, these table types will hereafter be referred to as "Table 1." These tables are derived from the corresponding tables in NUREG-1801, Volume 1, and present summary information from the AMRs.

- **Table 3.x.2-y** where

  3 indicates the application section number,

  x indicates the table number from NUREG-1801, Volume 1,

  2 indicates that this is the second table type in Section 3.x, and

  y indicates the system table number.

  For example, within the reactor coolant system subsection, the AMR results for the reactor vessel are presented in Table 3.1.2-1, and the results for the reactor vessel internals are in Table 3.1.2-2. In the engineered safety features subsection, the residual heat removal system results are presented in Table 3.2.2-1, and the containment spray system is in Table 3.2.2-2. For ease of discussion, these table types will hereafter be referred to as "Table 2." These tables present the results of the AMRs.

TABLE DESCRIPTION

NUREG-1801 contains the NRC Staff's generic evaluation of existing plant programs. It documents the technical basis for determining whether existing programs are adequate without modification or should be augmented for the extended period of operation. Evaluation results documented in the report indicate that many existing programs are adequate, without modification, to manage the aging effects for particular structures or components within the scope of license renewal. The report also contains recommendations on specific areas for which existing programs should be augmented for license renewal.

To take full advantage of NUREG-1801, VYNPS AMR results have been compared with information set forth in the tables of NUREG-1801. Results of that comparison are provided in the following two table types, Table 1 and Table 2.

Table 1

The purpose of Table 1 is to provide a summary comparison of how the VYNPS AMR results align with the corresponding table of NUREG-1801, Volume 1. These tables are essentially the same as Tables 1 through 6 provided in NUREG-1801, Volume 1, with the following exceptions:

- The ID column is labeled “Item Number” and the number has been expanded to include the table number.
- The "Type" column has been deleted. Items applicable to PWRs only are noted as such.
- The "Related Item" column has been replaced by a "Discussion" column.

The "Item Number" column provides a means to cross-reference to Table 1 from the Table 2s.

Further information is provided in the "Discussion" column. The following are examples of information that might be contained within this column:

- any "Further Evaluation Recommended" information or reference to the location of that information;
- the name of a plant-specific program being used;
- exceptions to the NUREG-1801 assumptions;
- a discussion of how the line item is consistent with the corresponding line item in NUREG-1801, Volume 1, when it may not be intuitively obvious;
- a discussion of how the line item is different than the corresponding line item in NUREG-1801, Volume 1, when it may appear to be consistent.

Table 2

Table 2 provides the results of the aging management reviews for those structures and components identified in Section 2 as being subject to aging management review. There is a Table 2 for each aging management review within a NUREG-1801 system group. For example, the engineered safety features system group contains tables specific to residual heat removal, core spray, automatic depressurization, high pressure coolant injection, reactor core isolation cooling, standby gas treatment, and primary containment penetrations.

Table 2 consists of the following nine columns.

Component Type

Column 1 identifies the component types from Section 2 of this application that are subject to aging management review. Similar to Section 2, component types are listed in alphabetical order. In the Class 1 tables in Section 3.1 and the structural tables in Section 3.5, component types are alphabetical by sub-groups.

The term “piping” in component lists may include pipe, pipe fittings (such as elbows and reducers), flow elements, orifices, and thermowells. If such components have unique tag numbers or the specific component has a function other than pressure boundary, then flow elements, orifices and thermowells are identified as a separate component type.

The term “heat exchanger (shell)” may include the bonnet/channel head and tubesheet. In cases where the bonnet/channel head and tubesheet provide a unique material and environment combination, they will be uniquely identified as a separate component type.

The general component type of “tank” includes components identified as tanks or accumulators on LRA drawings.

Intended Function

Column 2 identifies the license renewal intended functions (using abbreviations where necessary) for the listed component types. Definitions and abbreviations of intended functions are listed in Table 2.0-1 in Section 2.

Material

Column 3 lists the particular materials of construction for the component type being evaluated.

Environment

Column 4 lists the environment to which the component types are exposed. Internal and external service environments are indicated. A description of these environments is provided in Tables 3.0-1, 3.0-2, and 3.0-3 for mechanical, structural, and electrical components, respectively.

Aging Effect Requiring Management

Column 5 lists the aging effects requiring management for material and environment combinations for each component type.

Aging Management Programs (AMP)

Column 6 lists the programs used to manage the aging effects requiring management.

NUREG-1801, Vol. 2, Item

Column 7 documents identified consistencies by noting the appropriate NUREG-1801, Volume 2, item number. If there is no corresponding item number in NUREG-1801, Volume 2, for a particular combination of factors, column 7 is left blank.

Each combination of the following factors listed in Table 2 is compared to NUREG-1801, Volume 2, to identify consistencies:

- component type,
- material,
- environment,
- aging effect requiring management, and
- aging management program.

Table 1 Item

Column 8 lists the corresponding line item from Table 1. If there is no corresponding item in NUREG-1801, Volume 1, column 8 is left blank.

Each combination of the following that has an identified NUREG-1801, Volume 2 item number also has a Table 1 line item reference number:

- component type
- material
- environment
- aging effect requiring management
- aging management program

Notes

Column 9 contains notes that are used to describe the degree of consistency with the line items in NUREG-1801, Volume 2. Notes that use letter designations are standard notes based on Appendix F of Reference 3.0-3. Notes that use numeric designators are specific to VYNPS.

TABLE USAGE

Table 1

Information in the following columns is taken directly from NUREG-1801, Volume 1:

- Component
- Aging Effect/Mechanism
- Aging Management Programs
- Further Evaluation Recommended

The Discussion column explains, in summary, how the VYNPS evaluations and programs align with NUREG-1801, Volume 1.

Table 2

Table 2 contains the aging management review results and indicates whether or not the results correspond to line items in NUREG-1801, Volume 2. This table provides the following information:

- Component type
- Component intended function
- Material
- Environment
- Aging effect requiring management
- AMP credited

If there is a correlation between the combination in Table 2 and a combination for a line item in NUREG-1801, Volume 2, this will be identified by the NUREG-1801, Volume 2, item number in column 7. If the column is blank, no appropriately corresponding combination in NUREG-1801, Volume 2, was identified.

If a NUREG-1801, Volume 2, line item is identified, the next column provides a reference to a Table 1 row number. This reference corresponds to the NUREG-1801, Volume 2, “roll-up” to the NUREG-1801, Volume 1, tables.

Many of the NUREG-1801 evaluations refer to plant-specific programs. In these cases, Note E is used for correlations between the combination in Table 2 and a combination for a line item in NUREG-1801, Volume 2.

REFERENCES

3.0-1 NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Revision 1, U. S. Nuclear Regulatory Commission, September 2005.

3.0-2 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Volumes 1 and 2, Revision 1, U. S. Nuclear Regulatory Commission, September 2005.

3.0-3 NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule*, Nuclear Energy Institute (NEI), Revision 6, June 2005.

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Table 3.0-1
Service Environments for Mechanical Aging Management Reviews

Environment	Description
Class 1 Mechanical Environments	
Air—indoor	Indoor air. Although inerted with nitrogen, primary containment air is conservatively considered equivalent to reactor building ambient air and both are referred to as air—indoor.
Neutron fluence	Neutron flux integrated over time. Neutron fluence is specified as an environment for the limiting reactor vessel components with material properties that may be significantly affected by neutron irradiation.
Nitrogen	Nitrogen gas used in scram accumulators
Treated water	Treated or demineralized water
Treated water > 220°F	Treated or demineralized water above thermal fatigue threshold for carbon steel. Steam is considered treated water.
Treated water > 270°F	Treated or demineralized water above thermal fatigue threshold for stainless steel. Steam is considered treated water.
Treated water > 482°F	Treated or demineralized water above thermal embrittlement threshold for CASS. Steam is considered treated water.
Non-Class 1 Mechanical Environments	
Air—indoor	Indoor air on systems with temperatures above the dewpoint. Although inerted with nitrogen, primary containment air is conservatively considered as air—indoor.
Air—outdoor	Exposed to air and local weather conditions
Air—treated	Air that is dried and filtered but is subject to condensation unless monitored by the Instrument Air Quality Program
Air—untreated	Compressed air with moisture, etc.
Concrete	Components embedded in concrete
Condensation	Air and condensation on surfaces of indoor systems with temperatures below the dewpoint. For exterior surfaces, condensation is considered untreated water due to potential for surface contamination.
Exhaust gas	Gas present in a diesel engine exhaust

Table 3.0-1
Service Environments for Mechanical Aging Management Reviews (Continued)

Environment	Description
Fire protection foam	Fluoroprotein foam concentrate stored as a liquid for combination with water for fire suppression
Freon	Freon gas used in HVAC equipment (control room chiller)
Fuel oil	Fuel oil such as used for combustion engines, boilers, etc.
Gas	Inert gas such as carbon dioxide, Freon, Halon, nitrogen, etc.
Interstitial fluid	Non-toxic brine solution (fuel oil tank for John Deere diesel)
Lube oil	Lubricating oil for plant equipment
Nitrogen	Nitrogen gas
Raw water	Raw, untreated fresh water
Sand and concrete	Sand and concrete base for tanks
Silicone	Silicone (torus wide range level transmitter remote diaphragm seals)
Sodium pentaborate solution	Sodium pentaborate solution (SLC system)
Soil	External environment for components buried in the soil, including groundwater in the soil
Steam > 220°F	Steam above the thermal fatigue threshold for carbon steel
Steam > 270°F	Steam above the thermal fatigue threshold for stainless steel
Treated water	Treated or demineralized water[1]
Treated water > 140°F	Treated water above the SCC threshold for stainless steel
Treated water > 220°F	Treated water above the thermal fatigue threshold for carbon steel
Treated water > 270°F	Treated water above the thermal fatigue threshold for stainless steel
Treated water > 482°F	Treated water above the thermal embrittlement threshold for CASS
Untreated water	Water that may contain contaminants, including oil or boric acid, depending on the location; includes originally treated water that is not monitored by a chemistry program

1. For the aging management review process, and the Table 2 presentation of review results, "treated water" encompasses a range of water "types," all of which were chemically treated or demineralized. These water types include treated water, reactor coolant and closed cycle cooling water as defined in NUREG-1801. In the Table 2 results, the type of water can normally be inferred from the context of the result (e.g., if Water Chemistry Control – Closed Cooling Water is the aging management program, then the treated water is equivalent to closed cycle cooling water as defined by NUREG-1801). Where such an inference is not clear, a plant specific note identifies the water type.

   For the comparison of the aging management review results with those of NUREG-1801, as presented in the last three Table 2 columns, and for the summary of results discussed in Table 1, the NUREG-1801 definitions of water types were used. In other words, the "treated water" listed in the results was compared to the corresponding water type of NUREG-1801. The discussions in Table 1, and in the text sections referenced in Table 1 for further evaluation, use the water types defined by NUREG-1801. In these discussions, "treated water" refers only to water controlled by the Water Chemistry Control – BWR Program.

Table 3.0-2
Service Environments for Structural Aging Management Reviews

Environment	Description
Protected from weather	Air with temperature less than 150°F, humidity up to 100% and protected from precipitation
Exposed to weather (includes above grade and below grade)	Exposed to the weather with air temperature less than 115°F, humidity up to 100%
Exposed to fluid environment	Fluid environment at VYNPS is defined as raw water or treated water.

Table 3.0-3
Service Environments for Electrical Aging Management Reviews

Environment	Description
Heat and air	Indoor air at normal operating temperature.
Radiation and air	Normal plant operating radiation levels.
Moisture and voltage stress	A wetted environment with applied voltage > 2kV. Applies to underground medium-voltage cables energized at least 25% of the time.
Outdoor weather	Ambient outdoor conditions including precipitation.

3.1 REACTOR VESSEL, INTERNALS AND REACTOR COOLANT SYSTEM

3.1.1 Introduction

This section provides the results of the aging management reviews for components in the reactor vessel, internals and reactor coolant system that are subject to aging management review. The following component groups are addressed in this section (component group descriptions are available in the referenced sections).

- reactor vessel (Section 2.3.1.1)
- reactor vessel internals (Section 2.3.1.2)
- reactor coolant pressure boundary (Section 2.3.1.3)

Table 3.1.1, Summary of Aging Management Programs for the Reactor Coolant System in Chapter IV of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the reactor coolant system (RCS) component groups. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.1.2 Results

The following tables summarize the results of aging management reviews and the NUREG-1801 comparison for the reactor vessel, internals and reactor coolant system components.

- Table 3.1.2-1 Reactor Vessel (RV)—Summary of Aging Management Evaluation
- Table 3.1.2-2 Reactor Vessel Internals (RVI)—Summary of Aging Management Evaluation
- Table 3.1.2-3 Reactor Coolant Pressure Boundary (RCPB)—Summary of Aging Management Evaluation

3.1.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for the reactor coolant system components. Programs are described in Appendix B. Further details are provided in Tables 3.1.2-1 through 3.1.2-3.

3.1.2.1.1 Reactor Vessel

Materials

Reactor vessel components are constructed of the following materials.

- carbon steel
- low alloy steel
- low alloy steel with partial (SS) cladding

- low alloy steel with stainless steel (SS) cladding
- nickel-based alloy
- stainless steel

Environment

Reactor vessel components are exposed to the following environments.

- air—indoor
- neutron fluence
- treated water > 220ºF
- treated water > 270ºF

Aging Effects Requiring Management

The following aging effects associated with the reactor vessel components require management.

- cracking
- cracking—fatigue
- loss of material
- reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the effects of aging on reactor vessel components.

- BWR CRD Return Line Nozzle
- BWR Feedwater Nozzle
- BWR Penetrations
- BWR Stress Corrosion Cracking
- BWR Vessel ID Attachment Welds
- BWR Vessel Internals
- Inservice Inspection
- Reactor Head Closure Studs
- Reactor Vessel Surveillance
- Water Chemistry Control – BWR

3.1.2.1.2 Reactor Vessel Internals

Materials

Reactor vessel internals components are constructed of the following materials.

- cast austenitic stainless steel (CASS)

- nickel-based alloy
- stainless steel

Environment

Reactor vessel internals components are exposed to the following environments.

- air—indoor
- neutron fluence
- treated water > 270ºF
- treated water > 482ºF

Aging Effects Requiring Management

The following aging effects associated with the reactor vessel internals components require management.

- cracking
- cracking—fatigue
- cracking—flow induced vibration (FIV)
- loss of material
- loss of preload
- reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the effects of aging on reactor vessel internals components.

- BWR Vessel Internals
- Thermal Aging Embrittlement of CASS
- Water Chemistry Control – BWR

3.1.2.1.3 Reactor Coolant Pressure Boundary

Materials

Reactor coolant pressure boundary components are constructed of the following materials.

- carbon steel
- CASS
- low alloy steel
- stainless steel

Environment

Reactor coolant pressure boundary components are exposed to the following environments.

- air—indoor
- nitrogen
- treated water
- treated water > 220ºF
- treated water > 270ºF
- treated water > 482ºF

Aging Effects Requiring Management

The following aging effects associated with the reactor coolant pressure boundary components require management.

- cracking
- cracking—fatigue
- loss of material
- loss of preload
- reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the effects of aging on reactor coolant pressure boundary components.

- BWR Stress Corrosion Cracking
- Flow-Accelerated Corrosion
- Inservice Inspection
- One-Time Inspection
- System Walkdown
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.1.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.1.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the VYNPS approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.1.2.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of fatigue for the reactor vessel and the reactor internals is discussed in Section 4.3.1.1 and Section 4.3.1.2, respectively. The evaluation of fatigue as a TLAA for the Class 1 portions of the reactor coolant boundary piping and components, including those for interconnecting systems, is discussed in Section 4.3.1.3.

3.1.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

1. Loss of material due to general, pitting, and crevice corrosion in steel components of the reactor pressure vessel exposed to reactor coolant is managed at VYNPS by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow. The Inservice Inspection Program supplements the Water Chemistry Control - BWR Program for these components.

2. This paragraph in NUREG-1800 pertains to BWR isolation condenser components. VYNPS does not have an isolation condenser, however, loss of material due to general, pitting, and crevice corrosion in other steel components within the reactor coolant pressure boundary exposed to reactor coolant is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow. For some components, the Inservice Inspection Program supplements the Water Chemistry Control - BWR Program.

3. Loss of material due to general, pitting, and crevice corrosion in stainless steel, nickel-alloy and steel with stainless steel cladding components of the reactor pressure vessel, and loss of material in stainless steel (including CASS) components of the reactor coolant pressure boundary exposed to reactor coolant is managed at VYNPS by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow. The One-time Inspection Program is also used to manage loss of material for the main steam flow restrictors by means of a component specific inspection. For some components, the Inservice Inspection or BWR Vessel Internals Program supplements the Water Chemistry Control - BWR Program.

4. This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.3 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement

1. Neutron irradiation embrittlement is a TLAA evaluated for the period of extended operation in accordance with 10 CFR 54.21(c). The evaluation of loss of fracture toughness for the reactor vessel beltline shell, and welds is discussed in Section 4.2.

2. The Reactor Vessel Surveillance Program manages reduction of fracture toughness due to neutron embrittlement of reactor vessel beltline materials. VYNPS is a participant in the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP) (see Reactor Vessel Surveillance Program in Appendix B). This program monitors changes in the fracture toughness properties of ferritic materials in the reactor pressure vessel (RPV) beltline region.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

1) The Water Chemistry Control – BWR and One-Time Inspection programs will manage cracking due to SCC and IGSCC in the stainless steel head seal leak detection lines. The One-time Inspection Program will include a volumetric examination for the detection of cracking.

2) This paragraph in NUREG-1800 pertains to BWR isolation condenser components. VYNPS does not have an isolation condenser.

3.1.2.2.5 Crack Growth due to Cyclic Loading

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.6 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement and Void Swelling

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.7 Cracking due to Stress Corrosion Cracking

Both paragraphs in NUREG-1800 apply to PWRs only.

3.1.2.2.8 Cracking due to Cyclic Loading

1. This paragraph in NUREG-1800 pertains to the jet pump sensing lines inside the reactor vessel. At VYNPS, these lines have no license renewal intended function and thus are not subject to aging management review.

   The lines inside the vessel do not form part of the RCS pressure boundary and their failure would not affect the performance of any functions in the scope of license renewal. However, the lines outside the vessel are part of the RCS pressure boundary and are subject to aging management review.

2. This paragraph in NUREG-1800 pertains to BWR isolation condenser components. As VYNPS does not have an isolation condenser.

3.1.2.2.9 Loss of Preload due to Stress Relaxation

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.10 Loss of Material due to Erosion

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.11 Cracking due to Flow-Induced Vibration

Cracking due to flow-induced vibration in the stainless steel steam dryers is managed by the BWR Vessel Internals Program. The BWR Vessel Internals Program currently incorporates the guidance of GE-SIL-644, Revision 1. VYNPS will evaluate BWRVIP-139 once it is approved by the staff and either include its recommendations in the VYNPS BWR Vessel Internals Program or inform the staff of VYNPS's exceptions to that document.

3.1.2.2.12 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking (IASCC)

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.13 Cracking due to Primary Water Stress Corrosion Cracking (PWSCC)

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.14 Wall Thinning due to Flow-Accelerated Corrosion

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.15 Changes in Dimensions due to Void Swelling

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.16 Cracking due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

Both paragraphs in NUREG-1800 apply to PWRs only.

3.1.2.2.17 Cracking due to Stress Corrosion Cracking, Primary Water Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.18 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of VYNPS quality assurance procedures and administrative controls for aging management programs.

3.1.2.3 Time-Limited Aging Analyses

TLAA identified for the reactor coolant system include reactor vessel neutron embrittlement, metal fatigue, and loss of preload. These topics are addressed in Section 4.

3.1.3 Conclusion

The reactor vessel, internals and reactor coolant system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage aging effects for the reactor vessel, internals and reactor coolant system components are identified in Section 3.1.2.1 and in the following tables. A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the reactor coolant system components will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.1.1
Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-1	Steel pressure vessel support skirt and attachment welds	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. Section 3.1.2.2.1.
3.1.1-2	Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor vessel components: flanges; nozzles; penetrations; safe ends; thermal sleeves; vessel shells, heads and welds	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-3	Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor coolant pressure boundary piping, piping components, and piping elements exposed to reactor coolant	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-4	Steel pump and valve closure bolting	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) check Code limits for allowable cycles (less than 7000 cycles) of thermal stress range	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-5	Stainless steel and nickel alloy reactor vessel internals components	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-6	PWR only				
3.1.1-7	PWR only				
3.1.1-8	PWR only				
3.1.1-9	PWR only				
3.1.1-10	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-11	Steel top head enclosure (without cladding) top head nozzles (vent, top head spray or RCIC, and spare) exposed to reactor coolant	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	Consistent with NUREG-1801. The Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness, will be used to manage loss of material in carbon steel components of the reactor vessel. The Inservice Inspection Program supplements the Water Chemistry Control – BWR Program for these components. See Section 3.1.2.2.2 item 1.
3.1.1-12	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-13	Steel and stainless steel isolation condenser components exposed to reactor coolant	Loss of material due to general (steel only), pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Although VYNPS has no isolation condenser, loss of material in other steel components within the reactor coolant pressure boundary is managed by the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness. For some components, the Inservice Inspection Program supplements the Water Chemistry Control – BWR Program. See Section 3.1.2.2.2 item 2.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-14	Stainless steel, nickel-alloy, and steel with nickel-alloy or stainless steel cladding reactor vessel flanges, nozzles, penetrations, safe ends, vessel shells, heads and welds	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel, nickel-alloy and steel with stainless steel cladding components of the reactor vessel is managed by the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness. For some components, the Inservice Inspection or BWR Vessel Internals Program supplements the Water Chemistry Control – BWR Program. See Section 3.1.2.2.2 item 3.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-15	Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor coolant pressure boundary components exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel (including CASS) components of the reactor coolant pressure boundary is managed by the Water Chemistry Control – BWR Program, augmented by the One-Time Inspection Program to verify program effectiveness. The One-Time Inspection Program is also used to manage loss of material for the main steam flow restrictors by means of a component specific inspection. For some components, the Inservice Inspection Program supplements the Water Chemistry Control – BWR Program. See Section 3.1.2.2.2 item 3.
3.1.1-16	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-17	Steel (with or without stainless steel cladding) 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. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations.	Yes, TLAA	Loss of fracture toughness for the reactor vessel beltline shell, and welds is a TLAA. See Section 3.1.2.2.3 item 1.
3.1.1-18	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor Vessel Surveillance	Yes, plant specific	Consistent with NUREG-1801. The Reactor Vessel Surveillance Program manages reduction of fracture toughness of reactor vessel beltline materials. See Section 3.1.2.2.3 item 2.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-19	Stainless steel and nickel alloy top head enclosure vessel flange leak detection line	Cracking due to stress corrosion cracking and intergranular 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	The Water Chemistry Control – BWR and One-Time Inspection Programs manage cracking in the stainless steel head seal leak detection lines. See Section 3.1.2.2.4 item 1.
3.1.1-20	Stainless steel isolation condenser components exposed to reactor coolant	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and plant-specific verification program	Yes, detection of aging effects is to be evaluated	Not applicable. VYNPS does not have an isolation condenser. See Section 3.1.2.2.4 item 2.
3.1.1-21	PWR only				
3.1.1-22	PWR only				
3.1.1-23	PWR only				
3.1.1-24	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-25	Stainless steel jet pump sensing line	Cracking due to cyclic loading	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The jet pump instrumentation lines inside the reactor vessel are not subject to aging management review. The lines outside the vessel are part of the RCS pressure boundary and are subject to aging management review. These lines are included as piping and fittings <4" nominal pipe size (NPS) and cracking of these lines is addressed by line Item 3.1.1-48 of this table. See Section 3.1.2.2.8 item 1.
3.1.1-26	Steel and stainless steel isolation condenser components exposed to reactor coolant	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD) and plant-specific verification program	Yes, detection of aging effects is to be evaluated	Not applicable. VYNPS does not have an isolation condenser. See Section 3.1.2.2.8 item 2.
3.1.1-27	PWR only				
3.1.1-28	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-29	Stainless steel steam dryers exposed to reactor coolant	Cracking due to flow-induced vibration	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The BWR Vessel Internals Program will manage cracking in the stainless steel steam dryers. See Section 3.1.2.2.11.
3.1.1-30	PWR only				
3.1.1-31	PWR only				
3.1.1-32	PWR only				
3.1.1-33	PWR only				
3.1.1-34	PWR only				
3.1.1-35	PWR only				
3.1.1-36	PWR only				
3.1.1-37	PWR only				
3.1.1-38	Steel (with or without stainless steel cladding) control rod drive return line nozzles exposed to reactor coolant	Cracking due to cyclic loading	BWR CR Drive Return Line Nozzle	No	Consistent with NUREG-1801. The BWR CRD Return Line Nozzle Program manages cracking in the low alloy steel with stainless steel cladding control rod drive return line nozzles exposed to reactor coolant.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-39	Steel (with or without stainless steel cladding) feedwater nozzles exposed to reactor coolant	Cracking due to cyclic loading	BWR Feedwater Nozzle	No	Consistent with NUREG-1801. The BWR Feedwater Nozzle Program manages cracking in the low alloy steel feedwater nozzles exposed to reactor coolant.
3.1.1-40	Stainless steel and nickel alloy penetrations for control rod drive stub tubes instrumentation, jet pump instrument, standby liquid control, flux monitor, and drain line exposed to reactor coolant	Cracking due to stress corrosion cracking, Intergranular stress corrosion cracking, cyclic loading	BWR Penetrations and Water Chemistry	No	Cracking in stainless steel and nickel-alloy nozzles and penetrations in the reactor vessel is managed by the Water Chemistry Control – BWR and either the BWR Penetrations, BWR Vessel Internals or Inservice Inspection Program.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-41	Stainless steel and nickel alloy piping, piping components, and piping elements greater than or equal to 4 NPS; nozzle safe ends and associated welds	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	Cracking in stainless steel, nickel-alloy and steel clad with stainless steel components in reactor coolant is managed by several programs. Consistent with NUREG-1801 for some components of the reactor vessel and reactor coolant pressure boundary, the BWR Stress Corrosion Cracking and Water Chemistry Control – BWR Programs, further supplemented by the Inservice Inspection Program for some components, manage cracking. For other components, to which the BWR Stress Corrosion Cracking Program is not applicable, cracking is managed by the Water Chemistry Control – BWR Program and either the Inservice Inspection or One-Time Inspection Program.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-42	Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel ID Attachment Welds and Water Chemistry	No	Consistent with NUREG-1801. The BWR vessel ID attachment welds and Water Chemistry Control – BWR Programs manage cracking in stainless steel and nickel-alloy vessel attachment welds exposed to reactor coolant.
3.1.1-43	Stainless steel fuel supports and control rod drive assemblies control rod drive housing exposed to reactor coolant	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel Internals and Water Chemistry	No	Consistent with NUREG-1801. The BWR Vessel Internals and Water Chemistry Control – BWR Programs manage cracking in stainless steel components of the reactor vessel and vessel internals.
3.1.1-44	Stainless steel and nickel alloy core shroud, core plate, core plate bolts, support structure, top guide, core spray lines, spargers, jet pump assemblies, control rod drive housing, nuclear instrumentation guide tubes	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	BWR Vessel Internals and Water Chemistry	No	Consistent with NUREG-1801. The BWR Vessel Internals and Water Chemistry Control – BWR Programs manage cracking in stainless steel and nickel-alloy components of the reactor vessel internals exposed to reactor coolant.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-45	Steel piping, piping components, and piping elements exposed to reactor coolant	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Consistent with NUREG-1801. The Flow-Accelerated Corrosion Program manages wall thinning of steel components of the reactor coolant pressure boundary.
3.1.1-46	Nickel alloy core shroud and core plate access hole cover (mechanical covers)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	The VYNPS access hole covers are welded, not mechanical (bolted).

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-47	Stainless steel and nickel-alloy reactor vessel internals exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Loss of material in stainless steel and nickel-alloy components of the reactor vessel internals is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the Water Chemistry Control -BWR Program to manage loss of material. The Inservice Inspection Program is not applicable to most reactor vessel internals components since they are not part of the pressure boundary. Management of loss of material using the Water Chemistry Control - BWR Program augmented by the One-Time Inspection Program is consistent with other items of this table including line Items 3.1.1-14 and 3.1.1-15.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-48	Steel and stainless steel Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking (for stainless steel only), and thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	No	Cracking in stainless steel components of the reactor coolant pressure boundary exposed to reactor coolant is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program, which is consistent with NUREG-1801 programs XI.M32, One-Time Inspection and XI.M35. One-Time Inspection of ASME Code Class 1 Small-bore Piping, will verify the effectiveness of the Water Chemistry Program, and will manage cracking in piping and fitting <4" NPS. Cracking in steel components due to thermal and mechanical loading is not directly dependent on water chemistry, so only the One-time Inspection Program is credited. The Inservice Inspection Program is also credited for those components > 4" NPS that are compared to this line item. (continued below)

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					Inservice Inspection is not applicable to components <4" NPS. Lines that reference this item use either One-Time Inspection or Inservice Inspection but not both as listed in NUREG-1801, so note E is used.
3.1.1-49	Nickel alloy core shroud and core plate access hole cover (welded covers)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and, for BWRs with a crevice in the access hole covers, augmented inspection using UT or other demonstrated acceptable inspection of the access hole cover welds	No	VYNPS has welded access hole covers with no crevice behind the weld. Cracking of the nickel-alloy shroud support access hole covers is managed by the BWR Vessel Internals and Water Chemistry Control – BWR Programs as described in line Item 3.1.1-44.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-50	High-strength low alloy steel top head closure studs and nuts exposed to air with reactor coolant leakage	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	Reactor Head Closure Studs	No	Consistent with NUREG-1801 for the head closure flange bolting. The Reactor Head Closure Studs Program manages cracking in low alloy steel head closure flange bolting. The Inservice Inspection Program manages cracking in other low allow steel pressure boundary bolting.
3.1.1-51	Cast austenitic stainless steel 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 of CASS	No	Consistent with NUREG-1801. The Thermal Aging Embrittlement of CASS Program manages the reduction of fracture toughness in cast austenitic stainless steel components of the reactor vessel internals.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-52	Steel and stainless steel reactor coolant pressure boundary (RCPB) pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high-pressure and high-temperature systems	Cracking due to stress corrosion cracking, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Cracking of stainless steel bolting of the incore housing is managed by the Inservice Inspection Program. The ISI Program provides for visual and volumetric examinations of the bolting in accordance with ASME section XI IWB which is consistent with the NUREG-1801 Reactor Heads Closure Studs Program, Industry operating experience indicates that loss of material due to wear is not a significant aging effect for this bolting. Occasional thread failures due to wear related mechanisms such as galling, are event driven conditions that are resolved as required. Loss of preload is a design driven effect and not an aging effect requiring management. (continued below)

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					Bolting at VYNPS is standard grade B7 carbon steel, or similar material, except in rare specialized applications such as where stainless steel bolting is utilized. Loss of preload due to stress relaxation (creep) would only be a concern in very high temperature applications (> 700°F) as stated in the ASME Code, Section II, Part D, Table 4. No VYNPS bolting operates at >700°F. Therefore, loss of preload due to stress relaxation (creep) is not an applicable aging effect for the reactor coolant system. Other issues that may result in pressure boundary joint leakage are improper design or maintenance issues. (continued below)

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					Improper bolting application (design) and maintenance issues are current plant operational concerns and not related to aging effects or mechanisms that require management during the period of extended operation.To address these bolting operational concerns, VYNPS has taken actions to address NUREG–1339, “Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants.” These actions include implementation of good bolting practices in accordance with EPRI NP-5067, Good Bolting Practices. Proper joint preparation and make-up in accordance with industry standards is expected to preclude loss of preload. This has been confirmed by operating experience at VYNPS.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-53	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable. There are no steel components of the Class 1 reactor vessel, vessel internals or reactor coolant pressure boundary exposed to closed cycle cooling water.
3.1.1-54	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. There are no copper alloy components of the Class 1 reactor vessel, vessel internals or reactor coolant pressure boundary exposed to closed cycle cooling water.
3.1.1-55	Cast austenitic stainless steel Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection (IWB, IWC, and IWD). Thermal aging susceptibility screening is not necessary, inservice inspection requirements are sufficient for managing these aging effects. ASME Code Case N-481 also provides an alternative for pump casings.	No	The Inservice Inspection and One-Time Inspection Programs manage the reduction of fracture toughness in cast austenitic stainless steel components of the reactor coolant pressure boundary.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-56	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no copper alloy components in the Class 1 reactor vessel, vessel internals or reactor coolant pressure boundary.
3.1.1-57	Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and control rod drive pressure housings exposed to reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	The One-Time Inspection Program manages the reduction of fracture toughness in cast austenitic stainless steel main steam flow restrictors. VYNPS has no other Class 1 piping, piping components, piping elements, or CRD housings made of CASS. Pump casings and valve bodies of CASS are included in line Item 3.1.1-55 above.
3.1.1-58	PWR only				
3.1.1-59	PWR only				
3.1.1-60	PWR only				
3.1.1-61	PWR only				
3.1.1-62	PWR only				
3.1.1-63	PWR only				
3.1.1-64	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-65	PWR only				
3.1.1-66	PWR only				
3.1.1-67	PWR only				
3.1.1-68	PWR only				
3.1.1-69	PWR only				
3.1.1-70	PWR only				
3.1.1-71	PWR only				
3.1.1-72	PWR only				
3.1.1-73	PWR only				
3.1.1-74	PWR only				
3.1.1-75	PWR only				
3.1.1-76	PWR only				
3.1.1-77	PWR only				
3.1.1-78	PWR only				
3.1.1-79	PWR only				
3.1.1-80	PWR only				
3.1.1-81	PWR only				
3.1.1-82	PWR only				
3.1.1-83	PWR only				

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-84	PWR only				
3.1.1-85	Nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.1.1-86	Stainless steel piping, piping components, and piping elements exposed to air – indoor uncontrolled (External); air with borated water leakage; concrete; gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.1.1-87	Steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Not applicable. There are no components of the Class 1 reactor vessel, vessel internals or reactor coolant pressure boundary exposed to concrete.

Notes for Tables 3.1.2-1 through 3.1.2-3

Generic notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific notes

101. The environment of air - indoor (external) is considered to be equivalent to the NUREG-1801 environment of reactor coolant for the purposes of evaluating cracking due to fatigue.

102. High component surface temperature precludes moisture accumulation that could result in corrosion.

103. The environment of air - indoor (external) is considered to be equivalent to the NUREG-1801 generic line R-28 environment of System temperature up to 288°C (550°F) for the purposes of evaluating cracking due to fatigue.

104. Cracking of the head seal leak detection line is included in this line item.

105. The VYNPS One-Time Inspection Program is consistent with both XI.M32, One-Time Inspection and XI.M35, One-Time Inspection of ASME Code Class 1 Small-bore Piping, described in NUREG-1801.

Table 3.1.2-1
Reactor Vessel (RV)
Summary of Aging Management Evaluation

Table 3.1.2-1: Reactor Vessel								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting								
Closure flange studs, nuts, washers and bushings	Pressure boundary	Low alloy steel	Air-indoor (ext)	Loss of material	Reactor Head Closure Studs			H
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	C, 101
				Cracking	Reactor Head Closure Studs	IV.A1-9 (R-60)	3.1.1-50	B
Incore housing bolting • Flange bolts • Flange • Nut and washer	Pressure boundary	Stainless steel	Air-indoor (ext)	Cracking - fatigue	TLAA-metal fatigue			G
				Cracking	Inservice Inspection	IV.A2-6 (R-78)	3.1.1-52	E
Other pressure boundary bolting • Flange bolts and nuts (N6A, N6B, N7) • CRD flange capscrews and washers	Pressure boundary	Low alloy steel	Air-indoor (ext)	Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	C, 101
				Cracking	Inservice Inspection	IV.A1-9 (R-60)	3.1.1-50	E

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heads and Shell								
Dome: bottom head	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection			H
			Air-indoor (ext)	None	None			G, 102
Dome: upper head	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection			H
			Air-indoor (ext)	None	None			G, 102

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flanges (closure) • Upper head • Vessel shell	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection			H
			Air-indoor (ext)	None	None			G, 102
Reactor vessel shell • Upper shell • Intermediate nozzle shell • Lower shell	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking - fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection			H
			Air-indoor (ext)	None	None			G, 102

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Reactor vessel shell • Intermediate beltline shell	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection			H
			Neutron fluence	Reduction of fracture toughness	Reactor Vessel Surveillance	IV.A1-14 (R-63)	3.1.1-18	A
					TLAA – neutron fluence	IV.A1-13 (R-62)	3.1.1-17	A
			Air-indoor (ext)	None	None			G, 102

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzles and Penetrations								
CRD housings	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	C
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-8 (R-104)	3.1.1-43	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
CRD stub tubes	Pressure boundary	Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.A1-5 (R-69)	3.1.1-40	E

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Incore housings	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-5 (R-69)	3.1.1-40	E
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Nozzles • Recirc outlets (N1) • Recirc inlets (N2)	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection	IV.A1-1 (R-68)	3.1.1-41	E
			Air-indoor (ext)	None	None			G, 102

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzles • Main steam (N3)	Pressure boundary	Low alloy steel with partial SS cladding	Treated water > 220ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection			H
			Air-indoor (ext)	None	None			G, 102
Nozzles • Feedwater (N4)	Pressure boundary	Low alloy steel with partial SS cladding	Treated water > 220ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Feedwater Nozzle	IV.A1-3 (R-65)	3.1.1-39	B
			Air-indoor (ext)	None	None			G, 102

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Nozzles • Core spray (N5) • Head spray (N6A) • Head instr. (N6B) • Head vent (N7) • Jet pump instr. (N8)	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection	IV.A1-1 (R-68)	3.1.1-41	E
			Air-indoor (ext)	None	None			G, 102
Nozzle • CRD return (N9)	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR CRD Return Line Nozzle	IV.A1-2 (R-66)	3.1.1-38	B
			Air-indoor (ext)	None	None			G, 102

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Nozzle • Core SLC/ΔP (N10)	Pressure boundary	Low alloy steel with SS cladding	Treated water > 220ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR BWR Penetrations	IV.A1-5 (R-69)	3.1.1-40	B
			Air-indoor (ext)	None	None			G, 102
Nozzles • Instrumentation (N11, N12)	Pressure boundary	Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Penetrations Water Chemistry Control – BWR	IV.A1-5 (R-69)	3.1.1-40	B
			Air-indoor (ext)	None	None	IV.E-1 (RP-03)	3.1.1-85	A

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Nozzles • Flange leakoff (N13, N14)	Pressure boundary	Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			Air-indoor (ext)	None	None	IV.E-1 (RP-03)	3.1.1-85	A
Nozzles • Drain (N15)	Pressure boundary	Low alloy steel with partial SS cladding	Treated water > 220ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C
				Cracking - fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection			H
			Air-indoor (ext)	None	None			G, 102

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Safe Ends, Thermal Sleeves, Flanges, Caps								
Cap • CRD return line (N9)	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR CRD Return Line Nozzle Water Chemistry Control – BWR			F
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Flanges • Head nozzle flanges (N6, N7) • Blank flanges (N6)	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking - fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Safe ends ≥ 4” • Recirc inlet (N1) • Recirc outlet (N2)	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Stress Corrosion Cracking Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Safe ends ≥ 4” • Main steam (N3) • Feedwater (N4)	Pressure boundary	Carbon steel	Treated water > 220ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
			Air-indoor (ext)	None	None			G, 102

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Safe ends ≥ 4" • Core spray (N5)	Pressure boundary	Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Stress Corrosion Cracking Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	B
			Air-indoor (ext)	None	None	IV.E-1 (RP-03)	3.1.1-85	A

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Safe ends ≥ 4" • Jet pump instr. (N8)	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Stress Corrosion Cracking Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Safe ends < 4" • Core SLC/ΔP (N10) • Instrumentation (N11, N12)	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Safe ends < 4" • Drain (N15)	Pressure boundary	Low alloy steel	Treated water > 220ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-11 (R-59)	3.1.1-11	C
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
			Air-indoor (ext)	None	None			G, 102

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermal sleeves • Recirc inlet (N2) • Core spray (N5)	Pressure boundary	Stainless steel	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	C
				Cracking - fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-13 (R-100)	3.1.1-44	D
Thermal sleeves • Feedwater inlets (N4)	Pressure boundary	Stainless steel and Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1-1 (R-68)	3.1.1-41	E

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Weld • SLC nozzle to safe end weld (N10)	Pressure boundary	Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	BWR Vessel Internals Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	A
				Cracking	BWR Penetrations Water Chemistry Control – BWR	IV.A1-5 (R-69)	3.1.1-40	B
			Air-indoor (ext)	None	None	IV.E-1 (RP-03)	3.1.1-85	A

Table 3.1.2-1: Reactor Vessel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Vessel Attachments and Supports								
Internal attachments • Shroud support ring pad • Shroud support feet • Jet pump riser pads • Core spray brackets • Guide rod brackets • Steam dryer brackets • Dryer holddown brackets • Surveillance specimen holder brackets • Feedwater sparger brackets	Support for Criterion (a)(1) equipment	Stainless steel and Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Inservice Inspection Water Chemistry Control – BWR	IV.A1-8 (RP-25)	3.1.1-14	A
				Cracking – fatigue	TLAA-metal fatigue	IV.A1-7 (R-04)	3.1.1-2	C
				Cracking	BWR Vessel ID Attachment Welds Water Chemistry Control – BWR	IV.A1-12 (R-64)	3.1.1-42	B

Table 3.1.2-1: Reactor Vessel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Supports • Stabilizer pads • Support skirt	Support for Criterion (a)(1) equipment	Low alloy steel	Air-indoor (ext)	Loss of material	Inservice Inspection			H
				Cracking - fatigue	TLAA-metal fatigue	IV.A1-6 (R-70)	3.1.1-1	A

**Table 3.1.2-2
Reactor Vessel Internals (RVI)
Summary of Aging Management Evaluation**

Table 3.1.2-2 Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Control rod guide tubes • Tubes	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-8 (R-104)	3.1.1-43	D
Control rod guide tubes • Bases	Support for Criterion (a)(1) equipment	CASS	Treated water > 482º F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-8 (R-104)	3.1.1-43	D
			Treated water > 482º F and neutron fluence	Reduction of fracture toughness	Thermal Aging Embrittlement of CASS	IV.B1-9 (R-103)	3.1.1-51	A

Table 3.1.2-2 Reactor Vessel Internals (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Core plate • Plate, beams • Blocks, plugs • Alignment assemblies	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-6 (R-93)	3.1.1-44	B
Core plate • Rim bolts	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270º F (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-6 (R-93)	3.1.1-44	B
				Loss of preload	TLAA – loss of preload			H
Core spray lines	Flow distribution	Stainless steel	Treated water > 270º F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-7 (R-99)	3.1.1-44	B

Table 3.1.2-2 Reactor Vessel Internals (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Fuel support pieces • Orificed supports • Peripheral supports	Support for Criterion (a)(1) equipment	CASS	Treated water > 482ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-6 (R-93)	3.1.1-44	D
			Treated water > 482ºF and neutron fluence	Reduction of fracture toughness	Thermal Aging Embrittlement of CASS	IV.B1-9 (R-103)	3.1.1-51	A
Incore dry tubes	Pressure boundary	Stainless steel	Treated water > 270ºF (ext)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-10 (R-105)	3.1.1-44	B
			Air-indoor (int)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-2 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Incore guide tubes	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270ºF (ext)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-10 (R-105)	3.1.1-44	B
Jet pump assemblies • Risers, riser braces • Riser hold down bolts • Mixer barrels and adapters • Restraint brackets, wedges, bolts • Diffusers and tailpipes • Adapter upper rings	Floodable volume	Stainless steel	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-13 (R-100)	3.1.1-44	B

Table 3.1.2-2 Reactor Vessel Internals (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Jet pump assemblies • Holddown beams • Adapter lower ring	Floodable volume	Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-13 (R-100)	3.1.1-44	B
Jet pump castings • Transition piece • Inlet elbow/ nozzle • Mixer flange and flare • Diffuser collar	Floodable volume	CASS	Treated water > 482º F (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-13 (R-100)	3.1.1-44	B
			Treated water > 482º F and neutron fluence	Reduction of fracture toughness	Thermal Aging Embrittlement of CASS	IV.B1-9 (R-103)	3.1.1-51	C

Table 3.1.2-2 Reactor Vessel Internals (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Shroud	Floodable volume	Stainless steel	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-1 (R-92)	3.1.1-44	B
Shroud repair hardware • Tie rod assemblies • Top bracket • Radial restraints • Spring rod / top adapter • Bottom adapter	Support for Criterion (a)(1) equipment	Stainless steel and Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-1 (R-92) IV.B1-2 (R-96)	3.1.1-44 3.1.1-44	B B

Table 3.1.2-2 Reactor Vessel Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Shroud support • Ring, cylinder, and legs • Access hole cover	Support for Criterion (a)(1) equipment	Nickel-based alloy	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-2 (R-96) IV.B1-5 (R-94)	3.1.1-44 3.1.1-49	B E
Steam dryer	Structural integrity	Stainless steel	Treated water > 270ºF (int)	Cracking - FIV	BWR Vessel Internals	IV.B1-16 (RP-18)	3.1.1-29	E
Top guide assembly	Support for Criterion (a)(1) equipment	Stainless steel	Treated water > 270ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1-15 (RP-26)	3.1.1-47	E
				Cracking – fatigue	TLAA-metal fatigue	IV.B1-14 (R-53)	3.1.1-5	A
				Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1-17 (R-98)	3.1.1-44	B

Table 3.1.2-3
Reactor Coolant Pressure Boundary (RCPB)
Summary of Aging Management Evaluation

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting (flanges, valves, etc.) (all systems)	Pressure boundary	Stainless steel	Air-indoor (ext)	Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A, 101
				Cracking	Inservice Inspection			F
		Low alloy steel	Air-indoor (ext)	Loss of material	System Walkdown Inservice Inspection	V.E-7 (E-44)	3.2.1-31	C
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-11 (R-28)	3.1.1-4	A, 103
				Cracking	Inservice Inspection			H
Condensing chambers	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Detector (CRD)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking - fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Drive (CRD)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection	IV.C1-1 (R-03)	3.1.1-48	E
				Cracking - fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Driver mount (RR)	Pressure boundary	Carbon steel	Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	C

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Filter housing (CRD)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Flow elements (RR), (SLC)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifices (Instrumentation)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping and fittings < 4" NPS	Pressure boundary	Stainless steel	Treated water > 270° F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR	IV.C1-1 (R-03)	3.1.1-48	E, 103
					One-Time Inspection	IV.A1-10 (R-61)	3.1.1-19	E, 104
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water > 220° F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None			I, 102

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping and fittings < 4" NPS	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 103
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C
			Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	C
Piping and fittings < 4” NPS (CRD)	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	IV.E-5 (RP-07)	3.1.1-86	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping and fittings ≥ 4" NPS	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-6 (R-16)	3.1.1-13	C
					Flow-Accelerated Corrosion	IV.C1-7 (R-23)	3.1.1-45	A
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None			I, 102

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping and fittings ≥ 4" NPS	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-6 (R-16)	3.1.1-13	C
			Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	C

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing and cover (RR)	Pressure boundary	CASS	Treated water > 482° F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR BWR Stress Corrosion Cracking Inservice Inspection	IV.C1-9 (R-20)	3.1.1-41	B
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
				Reduction of fracture toughness	Inservice Inspection	IV.C1-3 (R-08)	3.1.1-55	E
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump cover thermal barrier (RR)	Pressure boundary	CASS	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water Inservice Inspection	V.D2-5 (E-19)	3.2.1-28	D
				Cracking	Water Chemistry Control – Closed Cooling Water Inservice Inspection	V.D2-26 (EP-44)	3.2.1-25	D
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Restrictors (MS)	Flow control	CASS	Treated water > 482°F (int)	Loss of material	Water Chemistry Control – BWR One-Time Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-9 (R-20)	3.1.1-41	E
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
				Reduction of fracture toughness	One-Time Inspection	IV.C1-2 (R-52)	3.1.1-57	E

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Rupture disc (CRD)	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	IV.E-5 (RP-07)	3.1.1-86	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Tank (CRD accumulator)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C
			Nitrogen (int)	None	None	V.F-18 (EP-7)	3.2.1-56	C
			Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	C
		Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
			Nitrogen (int)	None	None	IV.E-5 (RP-07)	3.1.1-86	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell < 4" NPS (all systems)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Thermowell ≥ 4" NPS (all systems)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies < 4" NPS	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None			I, 102
		CASS	Treated water > 482°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
				Reduction of fracture toughness	One-Time Inspection	IV.C1-3 (R-08)	3.1.1-55	E
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies < 4" NPS (continued)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-6 (R-16)	3.1.1-13	C
			Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	C
		CASS	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies < 4" NPS (continued)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR One-Time Inspection	IV.C1-1 (R-03)	3.1.1-48	E, 105
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
Valve bodies < 4" NPS (CRD)	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	IV.E-5 (RP-07)	3.1.1-86	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve bodies ≥ 4" NPS	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-6 (R-16)	3.1.1-13	C
					Flow-Accelerated Corrosion	IV.C1-7 (R-23)	3.1.1-45	A
				Cracking – fatigue	TLAA-metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
			Air-indoor (ext)	None	None			I, 102

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies ≥ 4" NPS (continued)	Pressure boundary	CASS	Treated water > 482°F (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
				Cracking – fatigue	TLAA – metal fatigue	IV.C1-15 (R-220)	3.1.1-3	A
				Reduction of fracture toughness	Inservice Inspection	IV.C1-3 (R-08)	3.1.1-55	E
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies ≥ 4" NPS (continued)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A
		Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-6 (R-16)	3.1.1-13	C
			Air-indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	C

Table 3.1.2-3: Reactor Coolant Pressure Boundary (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve bodies ≥ 4" NPS (continued)	Pressure boundary	CASS	Treated water (int)	Loss of material	Water Chemistry Control – BWR Inservice Inspection	IV.C1-14 (RP-27)	3.1.1-15	A
				Cracking	Water Chemistry Control – BWR Inservice Inspection BWR Stress Corrosion Cracking	IV.C1-9 (R-20)	3.1.1-41	B
			Air-indoor (ext)	None	None	IV.E-2 (RP-04)	3.1.1-86	A

3.2 ENGINEERED SAFETY FEATURES SYSTEMS

3.2.1 Introduction

This section provides the results of the aging management reviews for components in the engineered safety features (ESF) systems that are subject to aging management review. The following systems are addressed in this section (system descriptions are available in the referenced sections).

- residual heat removal system (Section 2.3.2.1)
- core spray system (Section 2.3.2.2)
- automatic depressurization system (Section 2.3.2.3)
- high pressure coolant injection system (Section 2.3.2.4)
- reactor core isolation cooling system (Section 2.3.2.5)
- standby gas treatment system (Section 2.3.2.6)
- primary containment penetrations (Section 2.3.2.7)

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the engineered safety features component groups. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.2.2 Results

The following system tables summarize the results of aging management reviews and the NUREG-1801 comparison for systems in the ESF system group.

- Table 3.2.2-1 Residual Heat Removal (RHR) System—Summary of Aging Management Evaluation
- Table 3.2.2-2 Core Spray (CS) System—Summary of Aging Management Evaluation
- Table 3.2.2-3 Automatic Depressurization System (ADS)—Summary of Aging Management Evaluation
- Table 3.2.2-4 High Pressure Coolant Injection (HPCI) System—Summary of Aging Management Evaluation
- Table 3.2.2-5 Reactor Core Isolation Cooling (RCIC) System—Summary of Aging Management Evaluation
- Table 3.2.2-6 Standby Gas Treatment (SBGT) System—Summary of Aging Management Evaluation

- Table 3.2.2-7 Primary Containment Penetrations (PCP)—Summary of Aging Management Evaluation

3.2.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for the ESF systems. Programs are described in Appendix B. Further details are provided in the system tables.

3.2.2.1.1 Residual Heat Removal System

Materials

Residual heat removal system components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- gray cast iron
- stainless steel

Environment

Residual heat removal system components are exposed to the following environments.

- air—indoor
- raw water
- treated water
- treated water > 270°F

Aging Effects Requiring Management

The following aging effects associated with the residual heat removal system require management.

- cracking
- cracking-fatigue
- fouling
- loss of material
- loss of material - wear

Aging Management Programs

The following aging management programs manage the aging effects for the residual heat removal components.

- Selective Leaching
- Service Water Integrity
- System Walkdown
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.2.2.1.2 Core Spray System

Materials

Core spray system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Core spray system components are exposed to the following environments.

- air—indoor
- treated water (int)

Aging Effects Requiring Management

The following aging effects associated with the core spray system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the core spray system components.

- System Walkdown
- Water Chemistry Control – BWR

3.2.2.1.3 Automatic Depressurization System

Materials

Automatic depressurization system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Automatic depressurization system components are exposed to the following environments.

- air—indoor
- steam > 220°F
- steam > 270°F
- treated water

Aging Effects Requiring Management

The following aging effects associated with the automatic depressurization system require management.

- cracking-fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the automatic depressurization system components.

- System Walkdown
- Water Chemistry Control – BWR

3.2.2.1.4 High Pressure Coolant Injection System

Materials

High pressure coolant injection system components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- glass
- stainless steel

Environment

High pressure coolant injection system components are exposed to the following environments.

- air—indoor
- air—outdoor
- air—untreated
- lube oil
- treated water
- treated water > 140°F
- steam > 220°F
- steam > 270°F

Aging Effects Requiring Management

The following aging effects associated with the high pressure coolant injection system require management.

- cracking
- cracking-fatigue
- fouling
- loss of material
- loss of material—wear

Aging Management Programs

The following aging management programs manage the aging effects for the high pressure coolant injection system components.

- Flow-Accelerated Corrosion
- Heat Exchanger Monitoring
- Oil Analysis
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- System Walkdown
- Water Chemistry Control – BWR

3.2.2.1.5 Reactor Core Isolation Cooling System

Materials

Reactor core isolation cooling system components are constructed of the following materials.

- aluminum
- carbon steel

- copper alloy > 15% zinc
- gray cast iron
- glass
- stainless steel

Environment

Reactor core isolation cooling system components are exposed to the following environments.

- air—indoor
- air—outdoor
- lube oil
- treated water
- treated water > 140°F
- treated water > 220°F
- sand/concrete
- steam > 220°F
- steam > 270°F

Aging Effects Requiring Management

The following aging effects associated with the reactor core isolation cooling system require management.

- cracking
- cracking-fatigue
- fouling
- loss of material
- loss of material—wear

Aging Management Programs

The following aging management programs manage the aging effects for the reactor core isolation cooling system components.

- Flow-Accelerated Corrosion
- Heat Exchanger Monitoring
- Oil Analysis
- Selective Leaching
- Water Chemistry Control – Auxiliary Systems
- Water Chemistry Control – BWR
- System Walkdown

3.2.2.1.6 Standby Gas Treatment System

Materials

Standby gas treatment system components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- fiberglass
- stainless steel

Environment

Standby gas treatment system components are exposed to the following environments.

- air—indoor
- raw water
- soil

Aging Effects Requiring Management

The following aging effects associated with the standby gas treatment system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the standby gas treatment system components.

- Buried Piping Inspection
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- System Walkdown

3.2.2.1.7 Primary Containment Penetrations

Materials

Primary containment penetration components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Primary containment penetration components are exposed to the following environments.

- air—indoor
- gas
- treated water
- untreated water

Aging Effects Requiring Management

The following aging effects associated with the primary containment penetrations require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the primary containment penetration components.

- Containment Leak Rate
- System Walkdown
- Water Chemistry Control – BWR

3.2.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.2.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the VYNPS approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.2.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

3.2.2.2.2 Cracking due to Underclad Cracking

This item covers underclad cracking of cladding on PWR steel pump casings. VYNPS is a BWR and does not have charging pumps or steel pump casings with stainless steel cladding. This item is not applicable to VYNPS.

3.2.2.2.3 Loss of Material due to Pitting and Crevice Corrosion

1. Loss of material due to pitting and crevice corrosion for internal surfaces of stainless steel piping and components in ESF systems exposed to treated water is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components including areas of stagnant flow.

2. At VYNPS there are no stainless steel ESF components that are in contact with a soil environment. This item is therefore not applicable.

3. Loss of material from pitting and crevice corrosion for BWR stainless steel and aluminum piping and piping components exposed to treated water at VYNPS is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components including areas of stagnant flow.

4. Loss of material from pitting and crevice corrosion could occur for copper alloy and stainless steel piping and components in ESF systems that are exposed to lubricating oil. Loss of material is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

5. Loss of material from pitting and crevice corrosion could occur for partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. At VYNPS there are no outdoor stainless steel tanks in the ESF systems. This item is therefore not applicable.

6. Loss of material from pitting and crevice corrosion for BWR stainless steel piping and piping components internally exposed to condensation at VYNPS is managed by the Periodic Surveillance and Preventive Maintenance Program. This program uses visual and other NDE techniques to manage loss of material for these components.

3.2.2.2.4 Reduction of Heat Transfer due to Fouling

1. Reduction of heat transfer due to fouling for copper alloy heat exchanger tubes exposed to lubricating oil in ESF systems at VYNPS is managed by the Oil Analysis Program. There are no stainless steel or steel heat exchanger tubes exposed to lubricating oil in the ESF systems. This program includes periodic

sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to fouling. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that fouling has not and will not affect the intended functions of these components.

2. Reduction of heat transfer due to fouling for stainless steel heat exchanger tubes exposed to treated water in ESF systems at VYNPS is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

3.2.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

At VYNPS there are no elastomeric components in the ESF systems. This item is not applicable to VYNPS.

3.2.2.2.6 Loss of Material due to Erosion

This discussion refers to stainless steel high pressure safety injection (HPSI) pump miniflow recirculation orifice exposed to treated borated water. VYNPS is a BWR and has no HPSI pump miniflow orifice and as such this item is not applicable.

3.2.2.2.7 Loss of Material due to General Corrosion and Fouling.

This item refers to loss of material due to general corrosion and fouling occurring for steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air-indoor uncontrolled (internal). At VYNPS the spray nozzles are copper alloy and are not subject to loss of material due to general corrosion in an indoor air environment. There are also no orifices in ECCS systems exposed to an indoor air environment (internal).

3.2.2.2.8 Loss of Material due to General, Pitting, and Crevice Corrosion

1. Loss of material due to general, pitting and crevice corrosion for BWR steel piping and components in ESF systems exposed to treated water is managed at VYNPS by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

2. The loss of material due to general, pitting and crevice corrosion for internal surfaces of primary containment penetration steel piping and components exposed to treated water is managed at VYNPS by the Water Chemistry Control –

BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components including areas of stagnant flow.

3. Loss of material due to general, pitting and crevice corrosion for steel piping and components in ESF systems exposed to lubricating oil is managed by the Oil Analysis Program. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

3.2.2.2.9 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC)

Loss of material due to general, pitting, crevice, and MIC for steel (with or without coating or wrapping) piping and piping components buried in soil in ESF systems at VYNPS is managed by the Buried Piping Inspection Program. There are no buried tanks in the ESF systems. The Buried Piping Inspection Program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within 10 years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period.

3.2.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of VYNPS quality assurance procedures and administrative controls for aging management programs.

3.2.2.3 Time-Limited Aging Analyses

The only time-limited aging analysis (TLAA) identified for the ESF systems components is metal fatigue. This is evaluated in Section 4.3.

3.2.3 Conclusion

The ESF system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage the effects of aging on ESF components are identified in Section 3.2.2.1 and in the following tables. A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the ESF components will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.2.1
Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-1	Steel and stainless steel 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	Fatigue is a TLAA. See Section 3.2.2.2.1
3.2.1-2	PWR only				
3.2.1-3	Stainless steel containment isolation piping and components internal surfaces exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in stainless steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.2.2.2.3 item 1.
3.2.1-4	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. No stainless steel components in the ESF systems are exposed to soil. See Section 3.2.2.2.3 item 2.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-5	Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in stainless steel and aluminum components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.2.2.2.3 item 3.
3.2.1-6	Stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in stainless and copper alloy components. See Section 3.2.2.2.3 item 4.
3.2.1-7	Partially encased stainless steel tanks with breached moisture barrier exposed to raw water	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated for pitting and crevice corrosion of tank bottoms because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes, plant specific	Not applicable. There are no outdoor stainless steel tanks in the ESF systems. See Section 3.2.2.2.3 item 5.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-8	Stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The Periodic Surveillance and Preventive Maintenance Program manages loss of material for internal stainless steel surfaces exposed to condensation in ESF systems. See Section 3.2.2.2.3 item 6.
3.2.1-9	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages reduction of heat transfer in copper alloy heat exchanger tubes. There are no stainless steel or steel heat exchanger tubes exposed to lube oil in the ESF systems. See Section 3.2.2.2.4 item 1.
3.2.1-10	Stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The reduction of heat transfer in stainless steel heat exchanger tubes is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.2.2.2.4 item 2.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-11	Elastomer seals and components in standby gas treatment system exposed to air - indoor uncontrolled	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific 5)	Not applicable. There are no elastomeric components in the ESF systems. See Section 3.2.2.2.5.
3.2.1-12	PWR only				
3.2.1-13	Steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled (internal)	Loss of material due to general corrosion and fouling	A plant-specific aging management program is to be evaluated.	Yes, plant specific	Not applicable. There are no steel nozzles or flow orifices internally exposed to air in the drywell and suppression chamber spray flow paths. See Section 3.2.2.2.7.
3.2.1-14	Steel piping, piping components, and piping elements exposed to treated water	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	Consistent with NUREG-1801. The loss of material in steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.2.2.2.8 item 1.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-15	Steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated water	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	Consistent with NUREG-1801. The loss of material in steel containment isolation components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.2.2.2.8 item 2.
3.2.1-16	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program, with exceptions to NUREG-1801, manages loss of material in steel components. See Section 3.2.2.2.8 item 3.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-17	Steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil	Loss of material due to general, pitting, crevice, and microbiologically-influenced 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	Consistent with NUREG-1801. The loss of material of buried steel piping will be managed by the Buried Piping Inspection Program. There are no buried tanks in the ESF systems. See Section 3.2.2.2.9
3.2.1-18	Stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	The Water Chemistry Control – BWR Program manages cracking of stainless steel components. None of the ESF system components are within the scope of the BWR Stress Corrosion Cracking Program (all relevant components are included in the reactor vessel, internals and reactor coolant systems). The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-19	Steel piping, piping components, and piping elements exposed to steam or treated water	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Consistent with NUREG-1801. The Flow-Accelerated Corrosion Program manages wall thinning in steel piping.
3.2.1-20	Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated water (borated or unborated) >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable. There are no CASS components in the ESF systems.
3.2.1-21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable. High strength steel closure bolting is not used in ESF systems.
3.2.1-22	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity	No	Not applicable. All steel closure bolting exposed to air (external) is conservatively assumed to be exposed to indoor uncontrolled air (see line Item 3.2.1-23).

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-23	Steel bolting and closure bolting exposed to air – outdoor (external), or air – indoor uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	The System Walkdown Program manages loss of material for steel bolting through the use of visual inspections that are performed at least once per refueling cycle. (continued below)

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
	Steel closure bolting exposed to air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Not applicable. Loss of preload is a design driven effect and not an aging effect requiring management. Bolting at VYNPS is standard grade B7 carbon steel, or similar material, except in rare specialized applications such as where stainless steel bolting is utilized. Loss of preload due to stress relaxation (creep) would only be a concern in very high temperature applications (> 700°F) as stated in the ASME Code, Section II, Part D, Table 4. No VYNPS bolting operates at >700°F. Therefore, loss of preload due to stress relaxation (creep) is not an applicable aging effect for ESF systems. Other issues that may result in pressure boundary joint leakage are improper design or maintenance issues. Improper bolting application (design) and maintenance issues are current plant operational concerns and not related to aging effects or mechanisms that require management during the period of extended operation.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-24					To address these bolting operational concerns, VYNPS has taken actions to address NUREG–1339, "Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants." These actions include implementation of good bolting practices in accordance with EPRI NP-5067, Good Bolting Practices. Proper joint preparation and make-up in accordance with industry standards is expected to preclude loss of preload. This has been confirmed by operating experience at VYNPS.
3.2.1-25	Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages cracking for stainless steel components exposed to closed cycle cooling water > 140°F. The only components to which this NUREG-1801 line item applies are the reactor recirculation pump cover thermal barriers listed in Table 3.1.2-3.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-26	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable. Steel containment isolation components exposed to closed cycle cooling water are all part of other safety systems that are evaluated separately.
3.2.1-27	Steel heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for steel components.
3.2.1-28	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for stainless steel components.
3.2.1-29	Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. There are no copper alloy components exposed to closed cycle cooling water in the ESF systems.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-30	Stainless steel and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages reduction of heat transfer for stainless steel heat exchanger tubes There are no copper alloy components exposed to closed cycle cooling water in the ESF systems.
3.2.1-31	External surfaces of steel components including ducting, piping, ducting closure bolting, and containment isolation piping external surfaces exposed to air - indoor uncontrolled (external); condensation (external) and air - outdoor (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The System Walkdown Program manages loss of material for external surfaces of steel components.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-32	Steel piping and ducting components and internal surfaces exposed to air – indoor uncontrolled (Internal)	Loss of material due to general corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	The loss of material from the internal surfaces of steel components exposed to air-indoor is managed by the System Walkdown, Periodic Surveillance and Preventive Maintenance, Fire Protection,Fire Water System, and One-Time Inspection Programs. The System Walkdown Program manages loss of material for external carbon steel components by visual inspection of external surfaces. For systems where internal carbon steel surfaces are exposed to the same environment as external surfaces, external surfaces condition will be representative of internal surfaces. Thus, loss of material on internal carbon steel surfaces is also managed by the System Walkdown Program.
3.2.1-33	Steel encapsulation components exposed to air-indoor uncontrolled (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable. The ESF systems include no steel encapsulation components.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-34	Steel piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	The Periodic Surveillance and Preventive Maintenance Program manages loss of material for steel components exposed internally to condensation (untreated air in the high pressure coolant injection system)
3.2.1-35	Steel containment isolation piping and components internal surfaces exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	The Containment Leak Rate programs manages loss of material for steel containment isolation components exposed to untreated (raw) water.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-36	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801 for heat exchanger components of the residual heat removal system and some piping components of the standby gas treatment system. The Service Water Integrity Program manages loss of material for carbon steel components exposed to raw water. For other piping components of the standby gas treatment system, the Periodic Surveillance and Preventive Maintenance manages loss of material for carbon steel components exposed to raw water.
3.2.1-37	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System	No	The Periodic Surveillance and Preventive Maintenance Program manages loss of material for stainless steel piping components exposed to raw water.
3.2.1-38	Stainless steel containment isolation piping and components internal surfaces exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no stainless steel containment isolation components exposed to raw water in the ESF systems.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-39	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Service Water Integrity Program manages loss of material for stainless steel heat exchanger components exposed to raw water.
3.2.1-40	Steel and stainless steel heat exchanger tubes (serviced by open-cycle cooling water) exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Service Water Integrity Program manages loss of material for stainless steel heat exchanger tubes exposed to raw water. There are no steel heat exchanger tubes exposed to raw water in the ESF systems.
3.2.1-41	Copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no copper alloy > 15% zinc components exposed to closed cycle cooling water in the ESF systems.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-42	Gray cast iron piping, piping components, piping elements exposed to closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material due to selective leaching for gray cast iron components exposed to closed cycle cooling water.
3.2.1-43	Gray cast iron piping, piping components, and piping elements exposed to soil	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no gray cast iron components exposed to soil in the ESF systems.
3.2.1-44	Gray cast iron motor cooler exposed to treated water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material due to selective leaching for gray cast iron components exposed to treated water.
3.2.1-45	PWR only				
3.2.1-46	PWR only				
3.2.1-47	PWR only				
3.2.1-48	PWR only				
3.2.1-49	PWR only				

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-50	Aluminum piping, piping components, and piping elements exposed to air-indoor uncontrolled (internal/external)	None	None	NA - No AEM or AMP	There are no aluminum components exposed to indoor air in the ESF systems. The only components to which this NUREG-1801 line item applies are in the auxiliary systems.
3.2.1-51	Galvanized steel ducting exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. Galvanized steel surfaces are evaluated as steel for the ESF systems.
3.2.1-52	Glass piping elements exposed to air – indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.2.1-53	Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801 for steel and copper alloy components. There are no nickel alloy components exposed to air in the ESF systems.

Table 3.2.1: Engineered Safety Features, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-54	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. There are no steel components of the ESF systems in indoor controlled air environments. All indoor air environments are conservatively considered to be uncontrolled.
3.2.1-55	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Not applicable. There are no steel or stainless steel components in ESF systems embedded in concrete.
3.2.1-56	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801 for stainless steel components exposed to gas in the ESF systems and for steel components exposed to gas in the reactor coolant system. There are no copper alloy components exposed to gas in the ESF systems.
3.2.1-57	PWR only				

Notes for Tables 3.2.2-1 through 3.2.2-7

Generic notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific notes

201. The environment of air - untreated (int) includes moisture with the potential for condensation on the internal surfaces of the components.

202. This treated water environment is the equivalent of the NUREG-1801 defined closed cycle cooling water.

203. The treated water in the reactor core isolation cooling system sight glass may be slightly greater than 140°F but will not lead to degradation of the glass.

Table 3.2.2-1
Residual Heat Removal (RHR) System
Summary of Aging Management Evaluation

Table 3.2.2-1: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Cyclone separator	Pressure boundary, Filtration	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Cyclone separator	Pressure boundary, Filtration	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Cyclone separator	Pressure boundary, Filtration	Stainless steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Cyclone separator	Pressure boundary, Filtration	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-1: Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-8 (E-18)	3.2.1-36	B
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	V.D2-7 (E-17)	3.2.1-27	B
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	V.D1-20 (EP-52)	3.2.1-42	C, 202
Heat exchanger (tubes)	Heat transfer	Stainless steel	Raw water (int)	Fouling	Service Water Integrity	V.D2-12 (E-21)	3.2.1-40	B

Table 3.2.2-1: Residual Heat Removal System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (ext)	Fouling	Water Chemistry Control – Closed Cooling Water	V.D2-10 (EP-35)	3.2.1-30	B
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water > 270°F (ext)	Fouling	Water Chemistry Control – BWR	V.D2-13 (EP-34)	3.2.1-10	A
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water > 270°F (int)	Fouling	Water Chemistry Control – BWR	V.D2-13 (EP-34)	3.2.1-10	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Raw water (int)	Cracking	Service Water Integrity			H
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-6 (E-20)	3.2.1-39	B
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	V.D2-5 (E-19)	3.2.1-28	B
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270°F (ext)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270°F (ext)	Cracking-fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C

Table 3.2.2-1: Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270°F (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270°F (ext)	Loss of material-wear	Service Water Integrity			H
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C
Nozzle	Pressure boundary, Flow control	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Nozzle	Pressure boundary, Flow control	Copper alloy > 15% Zn	Air - indoor (int)	None	None			G
Orifice	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-1: Residual Heat Removal System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Orifice	Pressure boundary, Flow control	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E

Table 3.2.2-1: Residual Heat Removal System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Pump casing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Pump casing	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Pump casing	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Tank	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-1: Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Tank	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tank	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Thermowell	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Thermowell	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Thermowell	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Thermowell	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-1: Residual Heat Removal System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-2
Core Spray (CS) System
Summary of Aging Management Evaluation

Table 3.2.2-2: Core Spray System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Cyclone separator	Pressure boundary Filtration	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Cyclone separator	Pressure boundary Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Flow nozzle	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Orifice	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-2: Core Spray System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Pump casing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A

Table 3.2.2-2: Core Spray System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-3
Automatic Depressurization System (ADS)
Summary of Aging Management Evaluation

Table 3.2.2-3: Automatic Depressurization System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Orifice	Pressure boundary and flow control	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Orifice	Pressure boundary and flow control	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			G
Orifice	Pressure boundary and flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A

Table 3.2.2-3: Automatic Depressurization System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			G
Piping	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			G
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-3: Automatic Depressurization System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			G
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-4
High Pressure Coolant Injection (HPCI) System
Summary of Aging Management Evaluation

Table 3.2.2-4: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bearing housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Bearing housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	V.E-1 (EP-1)	3.2.1-23	E
Bolting	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	C
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Bolting	Pressure boundary	Stainless steel	Air - outdoor (ext)	Loss of material	System Walkdown			G
Bolting	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	C
Drain pot	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Drain pot	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Drain pot	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Fan housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Fan housing	Pressure boundary	Carbon steel	Untreated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-17 (E-27)	3.2.1-34	E, 201
Filter housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Gear box	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Gear box	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Governor housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Governor housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Lube oil (ext)	Fouling	Oil Analysis	V.D2-9 (EP-47)	3.2.1-9	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water (int)	Fouling	Water Chemistry Control – BWR	VIII.E-10 (SP-58)	3.4.1-9	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material-wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.E3-11 (AP-32)	3.3.1-84	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (ext)	Loss of material -wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (ext)	Loss of material	Selective Leaching	VII.E3-11 (AP-32)	3.3.1-84	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (ext)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (ext)	Loss of material-wear	Heat Exchanger Monitoring			H
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Orifice	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			G
Orifice	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Orifice	Pressure boundary Flow control	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Orifice	Pressure boundary Flow control	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Orifice	Pressure boundary Flow control	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Orifice	Pressure boundary Flow control	Stainless steel	Lube oil (int)	Cracking	Oil Analysis			H

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary Flow control	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1-24 (EP-51)	3.2.1-6	E
Orifice	Pressure boundary Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	V.D2-29 (E-37)	3.2.1-18	E
Orifice	Pressure boundary Flow control	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-31 (E-07)	3.2.1-19	A
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Piping	Pressure boundary	Carbon steel	Untreated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-17 (E-27)	3.2.1-34	E, 201
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	System Walkdown			G
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Pump casing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	V.F-7 (EP-16)	3.2.1-52	A
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Steam trap	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Steam trap	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Steam trap	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-31 (E-07)	3.2.1-19	A
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Strainer housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Strainer housing	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Tank	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Thermowell	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Thermowell	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Thermowell	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Tubing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis			H

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1-24 (EP-51)	3.2.1-6	E
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			G
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Turbine casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Turbine casing	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Turbine casing	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	V.E-8 (E-45)	3.2.1-31	A

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-31 (E-07)	3.2.1-19	A
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.E3-11 (AP-32)	3.3.1-84	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C

Table 3.2.2-4: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis			H
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1-24 (EP-51)	3.2.1-6	E
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-5
Reactor Core Isolation Cooling (RCIC) System
Summary of Aging Management Evaluation

Table 3.2.2-5: Reactor Core Isolation Cooling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	V.E-1 (EP-1)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Bolting	Pressure boundary	Stainless steel	Air - outdoor (ext)	Loss of material	System Walkdown			G
Condenser	Pressure boundary	Gray cast iron	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Condenser	Pressure boundary	Gray cast iron	Treated water > 140°F (int)	Loss of material	Selective Leaching	V.D1-13 (E-43)	3.2.1-44	C
Condenser	Pressure boundary	Gray cast iron	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Drain pot	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Drain pot	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Drain pot	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Filter housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Flow indicator	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Flow indicator	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Flow indicator	Pressure boundary	Glass	Air - indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	A
Flow indicator	Pressure boundary	Glass	Lube oil (int)	None	None	V.F-7 (EP-16)	3.2.1-52	A
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Treated water > 140°F (int)	Loss of material	Selective Leaching	V.D1-13 (E-43)	3.2.1-44	C

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Heat exchanger (shell)	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Heat exchanger (shell)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Lube oil (ext)	Fouling	Oil Analysis	V.D2-9 (EP-47)	3.2.1-9	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water (int)	Fouling	Water Chemistry Control – BWR	VIII.E-10 (SP-58)	3.4.1-9	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material - wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.E3-11 (AP-32)	3.3.1-84	C

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Orifice	Pressure boundary, Flow control	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Orifice	Pressure boundary, Flow control	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Orifice	Pressure boundary, Flow control	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Orifice	Pressure boundary, Flow control	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Orifice	Pressure boundary, Flow control	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			G
Orifice	Pressure boundary, Flow control	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Orifice	Pressure boundary, Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-34 (E-09)	3.2.1-19	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Air - outdoor (ext)	Loss of material	System Walkdown			G
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Pump casing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Pump casing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Sight glass	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Sight glass	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.E3-11 (AP-32)	3.3.1-84	C

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Sight glass	Pressure boundary	Glass	Air - indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	V.F-7 (EP-16)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Treated water > 140°F (int)	None	None	V.F-10 (EP-29)	3.2.1-52	A, 203
Steam heater	Pressure boundary	Aluminum	Steam > 220°F (int)	Loss of material	Heat Exchanger Monitoring			G
Steam heater	Pressure boundary	Aluminum	Steam > 220°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			G
Steam heater	Pressure boundary	Aluminum	Steam > 270°F (int)	Cracking-fatigue	Heat Exchanger Monitoring			G
Steam heater	Pressure boundary	Aluminum	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-19 (EP-26)	3.2.1-5	A
Steam heater	Pressure boundary	Aluminum	Treated water (ext)	Loss of material-wear	Heat Exchanger Monitoring			H
Steam trap	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-34 (E-09)	3.2.1-19	A
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Strainer	Filtration	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Strainer	Filtration	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			G
Strainer	Filtration	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Strainer housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Strainer housing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Tank	Pressure boundary	Aluminum	Air - outdoor (ext)	None	None			G
Tank	Pressure boundary	Aluminum	Sand/concrete (ext)	None	None			G
Tank	Pressure boundary	Aluminum	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-19 (EP-26)	3.2.1-5	A
Tank	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Thermowell	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			G
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Turbine casing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Turbine casing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Turbine casing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	V.E-8 (E-45)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E

Table 3.2.2-5: Reactor Core Isolation Cooling System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-34 (E-09)	3.2.1-19	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	V.D2-32 (E-10)	3.2.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A

Table 3.2.2-6
Standby Gas Treatment (SBGT) System
Summary of Aging Management Evaluation

Table 3.2.2-6: Standby Gas Treatment System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Duct	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Duct	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Fan housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Fan housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Filter	Filtration	Fiberglass	Air - indoor (ext)	None	None			F
Filter	Filtration	Fiberglass	Air - indoor (int)	None	None			F
Filter	Filtration	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A

Table 3.2.2-6: Standby Gas Treatment System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Filter	Filtration	Stainless steel	Air - indoor (int)	None	None			G
Filter housing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Filter housing	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Filter unit housing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Filter unit housing	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Orifice	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Orifice	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	One-Time Inspection	V.B-1 (E-25)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-8 (E-18)	3.2.1-36	E

Table 3.2.2-6: Standby Gas Treatment System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping Inspection	V.B-9 (E-42)	3.2.1-17	B
Piping	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Piping	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Thermowell	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Thermowell	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Tubing	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D1-25 (EP-55)	3.2.1-37	E
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A

Table 3.2.2-6: Standby Gas Treatment System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-8 (E-18)	3.2.1-36	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (int)	None	None			G

Table 3.2.2-7
Primary Containment Penetrations (PCP)
Summary of Aging Management Evaluation

Table 3.2.2-7: Primary Containment Penetrations

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.C-1 (E-35)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C-6 (E-31)	3.2.1-15	A
Piping	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Containment Leak Rate	V.C-5 (E-22)	3.2.1-35	E
Piping	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Piping	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Piping	Pressure boundary	Stainless steel	Gas (int)	None	None	V.F-15 (EP-22)	3.2.1-56	A

Table 3.2.2-7: Primary Containment Penetrations (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C-4 (E-33)	3.2.1-3	A
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	V.C-1 (E-35)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C-6 (E-31)	3.2.1-15	A
Valve body	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Containment Leak Rate	V.C-5 (E-22)	3.2.1-35	E
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	V.F-15 (EP-22)	3.2.1-56	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C-4 (E-33)	3.2.1-3	A

3.3 AUXILIARY SYSTEMS

3.3.1 Introduction

This section provides the results of the aging management reviews for those components in the auxiliary systems which are subject to aging management review. The following systems are addressed in this section (system descriptions are available in the referenced sections).

- standby liquid control system (Section 2.3.3.1)
- service water systems (Section 2.3.3.2)
- reactor building closed cooling water system (Section 2.3.3.3)
- emergency diesel generator system (Section 2.3.3.4)
- fuel pool cooling systems (Section 2.3.3.5)
- fuel oil system (Section 2.3.3.6)
- instrument air system (Section 2.3.3.7)
- fire protection—water system (Section 2.3.3.8)
- fire protection—carbon dioxide system (Section 2.3.3.9)
- heating, ventilation and air conditioning systems (Section 2.3.3.10)
- primary containment atmosphere control and containment atmosphere dilution systems (Section 2.3.3.11)
- John Deere diesel (Section 2.3.3.12)
- miscellaneous systems in scope for 10 CFR 54.4(a)(2) (Section 2.3.3.13)

Table 3.3.1, Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the auxiliary systems component group. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.3.2 Results

The following system tables summarize the results of aging management reviews and the NUREG-1801 comparison for auxiliary systems.

- Table 3.3.2-1 Standby Liquid Control (SLC) System — Summary of Aging Management Evaluation

- Table 3.3.2-2 Service Water (SW) Systems — Summary of Aging Management Evaluation

- Table 3.3.2-3 Reactor Building Closed Cooling Water (RBCCW) System — Summary of Aging Management Evaluation

- Table 3.3.2-4 Emergency Diesel Generator (EDG) System — Summary of Aging Management Evaluation

- Table 3.3.2-5 Fuel Pool Cooling (FPC) Systems — Summary of Aging Management Evaluation
- Table 3.3.2-6 Fuel Oil (FO) System — Summary of Aging Management Evaluation
- Table 3.3.2-7 Instrument Air (IA) System — Summary of Aging Management Evaluation
- Table 3.3.2-8 Fire Protection (FP)—Water System — Summary of Aging Management Evaluation
- Table 3.3.2-9 Fire Protection (FP)—CO_2 System — Summary of Aging Management Evaluation
- Table 3.3.2-10 Heating, Ventilation and Air Conditioning (HVAC) Systems — Summary of Aging Management Evaluation
- Table 3.3.2-11 Primary Containment Atmosphere Control (PCAC) and Containment Atmosphere Dilution (CAD) Systems—Summary of Aging Management Evaluation
- Table 3.3.2-12 John Deere Diesel (JDD)— Summary of Aging Management Evaluation

Miscellaneous Systems in Scope for 10 CFR 54.4(a)(2)

- Table 3.3.2-13-1 Augmented Offgas (AOG) System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-13-2 Condensate (C) System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-13-3 Containment Air Dilution (CAD), Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-13-4 Condensate Demineralizer (CD) System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-13-5 Control Rod Drive (CRD) System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-13-41 Sampling (SPL) System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-13-42 Service Water (SW) System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

3.3.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for the auxiliary systems. Programs are described in Appendix B. Further details are provided in the system tables.

3.3.2.1.1 Standby Liquid Control System

Materials

Standby liquid control system components are constructed of the following materials.

- carbon steel
- glass
- stainless steel

Environment

Standby liquid control system components are exposed to the following environments.

- air—indoor
- concrete
- lube oil
- sodium pentaborate solution

Aging Effects Requiring Management

The following aging effects associated with the standby liquid control system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the standby liquid control system components.

- Oil Analysis

- System Walkdown
- Water Chemistry Control – BWR

3.3.2.1.2 Service Water Systems

Materials

Service water systems components are constructed of the following materials.

- carbon steel
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- stainless steel

Environment

Service water systems components are exposed to the following environments.

- air—indoor
- air—outdoor
- condensation
- lube oil
- raw water
- soil
- treated water

Aging Effects Requiring Management

The following aging effects associated with the service water systems require management.

- fouling
- loss of material
- loss of material—wear

Aging Management Programs

The following aging management programs manage the effects of aging on service water systems components.

- Buried Piping Inspection
- Oil Analysis
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- System Walkdown
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.3 Reactor Building Closed Cooling Water System

Materials

Reactor building closed cooling water system components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- stainless steel

Environment

Reactor building closed cooling water system components are exposed to the following environments.

- air—indoor
- condensation
- lube oil
- treated water
- treated water > 140°F
- untreated water

Aging Effects Requiring Management

The following aging effects associated with the reactor building closed cooling water system require management.

- cracking
- loss of material
- loss of material—wear

Aging Management Programs

The following aging management programs manage the effects of aging on reactor building closed cooling water system components.

- Heat Exchanger Monitoring
- Oil Analysis
- Selective Leaching
- System Walkdown
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.4 Emergency Diesel Generator System

Materials

Emergency diesel generator system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- copper alloy > 15% zinc (inhibited)
- glass
- gray cast iron
- stainless steel

Environment

Emergency diesel generator system components are exposed to the following environments.

- air—indoor
- air—outdoor
- air—untreated
- exhaust gas
- lube oil
- raw water
- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the emergency diesel generator system require management.

- cracking
- cracking-fatigue
- fouling
- loss of material
- loss of material—wear

Aging Management Programs

The following aging management programs manage the effects of aging on emergency diesel generator system components.

- Oil Analysis

- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- System Walkdown
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.5 Fuel Pool Cooling Systems

Materials

Fuel pool cooling systems components are constructed of the following materials.

- aluminum/boron carbide
- carbon steel
- stainless steel

Environment

Fuel pool cooling systems components are exposed to the following environments.

- air—indoor
- raw water
- treated water

Aging Effects Requiring Management

The following aging effects associated with the fuel pool cooling systems require management.

- cracking
- fouling
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on fuel pool cooling systems components.

- Service Water Integrity
- System Walkdown
- Water Chemistry Control – BWR

3.3.2.1.6 Fuel Oil System

Materials

Fuel oil system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy > 15% zinc
- copper alloy < 15% zinc
- fiberglass
- glass
- stainless steel

Environment

Fuel oil system components are exposed to the following environments.

- air—indoor
- air—outdoor
- concrete
- fuel oil
- interstitial fluid (brine)
- soil

Aging Effects Requiring Management

The following aging effects associated with the fuel oil system require management.

- cracking
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on fuel oil system components.

- Buried Piping Inspection
- Diesel Fuel Monitoring
- System Walkdown

3.3.2.1.7 Instrument Air System

Materials

Instrument air system components are constructed of the following materials.

- carbon steel

- copper alloy > 15% zinc
- stainless steel

Environment

Instrument air system components are exposed to the following environments.

- air—indoor
- air—treated
- nitrogen

Aging Effects Requiring Management

The following aging effects associated with the instrument air system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on instrument air system components.

- Instrument Air Quality
- System Walkdown

3.3.2.1.8 Fire Protection—Water System

Materials

Fire protection—water system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy > 15% zinc
- copper alloy < 15% zinc
- gray cast iron
- stainless steel

Environment

Fire protection—water system components are exposed to the following environments.

- air—indoor
- air—outdoor
- exhaust gas
- fire protection foam

- lube oil
- raw water
- soil
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the fire protection—water system require management.

- cracking
- cracking—fatigue
- fouling
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on fire protection—water system components.

- Buried Piping Inspection
- Fire Protection
- Fire Water System
- Oil Analysis
- Selective Leaching
- System Walkdown

3.3.2.1.9 Fire Protection—Carbon Dioxide System

Materials

Fire protection—CO_2 system components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- copper alloy < 15% zinc
- stainless steel

Environment

Fire protection—CO_2 system components are exposed to the following environments.

- air—indoor
- air—outdoor
- gas

Aging Effects Requiring Management

The following aging effects associated with the fire protection—CO_2 system require management.

- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on fire protection—CO_2 system components.

- System Walkdown

3.3.2.1.10 Heating, Ventilation and Air Conditioning Systems

Materials

Heating, ventilation and air conditioning systems components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- elastomer
- fiberglass
- glass
- gray cast iron
- stainless steel

Environment

Heating, ventilation and air conditioning systems components are exposed to the following environments.

- air—indoor
- air—outdoor
- condensation
- freon
- raw water
- treated water
- steam > 220°F

Aging Effects Requiring Management

The following aging effects associated with the heating, ventilation and air conditioning systems require management.

- change in material properties
- cracking
- cracking—fatigue
- fouling
- loss of material
- loss of material—wear

Aging Management Programs

The following aging management programs manage the effects of aging on heating, ventilation and air conditioning systems components.

- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- System Walkdown
- Water Chemistry Control – Auxiliary Systems
- Water Chemistry Control – Closed Cooling Water

3.3.2.1.11 Primary Containment Atmosphere Control and Containment Atmosphere Dilution Systems

Materials

Primary containment atmosphere control and containment atmosphere dilution systems components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Primary containment atmosphere control and containment atmosphere dilution systems components are exposed to the following environments.

- air—indoor
- treated water
- treated water > 482°F
- silicone

Aging Effects Requiring Management

The following aging effects associated with the primary containment atmosphere control and containment atmosphere dilution systems require management.

- cracking
- cracking—fatigue
- fouling
- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the primary containment atmosphere control and containment atmosphere dilution systems components.

- Periodic Surveillance and Preventive Maintenance
- System Walkdown
- Water Chemistry Control – BWR

3.3.2.1.12 John Deere Diesel

Materials

John Deere diesel components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc
- copper alloy < 15% zinc
- stainless steel

Environment

John Deere diesel components are exposed to the following environments.

- air - indoor
- air - outdoor
- exhaust gas
- lube oil
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the John Deere diesel require management.

- cracking—fatigue
- fouling

- loss of material
- loss of material—wear

Aging Management Programs

The following aging management programs manage the effects of aging on John Deere diesel components.

- Oil Analysis
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- System Walkdown
- Water Chemistry Control – Auxiliary Systems

3.3.2.1.13 Miscellaneous Systems in Scope for 10 CFR 54.4(a)(2)

The following lists encompass materials, environments, aging effects requiring management, and aging management programs for the series 3.3.2-13-xx tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- carbon steel
- copper alloy < 15% zinc
- copper alloy > 15% zinc
- glass
- gray cast iron
- stainless steel

Environment

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- air—indoor
- air—outdoor
- condensation
- fuel oil
- lube oil
- raw water
- sodium pentaborate solution
- steam > 220°F
- steam > 270°F
- treated water

- treated water > 220°F
- treated water > 270°F
- untreated water

Aging Effects Requiring Management

The following aging effects associated with nonsafety-related components affecting safety-related systems require management.

- cracking
- cracking—fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on nonsafety-related components affecting safety-related systems.

- Diesel Fuel Monitoring
- Fire Water System
- Flow-Accelerated Corrosion
- Instrument Air Quality
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- System Walkdown
- Water Chemistry Control – Auxiliary Systems
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.3.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.3.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the VYNPS approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.3.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

3.3.2.2.2 Reduction of Heat Transfer due to Fouling

Reduction of heat transfer due to fouling for stainless steel heat exchanger tubes exposed to treated water is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

3.3.2.2.3 Cracking due to Stress Corrosion Cracking (SCC)

1. Cracking due to SCC can occur in the stainless steel piping, piping components, and piping elements of the BWR standby liquid control (SLC) system that are exposed to sodium pentaborate solution greater than 140°F. At VYNPS the sodium pentaborate solution in the SLC system does not exceed 140°F. Therefore cracking due to SCC is not an aging effect requiring management for the SLC system. This item is not applicable to VYNPS.

2. Cracking due to SCC in stainless steel heat exchanger components exposed to treated water greater than 140°F is an aging effect requiring management at VYNPS. There are no auxiliary system components at VYNPS with stainless steel cladding. For VYNPS auxiliary systems these stainless steel heat exchanger components are managed by the Water Chemistry Control – BWR Program. This program monitors parameters and contaminants to ensure they remain within the limits specified by the EPRI guidelines. The effectiveness of the Water Chemistry Control—BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program for managing cracking using visual and ultrasonic inspection techniques.

3. Cracking due to SCC in stainless steel diesel engine exhaust piping exposed to diesel exhaust is an aging effect requiring management at VYNPS. At VYNPS cracking of stainless steel exhaust piping in the emergency diesel generator system is managed by the Periodic Surveillance and Preventive Maintenance Program. This program uses visual and other NDE techniques to manage cracking of the piping. These inspections will manage the aging effect of cracking such that the intended function of the component will not be affected.

3.3.2.2.4 Cracking due to Stress Corrosion Cracking and Cyclic Loading

1. Cracking due to SCC and cyclic loading could occur in stainless steel PWR nonregenerative heat exchanger components exposed to treated borated water greater than 140°F in the chemical and volume control system. VYNPS is a BWR

and does not have a nonregenerative heat exchanger exposed to treated borated water. This item is not applicable to VYNPS.

2. Cracking due to SCC and cyclic loading could occur in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 140°F. VYNPS is a BWR and does not have a regenerative heat exchanger exposed to treated borated water. This item is not applicable to VYNPS.

3. Cracking due to SCC and cyclic loading could occur for the stainless steel pump casing for the PWR high-pressure pumps in the chemical and volume control system. VYNPS is a BWR and does not have a chemical and volume control system. This item is not applicable to VYNPS.

3.3.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

1. Cracking and change in material properties due to elastomer degradation in elastomer duct flexible connections of the heating, ventilation and air conditioning systems exposed to air-indoor are aging effects requiring management at VYNPS. These aging effects are managed by the Periodic Surveillance and Preventive Maintenance Program. This program includes visual inspections and physical manipulation of the flexible connections to confirm that the components are not experiencing any aging that would affect accomplishing their intended functions.

2. For the auxiliary systems at VYNPS, no credit is taken for any elastomer linings to prevent loss of material from the underlying carbon steel material such that the material is identified as carbon steel for the aging management review. This item is not applicable to VYNPS.

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material due to General Corrosion

Loss of material and cracking are aging effects requiring management for Boral spent fuel storage racks exposed to a treated water environment. These aging effects are managed by the Water Chemistry Control – BWR Program.

Reduction of neutron-absorbing capacity is insignificant and requires no aging management. The potential for aging effects due to sustained irradiation of Boral was previously evaluated by the staff (BNL-NUREG-25582, dated January 1979; NUREG-1787, VC Summer SER, paragraph 3.5.2.4.2, page 3-408) and determined to be insignificant. Plant operating experience with Boral coupons inspected in 1991 and 1996 is consistent with the staff's conclusion and an aging management program is not required.

3.3.2.2.7 Loss of Material due to General, Pitting, and Crevice Corrosion

1. Steel piping and components in auxiliary systems at VYNPS that are exposed to lubricating oil are managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

   VYNPS is a BWR with an inert containment atmosphere and as a result has no reactor coolant pump oil collection system.

2. VYNPS does not have a separate shutdown cooling system. Loss of material due to general, pitting, and crevice corrosion in carbon steel piping and components in other auxiliary systems exposed to treated water are managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control—BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

3. Loss of material due to general (steel only) pitting and crevice corrosion for carbon steel and stainless steel diesel exhaust piping and components exposed to diesel exhaust in the emergency diesel generator and John Deere diesel generator systems is managed by the Periodic Surveillance and Preventive Maintenance (PSPM) Program. This program uses visual and other NDE techniques to manage loss of material for these components. The carbon steel and stainless steel diesel exhaust piping and components in the fire protection system are managed by the Fire Protection Program. The Fire Protection Program uses visual inspections of diesel exhaust piping and components to manage loss of material. These inspections in the PSPM and fire protection programs will manage the aging effect of loss of material such that the intended function of the components will not be affected.

3.3.2.2.8 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC)

Loss of material due to general, pitting, crevice, and MIC for carbon steel (with or without coating or wrapping) piping and components buried in soil in the service water, fuel oil, and fire protection-water systems at VYNPS is managed by the Buried Piping Inspection Program. This program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within 10 years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period. This program will manage the aging effect of loss of material such that the intended function of the components will not be affected.

3.3.2.2.9 Loss of Material due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion and Fouling

1. Fouling is not an aging effect requiring management for the fuel oil system at VYNPS. Loss of material due to general, pitting, crevice, and MIC for carbon steel piping and components exposed to fuel oil is an aging effect requiring management at VYNPS and these components are managed by the Diesel Fuel Monitoring Program. This program includes sampling and monitoring of fuel oil quality to ensure they remain within the limits specified by the ASTM standards. Maintaining parameters within limits ensures that significant loss of material will not occur. Ultrasonic inspection of storage tank bottoms where water and contaminants accumulate will be performed to confirm the effectiveness of the Diesel Fuel Monitoring Program. In addition, operating experience at VYNPS has confirmed the effectiveness of this program in maintaining fuel oil quality within limits such that loss of material will not affect the intended functions of these components.

2. Loss of material due to general, pitting, crevice, MIC and fouling for carbon steel heat exchanger components exposed to lubricating oil are aging effects requiring management in the auxiliary systems at VYNPS, and is managed by theOil Analysis Program. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion or fouling. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion and fouling has not and will not affect the intended functions of these components.

3.3.2.2.10 Loss of Material due to Pitting and Crevice Corrosion

1. Loss of material due to pitting and crevice corrosion could occur in BWR and PWR steel piping with elastomer lining or stainless steel cladding that are exposed to treated water and treated borated water if the cladding or lining is degraded. For the auxiliary systems at VYNPS no credit is taken for any elastomer linings or stainless steel cladding to prevent loss of material from the underlying carbon steel material such that the material is identified as carbon steel for the aging management review. This item is not applicable to VYNPS.

2. In the auxiliary systems at VYNPS there are no aluminum components exposed to treated water. Loss of material due to pitting and crevice corrosion for stainless

steel piping and components, and for stainless steel heat exchanger components exposed to treated water in the auxiliary systems at VYNPS is managed by the Water Chemistry Control – BWR Program. The effectiveness of the program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3. Loss of material due to pitting and crevice corrosion for copper alloy components exposed to condensation (external) in the HVAC and other auxiliary systems is managed by the System Walkdown, Periodic Surveillance and Preventive Maintenance (PSPM), Service Water Integrity and Heat Exchanger Monitoring Programs. The sYstem Walkdown Program includes a periodic visual inspection. The PSPM, Service Water Integrity and Heat Exchanger Monitoring Programs include other NDE techniques to manage loss of material of the components. These inspections will manage the aging effect of loss of material such that the intended function of the components will not be affected.

4. Loss of material due to pitting and crevice corrosion for copper alloy components exposed to lubricating oil in auxiliary systems at VYNPS is managed by the Oil Analysis Program which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

5. Loss of material due to pitting and crevice corrosion could occur for HVAC aluminum piping, piping components, and piping elements and stainless steel ducting and components exposed to condensation. At VYNPS there are no aluminum components or stainless steel ducting exposed to condensation in the HVAC systems. However, this item can be applied to stainless steel components exposed to condensation, both internal and external, in other systems. The System Walkdown and Service Water Integrity Programs will manage loss of material in stainless steel components exposed externally to condensation. The Periodic Surveillance and Preventive Maintenance Program will manage loss of material in stainless steel components exposed internally or externally to condensation. These programs include a periodic visual inspection and the PSPM Program includes other NDE techniques to manage loss of material of the components.

6. Loss of material due to pitting and crevice corrosion could occur for copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation. At VYNPS there are no copper alloy components exposed to condensation in the Fire Protection systems. However, this item can be applied

to copper alloy components exposed to internal condensation in other systems. The Periodic Surveillance and Preventive Maintenance Program will manage loss of material in copper alloy components exposed internally to untreated air, which is equivalent to condensation, through the use of visual inspections or other NDE techniques.

The Instrument Air Quality Program will manage loss of material in copper alloy components exposed internally to treated air. The Instrument Air Quality Program maintains humidity and particulates within acceptable limits, thereby preserving the environment of treated air that is not conducive to corrosion. This is equivalent to the management of loss of material in steel and stainless steel components addressed in Item Numbers 3.3.1-53 and 54 respectively.

7. Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements exposed to soil. At VYNPS there are no stainless steel piping components exposed to soil in the auxiliary systems. However, loss of material due to pitting and crevice corrosion for stainless steel bolting buried in soil in the fire protection-water systems at VYNPS is managed by the Buried Piping Inspection Program. This program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the buried stainless steel bolting. Buried components will be inspected when excavated during maintenance. An inspection will be performed within 10 years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period.

8. Loss of material due to pitting and crevice corrosion for stainless steel piping and components of the standby liquid control system exposed to sodium pentaborate solution is managed at VYNPS by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control—BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3.3.2.2.11 <u>Loss of Material due to Pitting, Crevice and Galvanic Corrosion</u>

Loss of material due to pitting and crevice, and galvanic corrosion for copper alloy piping and components exposed to treated water in the auxiliary and other systems at VYNPS is managed by the Water Chemistry Control – BWR Program. The effectiveness of the program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3.3.2.2.12 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

1. Loss of material due to pitting, crevice, and MIC in stainless steel, aluminum and copper alloy piping, and components exposed to fuel oil is an aging effect requiring management at VYNPS and these components are managed by the Diesel Fuel Monitoring Program. This program includes sampling and monitoring of fuel oil quality to ensure they remain within the limits specified by the ASTM standards. Maintaining parameters within limits ensures that significant loss of material will not occur. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining fuel oil quality within limits such that loss of material will not affect the intended functions of these components.

2. Loss of material due to pitting, crevice, and MIC in stainless steel piping and components exposed to lubricating oil is managed by the Oil Analysis Program which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. Operating experience at VYNPS has confirmed the effectiveness of this program in maintaining contaminants within limits such that corrosion has not and will not affect the intended functions of these components.

3.3.2.2.13 Loss of Material due to Wear

Loss of material due to wear could occur in the elastomer seals and components exposed to air indoor uncontrolled (internal or external). Wear is the removal of surface layers due to relative motion between two surfaces. At VYNPS, in the auxiliary systems, this specific aging effect for elastomers is not applicable based on operating experience. Where the aging effects of change in material properties and cracking are identified for elastomer components, they are managed by the Periodic Surveillance and Preventive Maintenance Program. This item is not applicable to VYNPS auxiliary systems.

3.3.2.2.14 Cracking due to Underclad Cracking

Cracking due to underclad cracking could occur for PWR steel charging pump casings with stainless steel cladding exposed to treated borated water. VYNPS is a BWR and has no charging pumps. This item is not applicable to VYNPS.

3.3.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of VYNPS quality assurance procedures and administrative controls for aging management programs.

3.3.2.3 Time-Limited Aging Analysis

The only TLAA identified for auxiliary system components is metal fatigue. This is evaluated in Section 4.3.

3.3.3 Conclusion

The auxiliary system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage the effects of aging on auxiliary system components are identified in Section 3.3.2.1 and in the following tables. A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the auxiliary system components will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.3.1
Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-1	Steel cranes - structural girders exposed to air – indoor uncontrolled (external)	Cumulative fatigue damage	TLAA to be evaluated for structural girders of cranes. See the Standard Review Plan, Section 4.7 for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	This line item was not used. Steel cranes are evaluated as structural components in Section 3.5.
3.3.1-2	Steel and stainless steel piping, piping components, piping elements, and heat exchanger components exposed to air – indoor uncontrolled, treated borated water or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. See Section 3.3.2.2.1.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-3	Stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The reduction of heat transfer in stainless steel heat exchanger tubes is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.3.2.2.2.
3.3.1-4	Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. The operating temperature of the standby liquid control system is below the 140°F threshold for cracking in stainless steel. See Section 3.3.2.2.3 item 1.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-5	Stainless steel and stainless clad steel heat exchanger components exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Plant specific	Yes, plant specific	Cracking in stainless steel heat exchanger tubes exposed to treated water > 140°F is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.3.2.2.3 item 2.
3.3.1-6	Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Cracking due to stress corrosion cracking	Plant specific	Yes, plant specific	Cracking of stainless steel diesel exhaust components will be managed by the Periodic Surveillance and Preventive Maintenance Program. See Section 3.3.2.2.3 item 3.
3.3.1-7	PWR only				
3.3.1-8	PWR only				
3.3.1-9	PWR only				

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-10	High-strength steel closure bolting exposed to air with steam or water leakage.	Cracking due to stress corrosion cracking, cyclic loading	Bolting Integrity The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Yes, if the bolts are not replaced during maintenance	Not applicable. High strength steel bolting is not used in the auxiliary systems.
3.3.1-11	Elastomer seals and components exposed to air – indoor uncontrolled (internal/ external)	Hardening and loss of strength due to elastomer degradation	Plant specific	Yes, plant specific	The change in material properties of elastomer components will be managed by the Periodic Surveillance and Preventive Maintenance Program. See Section 3.3.2.2.5 item 1.
3.3.1-12	Elastomer lining exposed to treated water or treated borated water	Hardening and loss of strength due to elastomer 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	Not applicable. There are no elastomer lined components exposed to treated water in the auxiliary systems. See Section 3.3.2.2.5 item 2.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-13	Boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water	Reduction of neutron-absorbing capacity and loss of material due to general corrosion	Plant specific	Yes, plant specific	The Water Chemistry Control – BWR Program manages the degradation of boral. Reduction of neutron-absorbing capacity is insignificant and requires no aging management. See Section 3.3.2.2.6.
3.3.1-14	Steel piping, piping component, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in steel components. See Section 3.3.2.2.7 item 1.
3.3.1-15	Steel reactor coolant pump oil collection system piping, tubing, and valve bodies exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. Reactor coolant pump oil collection components are not required. VYNPS operates with an inerted containment. See Section 3.3.2.2.7 item 1.
3.3.1-16	Steel reactor coolant pump oil collection system tank exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection to evaluate the thickness of the lower portion of the tank	Yes, detection of aging effects is to be evaluated	Not applicable. Reactor coolant pump oil collection components are not required. VYNPS operates with an inerted containment. SeeSection 3.3.2.2.7 item 1.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-17	Steel piping, piping components, and piping elements exposed to treated water	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	Consistent with NUREG-1801. The loss of material in steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.3.2.2.7 item 2.
3.3.1-18	Stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Loss of material/ general (steel only), pitting and crevice corrosion	Plant specific	Yes, plant specific	The Periodic Surveillance and Preventive Maintenance and Fire Protection Programs will manage loss of material in steel and stainless steel components exposed to diesel exhaust. See Section 3.3.2.2.7 item 3.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-19	Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically influenced 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	Consistent with NUREG-1801. The loss of material of buried steel components will be managed by the Buried Piping Inspection Program. See Section 3.3.2.2.8
3.3.1-20	Steel piping, piping components, piping elements, and tanks exposed to fuel oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Diesel Fuel Monitoring Program manages loss of material in steel components. See Section 3.3.2.2.9 item 1.
3.3.1-21	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in steel heat exchanger components. See Section 3.3.2.2.9 item 2.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-22	Steel with elastomer lining or stainless steel cladding piping, piping components, and piping elements exposed to treated water and treated borated water	Loss of material due to pitting and crevice corrosion (only for steel after lining/ cladding degradation)	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. No credit is taken for any elastomer linings or stainless steel cladding to prevent loss of material from the underlying carbon steel material. See Section 3.3.2.2.10 item 1.
3.3.1-23	Stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in stainless steel heat exchanger components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.3.2.2.10 item 2.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-24	Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in stainless steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. There are no aluminum piping components exposed to treated water in the auxiliary systems. See Section 3.3.2.2.10 item 2.
3.3.1-25	Copper alloy HVAC piping, piping components, piping elements exposed to condensation (external)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The System Walkdown, Periodic Surveillance and Preventive Maintenance, Service Water Integrity and Heat Exchanger Monitoring Programs will manage loss of material in copper alloy components. See Section 3.3.2.2.10 item 3.
3.3.1-26	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in copper alloy components. See Section 3.3.2.2.10 item 4.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-27	Stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements exposed to condensation	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The System Walkdown, Periodic Surveillance and Preventive Maintenance and Service Water Integrity Programs manage loss of material in stainless steel components. There are no aluminum pressure boundary components exposed to condensation in the auxiliary systems. See Section 3.3.2.2.10 item 5.
3.3.1-28	Copper alloy fire protection piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The Periodic Surveillance and Preventive Maintenance and Instrument Air Quality Programs will manage loss of material in copper alloy components. See Section 3.3.2.2.10 item 6.
3.3.1-29	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific	The Buried Piping Inspection Program manages loss of material in stainless steel components. See Section 3.3.2.2.10 item 7.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-30	Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in stainless steel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.3.2.2.10 item 8.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-31	Copper alloy piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in copper alloy components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. The components to which this NUREG-1801 line item applies are in the high pressure coolant injection and reactor core isolation cooling systems in Tables 3.2.2-4 and 3.2.2-5, and components in scope under criterion 10 CFR 54.4(a)(2), listed in series 3.3.2-13-xx tables. See Section 3.3.2.2.11
3.3.1-32	Stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Diesel Fuel Monitoring Program manages loss of material in stainless steel, aluminum and copper alloy components. See Section 3.3.2.2.12 item 1.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-33	Stainless steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The Oil Analysis Program manages loss of material in stainless steel components. See Section 3.3.2.2.12 item 2.
3.3.1-34	Elastomer seals and components exposed to air – indoor uncontrolled (internal or external)	Loss of material due to Wear	Plant specific	Yes, plant specific	Not applicable. There are no elastomer components with loss of material due to wear as an applicable aging effect. See Section 3.3.2.2.13.
3.3.1-35	PWR only				
3.3.1-36	Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated water	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	No	Not applicable. Boraflex is not used in the VYNPS spent fuel storage racks.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-37	Stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	BWR Reactor Water Cleanup System	No	Cracking of stainless steel components of the reactor water cleanup system is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. The only components to which this NUREG-1801 line item applies are included in scope only under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-13-xx tables. The BWR Reactor Water Cleanup System Program is not credited for license renewal. NUREG-1801 states that no IGSCC inspection is recommended for plants that have piping made of material that is resistant to IGSCC, and that have satisfactorily completed all actions requested in NRC GL 89-10. Since VYNPS satisfies these criteria, the Water Chemistry Control - BWR Program is used in lieu of the Reactor Water Cleanup System Program to manage cracking. (continued below)

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					As described in line Item 3.3.1-38, the One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program
3.3.1-38	Stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	The Water Chemistry Control – BWR Program manages cracking of stainless steel components. None of the auxiliary system components are within the scope of the BWR Stress Corrosion Cracking Program (all relevant components are included in the reactor vessel, internals and reactor coolant systems). The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program.
3.3.1-39	Stainless steel BWR spent fuel storage racks exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry	No	Not applicable. There are no stainless steel spent fuel storage components with intended functions exposed to treated water >60°C (> 140°F).
3.3.1-40	Steel tanks in diesel fuel oil system exposed to air - outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	The System Walkdown Program manages loss of material in steel tanks of the diesel fuel oil system exposed to air - outdoor (external) through visual inspections.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-41	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable. High-strength steel closure bolting is not used in the auxiliary systems.
3.3.1-42	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity	No	This line item was not used. Loss of material of steel closure bolting was addressed by other line items including 3.3.1-43, 3.3.1-55 and 3.3.1-58.
3.3.1-43	Steel bolting and closure bolting exposed to air – indoor uncontrolled (external) or air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	The System Walkdown Program manages the loss of material for steel bolting through the use of visual inspections that are performed at least once per refueling cycle.
3.3.1-44	Steel compressed air system closure bolting exposed to condensation	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	This line item was not used. Loss of material of steel closure bolting was addressed by other line items including 3.3.1-43, 3.3.1-55 and 3.3.1-58.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-45	Steel closure bolting exposed to air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Not applicable. Loss of preload is a design driven effect and not an aging effect requiring management. Bolting at VYNPS is standard grade B7 carbon steel, or similar material, except in rare specialized applications such as where stainless steel bolting is utilized. Loss of preload due to stress relaxation (creep) would only be a concern in very high temperature applications (> 700°F) as stated in the ASME Code, Section II, Part D, Table 4. No VYNPS bolting operates at >700°F. Therefore, loss of preload due to stress relaxation (creep) is not an applicable aging effect for auxiliary systems. Other issues that may result in pressure boundary joint leakage are improper design or maintenance issues. Improper bolting application (design) and maintenance issues are current plant operational concerns and not related to aging effects or mechanisms that require management during the period of extended operation. (continued below)

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					To address these bolting operational concerns, VYNPS has taken actions to address NUREG-1339, "Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants." These actions include implementation of good bolting practices in accordance with EPRI NP-5067, Good Bolting Practices. Proper joint preparation and make-up in accordance with industry standards is expected to preclude loss of preload. This has been confirmed by operating experience at VYNPS
3.3.1-46	Stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages cracking for stainless steel components.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-47	Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801 for most auxiliary systems. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for steel components. For steel components of the house heating boiler and stator cooling systems, the Water Chemistry Control – Auxiliary Systems Program manages loss of material.
3.3.1-48	Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for steel heat exchanger components.
3.3.1-49	Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water	Loss of material due to microbiologically influenced corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for stainless steel heat exchanger components.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-50	Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801 for most auxiliary systems. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for stainless steel components. For stainless steel components of the demineralized water system, the Water Chemistry Control – Auxiliary Systems Program manages loss of material.
3.3.1-51	Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801 for most auxiliary systems. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for copper alloy components. For copper alloy components of the house heating boiler system, demineralized water system, and portions of the HVAC system, the Water Chemistry Control – Auxiliary Systems Program manages loss of material.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-52	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages reduction of heat transfer for copper alloy heat exchanger tubes exposed to closed cycle cooling water. The auxiliary systems have no steel or stainless steel heat exchanger tubes exposed to closed cycle cooling water with a heat transfer intended function.
3.3.1-53	Steel compressed air system piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to general and pitting corrosion	Compressed Air Monitoring	No	The Instrument Air Quality Program manages loss of material for carbon steel components exposed to treated air.
3.3.1-54	Stainless steel compressed air system piping, piping components, and piping elements exposed to internal condensation	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	No	The Instrument Air Quality Program manages loss of material for stainless steel components exposed to treated air.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-55	Steel ducting closure bolting exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The System Walkdown Program manages loss of material for steel closure bolting in the HVAC system.
3.3.1-56	Steel HVAC ducting and components external surfaces exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The System Walkdown Program manages loss of material for external surfaces of steel components.
3.3.1-57	Steel piping and components external surfaces exposed to air – indoor uncontrolled (External)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The System Walkdown Program manages loss of material for external surfaces of steel components.
3.3.1-58	Steel external surfaces exposed to air – indoor uncontrolled (external), air - outdoor (external), and condensation (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The System Walkdown Program manages loss of material for external surfaces of steel components.
3.3.1-59	Steel heat exchanger components exposed to air – indoor uncontrolled (external) or air -outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The System Walkdown Program manages loss of material for external surfaces of steel heat exchanger components.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-60	Steel piping, piping components, and piping elements exposed to air - outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801. The System Walkdown Program manages loss of material for external surfaces of steel components.
3.3.1-61	Elastomer fire barrier penetration seals exposed to air – outdoor or air - indoor uncontrolled	Increased hardness, shrinkage and loss of strength due to weathering	Fire Protection	No	This line item was not used in the auxiliary systems tables. Fire barrier seals are evaluated as structural components in Section 3.5. Cracking and the change in material properties of elastomer seals are managed by the Fire Protection Program.
3.3.1-62	Aluminum piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion	Fire Protection	No	Not applicable. There are no aluminum components with intended functions exposed to raw water in the auxiliary systems.
3.3.1-63	Steel fire rated doors exposed to air – outdoor or air - indoor uncontrolled	Loss of material due to Wear	Fire Protection	No	This line item was not used in the auxiliary systems tables. Steel fire doors are evaluated as structural components in Section 3.5. The loss of material for fire doors is managed by the Fire Protection Program.
3.3.1-64	Steel piping, piping components, and piping elements exposed to fuel oil	Loss of material due to general, pitting, and crevice corrosion	Fire Protection and Fuel Oil Chemistry	No	This line item was not used. Loss of material of steel components exposed to fuel oil was addressed by other line items including 3.3.1-20 and 3.3.1-32.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-65	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – indoor uncontrolled	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	This line item was not used. Reinforced concrete structural fire barriers are evaluated as structural components in Section 3.5.
3.3.1-66	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – outdoor	Concrete cracking and spalling due to freeze thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	This line item was not used. Reinforced concrete structural fire barriers are evaluated as structural components in Section 3.5.
3.3.1-67	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – outdoor or air - indoor uncontrolled	Loss of material due to corrosion of embedded steel	Fire Protection and Structures Monitoring Program	No	This line item was not used. Reinforced concrete structural fire barriers are evaluated as structural components in Section 3.5.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-68	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801 for Fire Protection system components. The loss of material in steel components exposed to raw or untreated water is managed by the Fire Water System Program. The Periodic Surveillance and Preventive Maintenance and One-Time Inspection Programs manage loss of material for some components in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-13-xx tables.
3.3.1-69	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Fire Water System	No	The loss of material in stainless steel components exposed to raw water is managed by the Fire Water System, Fire Protection, and One-Time Inspection Programs.
3.3.1-70	Copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	The loss of material in copper alloy components exposed to raw water is managed by the Fire Water System, Fire Protection, and One-Time Inspection Programs.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-71	Steel piping, piping components, and piping elements exposed to moist air or condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	The loss of material for steel components exposed to moist air or condensation is managed by the Periodic Surveillance and Preventive Maintenance Program using visual inspections or other NDE techniques.
3.3.1-72	Steel HVAC ducting and components internal surfaces exposed to condensation (Internal)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Loss of material of steel component internal surfaces exposed to condensation is managed by the Periodic Surveillance and Preventive Maintenance Program using visual inspections or other NDE techniques.
3.3.1-73	Steel crane structural girders in load handling system exposed to air- indoor uncontrolled (external)	Loss of material due to general corrosion	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	This line item was not used in the auxiliary systems tables. Steel crane structural girders are evaluated as structural components in Section 3.5. Loss of material for steel crane structural components is managed by the Periodic Surveillance and Preventive Maintenance and Structures Monitoring Programs.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-74	Steel cranes - rails exposed to air – indoor uncontrolled (external)	Loss of material due to Wear	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	This line item was not used. Steel crane rails are evaluated as structural components in Section 3.5.
3.3.1-75	Elastomer seals and components exposed to raw water	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Open-Cycle Cooling Water System	No	Not applicable. There are no elastomeric components exposed to raw or untreated water in the auxiliary systems that require aging management.
3.3.1-76	Steel piping, piping components, and piping elements (without lining/coating or with degraded lining/coating) exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining/ coating degradation	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Service Water Integrity Program manages loss of material in steel components.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-77	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801 for most auxiliary systems. The Service Water Integrity Program manages loss of material for steel heat exchanger components. For steel heat exchanger tubes of the reactor building closed cooling water system, the Heat Exchanger Monitoring Program manages loss of material.
3.3.1-78	Stainless steel, nickel alloy, and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion	Open-Cycle Cooling Water System	No	This line was not used. There are no nickel alloy components exposed to raw water in the auxiliary systems. Stainless steel and copper alloy components exposed to raw water are addressed in other line items including 3.3.1-79 and 3.3.1-81.
3.3.1-79	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Service Water Integrity Program manages loss of material in stainless steel components.
3.3.1-80	Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Open-Cycle Cooling Water System	No	Not applicable. This line applies to EDG system components. At VYNPS, these components are not exposed to raw water (heat exchanger components exposed to raw water are addressed in line Item 3.3.1-82).

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-81	Copper alloy piping, piping components, and piping elements, exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Service Water Integrity Program manages loss of material in copper alloy components.
3.3.1-82	Copper alloy heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Service Water Integrity Program manages loss of material in copper alloy heat exchanger components.
3.3.1-83	Stainless steel and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801 for most systems. The Service Water Integrity Program manages reduction of heat transfer in stainless steel and copper alloy heat exchanger tubes. For the fire protection system, the Fire Protection Program manages reduction of heat transfer in copper alloy heat exchanger tubes.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-84	Copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to raw water, treated water, or closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material in copper alloy > 15% Zn components exposed to all types of water.
3.3.1-85	Gray cast iron piping, piping components, and piping elements exposed to soil, raw water, treated water, or closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. The Selective Leaching Program will manage loss of material in gray cast iron components exposed to soil and all types of water.
3.3.1-86	Structural steel (new fuel storage rack assembly) exposed to air – indoor uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring Program	No	This line item was not used. Structural steel of the new fuel storage rack assembly is evaluated as a structural component in Section 3.5.
3.3.1-87	PWR only				
3.3.1-88	PWR only				
3.3.1-89	PWR only				
3.3.1-90	PWR only				

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-91	PWR only				
3.3.1-92	Galvanized steel piping, piping components, and piping elements exposed to air – indoor uncontrolled	None	None	NA - No AEM or AMP	Not applicable. Galvanized steel surfaces are evaluated as steel for the auxiliary systems.
3.3.1-93	Glass piping elements exposed to air, air – indoor uncontrolled (external), fuel oil, lubricating oil, raw water, treated water, and treated borated water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3.1-94	Stainless steel and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.3.1: Auxiliary Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-95	Steel and aluminum piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. There are no components exposed to controlled indoor air at VYNPS.
3.3.1-96	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3.1-97	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3.1-98	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air	None	None	NA - No AEM or AMP	Not applicable. Dried (treated) air is maintained as an environment as a result of the Instrument Air Quality Program, so aging effects may occur without that program.
3.3.1-99	PWR only				

Notes for Table 3.3.2-1 through 3.3.2-13-42

Generic notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific notes

301. This treated water environment is the equivalent of the NUREG-1801 defined closed cycle cooling water.

302. The air - untreated environment is the equivalent of the NUREG-1801 defined condensation.

303. The treated water in the SBO diesel generator sight glass may be slightly greater than 140°F but will not lead to degradation of the glass.

304. This treated water environment is fire diesel engine jacket cooling water

305. This treated water or steam environment is from the house heating boiler system. The system water is similar to closed cooling water, but monitored by the Water Chemistry Control – Auxiliary Systems Program.

306. This treated water environment does not directly match any NUREG-1801 defined environment. However, for the purposes of evaluating selective leaching, comparison to NUREG-1801 treated water or closed cycle cooling water is acceptable since selective leaching is applicable to all water types

Table 3.3.2-1
Standby Liquid Control (SLC) System
Summary of Aging Management Evaluation

Table 3.3.2-1: Standby Liquid Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Gauge	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Gauge	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Gauge	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Gauge	Pressure boundary	Glass	Lube oil (int)	None	None	VII.J-10 (AP-15)	3.3.1-93	A
Heater	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Heater	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A

Table 3.3.2-1: Standby Liquid Control System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Pump casing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Tank	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Concrete (ext)	None	None	VII.J-17 (AP-19)	3.3.1-96	A
Tank	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Thermowell	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Thermowell	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A

Table 3.3.2-1: Standby Liquid Control System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A

Table 3.3.2-2
Service Water (SW) Systems
Summary of Aging Management Evaluation

Table 3.3.2-2: Service Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Bolting	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Bolting	Pressure boundary	Stainless steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	D
Coil	Heat transfer	Copper alloy > 15% Zn	Lube oil (ext)	Fouling	Oil Analysis	V.D2-9 (EP-47)	3.2.1-9	E
Coil	Heat transfer	Copper alloy > 15% Zn	Raw water (int)	Fouling	Service Water Integrity	VII.C1-6 (A-72)	3.3.1-83	B
Coil	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material	Oil Analysis	VII.C1-8 (AP-47)	3.3.1-26	E

Table 3.3.2-2: Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Coil	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-4 (A-66)	3.3.1-84	A
Coil	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	B
Expansion joint	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Expansion joint	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Fan housing	SSR	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Fan housing	SSR	Carbon steel	Condensation (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-3 (A-08)	3.3.1-72	E
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-5 (A-64)	3.3.1-77	B
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	Service Water Integrity	VII.F1-16 (A-46)	3.3.1-25	E

Table 3.3.2-2: Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material-wear	Service Water Integrity			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	B
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	D
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.E3-1 (A-67)	3.3.1-49	D
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material-wear	Service Water Integrity			H
Heat exchanger (tubesheets)	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-5 (A-64)	3.3.1-77	B
Heat exchanger (tubesheets)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	D
Indicator	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E

Table 3.3.2-2: Service Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Indicator	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Orifice	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Orifice	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Orifice	Pressure boundary Flow control	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Orifice	Pressure boundary Flow control	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Piping	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping Inspection	VII.C1-18 (A-01)	3.3.1-19	B

Table 3.3.2-2: Service Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Piping	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Piping	Pressure boundary	Copper alloy < 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-8 (AP-47)	3.3.1-26	E
Piping	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	B
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Pump casing	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Strainer	Filtration	Stainless steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Strainer	Filtration	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B

Table 3.3.2-2: Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Suction barrel	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Service Water Integrity	VII.F1-1 (A-09)	3.3.1-27	E
Suction barrel	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Thermowell	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Thermowell	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Thermowell	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Tubing	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	B

Table 3.3.2-2: Service Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Valve body	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Valve body	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Valve body	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	B
Valve body	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-10 (A-47)	3.3.1-84	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	B

Table 3.3.2-2: Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Valve body	Pressure boundary	Stainless steel	Air - outdoor (ext)	Loss of material	System Walkdown			G
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-14 (AP-59)	3.3.1-33	E
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B

Table 3.3.2-3
Reactor Building Closed Cooling Water (RBCCW) System
Summary of Aging Management Evaluation

Table 3.3.2-3: Reactor Building Closed Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Flow switch housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Flow switch housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Heat exchanger (housing)	SSR	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heat exchanger (housing)	SSR	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	B

Table 3.3.2-3: Reactor Building Closed Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Untreated water (ext)	Loss of material	Heat Exchanger Monitoring	VII.C1-5 (A-64)	3.3.1-77	E
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Untreated water (ext)	Loss of material-wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	Heat Exchanger Monitoring	VII.F1-16 (A-46)	3.3.1-25	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material-wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material	Oil Analysis	VII.C2-5 (AP-47)	3.3.1-26	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material-wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.C2-6 (AP-43)	3.3.1-84	C, 301
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-8 (AP-34)	3.3.1-51	D

Table 3.3.2-3: Reactor Building Closed Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Air - indoor (ext)	Loss of material-wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.E3-1 (A-67)	3.3.1-49	D
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Cracking	Water Chemistry Control – BWR	VII.E3-3 (A-71)	3.3.1-5	E
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Loss of material	Water Chemistry Control – BWR	VII.A4-2 (A-70)	3.3.1-23	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Loss of material-wear	Heat Exchanger Monitoring			H
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Closed Cooling Water	VII.C2-11 (AP-60)	3.3.1-46	B
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.E3-1 (A-67)	3.3.1-49	D
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-3: Reactor Building Closed Cooling Water System (Continued)								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Thermowell	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Thermowell	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	B
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B

Table 3.3.2-4
Emergency Diesel Generator (EDG) System
Summary of Aging Management Evaluation

Table 3.3.2-4: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
Expansion joint	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Expansion joint	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	TLAA – metal fatigue			H
Expansion joint	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Expansion joint	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.H2-1 (AP-33)	3.3.1-6	E

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking-fatigue	TLAA-metal fatigue			H
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Filter housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Filter housing	Pressure boundary	Carbon steel	Air - untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.H2-3 (AP-41)	3.3.1-59	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	D

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (fins)	Heat transfer	Aluminum	Air - indoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.H2-3 (AP-41)	3.3.1-59	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	D
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	D
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Air - indoor (ext)	Loss of material	System Walkdown	VII.H2-3 (AP-41)	3.3.1-59	A
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	D

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C2-8 (A-50)	3.3.1-85	C
Heat exchanger (tubes)	Heat transfer	Copper alloy < 15% Zn	Air - indoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Heat transfer	Copper alloy < 15% Zn	Treated water (int)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.C2-2 (AP-80)	3.3.1-52	D
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn (inhibited)	Lube oil (ext)	Fouling	Oil Analysis	V.D2-9 (EP-47)	3.2.1-9	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn (inhibited)	Raw water (int)	Fouling	Service Water Integrity	VII.C1-6 (A-72)	3.3.1-83	D
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn (inhibited)	Treated water (ext)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.C2-2 (AP-80)	3.3.1-52	D
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn (inhibited)	Treated water > 140°F (ext)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.C2-2 (AP-80)	3.3.1-52	D

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (ext)	Loss of material-wear	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-8 (AP-34)	3.3.1-51	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (inhibited)	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (inhibited)	Lube oil (ext)	Loss of material-wear	Service Water Integrity			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (inhibited)	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (inhibited)	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-8 (AP-34)	3.3.1-51	D

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (inhibited)	Treated water (ext)	Loss of material-wear	Service Water Integrity			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (inhibited)	Treated water > 140°F (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-8 (AP-34)	3.3.1-51	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn (inhibited)	Treated water > 140°F (ext)	Loss of material-wear	Service Water Integrity			H
Heat exchanger (tubesheets)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Heat exchanger (tubesheets)	Pressure boundary	Copper alloy > 15% Zn	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	D
Heat exchanger (tubesheets)	Pressure boundary	Copper alloy > 15% Zn	Raw water (ext)	Loss of material	Selective Leaching	VII.C1-4 (A-66)	3.3.1-84	C
Heat exchanger (tubesheets)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-8 (AP-34)	3.3.1-51	D
Heat exchanger (tubesheets)	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	C, 301

Table 3.3.2-4: Emergency Diesel Generator System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubesheets)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-8 (AP-34)	3.3.1-51	D
Heat exchanger (tubesheets)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	C, 301
Heater housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heater housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Heater housing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Orifice	Pressure boundary Flow control	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary Flow control	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	TLAA-metal fatigue			H
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Piping	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Piping	Pressure boundary	Carbon steel	Air - untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E
Piping	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Air - untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-1 (A-09)	3.3.1-27	E, 302
Pump casing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Pump casing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Sight glass	Pressure boundary	Glass	Air - indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	VII.J-10 (AP-15)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Treated water > 140°F (int)	None	None	VII.J-13 (AP-51)	3.3.1-93	A, 303
Silencer	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	TLAA-metal fatigue			H
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Strainer	Filtration	Stainless steel	Air - outdoor (ext)	Loss of material	System Walkdown			G
Strainer	Filtration	Stainless steel	Air - outdoor (int)	Loss of material	System Walkdown			G
Strainer	Filtration	Stainless steel	Lube oil (ext)	Cracking	Oil Analysis			H
Strainer	Filtration	Stainless steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-17 (AP-59)	3.3.1-33	E
Strainer	Filtration	Stainless steel	Lube oil (int)	Cracking	Oil Analysis			H
Strainer	Filtration	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-17 (AP-59)	3.3.1-33	E
Strainer housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Tank	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-4: Emergency Diesel Generator System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Tank	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Tank	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Air - untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-1 (A-09)	3.3.1-27	E, 302
Thermowell	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Thermowell	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Thermowell	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	B
Thermowell	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	A, 301
Tubing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	B
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-9 (AP-78)	3.3.1-28	E, 302
Turbocharger	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Turbocharger	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	TLAA-metal fatigue			H
Turbocharger	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Valve body	Pressure boundary	Carbon steel	Air - untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	B
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	A, 301
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	B

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	A, 301
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air - untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-9 (AP-78)	3.3.1-28	E, 302
Valve body	Pressure boundary	Gray cast iron	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C2-8 (A-50)	3.3.1-85	C
Valve body	Pressure boundary	Gray cast iron	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Valve body	Pressure boundary	Gray cast iron	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.C2-8 (A-50)	3.3.1-85	C
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-4: Emergency Diesel Generator System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-17 (AP-59)	3.3.1-33	E
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Closed Cooling Water	VII.C2-11 (AP-60)	3.3.1-46	D
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Valve body	Pressure boundary	Stainless steel	Air - untreated (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-1 (A-09)	3.3.1-27	E, 302

Table 3.3.2-5
Fuel Pool Cooling (FPC) System
Summary of Aging Management Evaluation

Table 3.3.2-5: Fuel Pool Cooling Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-2 (A-70)	3.3.1-23	A
Heat exchanger (tubes)	Heat transfer	Stainless steel	Raw water (int)	Fouling	Service Water Integrity	VII.C1-7 (AP-61)	3.3.1-83	D
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (ext)	Fouling	Water Chemistry Control – BWR	VII.A4-4 (AP-62)	3.3.1-3	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	D

Table 3.3.2-5: Fuel Pool Cooling Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.A4-2 (A-70)	3.3.1-23	A
Neutron absorber (boral)	Neutron absorption	Aluminum/boron carbide	Treated water (ext)	Cracking	Water Chemistry Control – BWR			H
Neutron absorber (boral)	Neutron absorption	Aluminum/boron carbide	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.A2-3 (A-89)	3.3.1-13	E
Orifice	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A

Table 3.3.2-5: Fuel Pool Cooling Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Thermowell	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A

Table 3.3.2-6
Fuel Oil (FO) System
Summary of Aging Management Evaluation

Table 3.3.2-6: Fuel Oil System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
Filter housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Flame arrestor	Flow control	Aluminum	Air - outdoor (ext)	None	None			G
Flame arrestor	Flow control	Aluminum	Air - outdoor (int)	None	None			G
Flex hose	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Flex hose	Pressure boundary	Copper alloy > 15% Zn	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-3 (AP-44)	3.3.1-32	E
Flex hose	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-6: Fuel Oil System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flex hose	Pressure boundary	Stainless steel	Fuel oil (int)	Cracking	Diesel Fuel Monitoring			H
Flex hose	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-6 (AP-54)	3.3.1-32	E
Injector housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Injector housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.H1-8 (A-24)	3.3.1-60	A
Piping	Pressure boundary	Carbon steel	Air - outdoor (int)	Loss of material	System Walkdown	VIII.B1-6 (SP-59)	3.4.1-30	E
Piping	Pressure boundary	Carbon steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping Inspection	VII.H1-9 (A-01)	3.3.1-19	B

Table 3.3.2-6: Fuel Oil System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Fiberglass	Fuel oil (int)	None	None			F
Piping	Pressure boundary	Fiberglass	Soil (ext)	None	None			F
Pump casing	Pressure boundary	Aluminum	Air - indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C
Pump casing	Pressure boundary	Aluminum	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-1 (AP-35)	3.3.1-32	E
Pump casing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Sight glass	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Sight glass	Pressure boundary	Copper alloy > 15% Zn	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-3 (AP-44)	3.3.1-32	E
Sight glass	Pressure boundary	Glass	Air - indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Fuel oil (int)	None	None	VII.J-9 (AP-49)	3.3.1-93	A

Table 3.3.2-6: Fuel Oil System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Tank	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.H1-11 (A-95)	3.3.1-40	E
Tank	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Tank	Pressure boundary	Carbon steel	Concrete (ext)	Loss of material	Diesel Fuel Monitoring			G
Tank	Pressure boundary	Fiberglass	Fuel oil (int)	None	None			F
Tank	Pressure boundary	Fiberglass	Interstitial fluid (brine) (ext)	None	None			F
Tank	Pressure boundary	Fiberglass	Interstitial fluid (brine) (int)	None	None			F
Tank	Pressure boundary	Fiberglass	Soil (ext)	None	None			F

Table 3.3.2-6: Fuel Oil System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Thermowell	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Thermowell	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-6 (AP-54)	3.3.1-32	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-3 (AP-44)	3.3.1-32	E
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.H1-8 (A-24)	3.3.1-60	A
Valve body	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-3 (AP-44)	3.3.1-32	E
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-6: Fuel Oil System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-6 (AP-54)	3.3.1-32	E

Table 3.3.2-7
Instrument Air (IA) System
Summary of Aging Management Evaluation

Table 3.3.2-7: Instrument Air System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Piping	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-2 (A-26)	3.3.1-53	E
Piping	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-4 (AP-81)	3.3.1-54	E
Tank	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Tank	Pressure boundary	Carbon steel	Nitrogen (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A

Table 3.3.2-7: Instrument Air System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-2 (A-26)	3.3.1-53	E
Tank	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-4 (AP-81)	3.3.1-54	E
Tubing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Tubing	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-2 (A-26)	3.3.1-53	E
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-4 (AP-81)	3.3.1-54	E
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Valve body	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-2 (A-26)	3.3.1-53	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

Table 3.3.2-7: Instrument Air System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated air (int)	Loss of material	Instrument Air Quality	VII.G-9 (AP-78)	3.3.1-28	E
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-4 (AP-81)	3.3.1-54	E

Table 3.3.2-8
Fire Protection (FP)—Water System
Summary of Aging Management Evaluation

Table 3.3.2-8: Fire Protection—Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping Inspection	VII.G-25 (A-01)	3.3.1-19	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	System Walkdown			G
Bolting	Pressure boundary	Stainless steel	Soil (ext)	Loss of material	Buried Piping Inspection	VII.G-20 (AP-56)	3.3.1-29	E
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking-fatigue	Fire Protection			H
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Loss of material	Fire Protection	VII.H2-2 (A-27)	3.3.1-18	E

Table 3.3.2-8: Fire Protection—Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Filter	Filtration	Stainless steel	Raw water (ext)	Loss of material	Fire Protection	VII.G-19 (A-55)	3.3.1-69	E
Filter	Filtration	Stainless steel	Raw water (int)	Loss of material	Fire Protection	VII.G-19 (A-55)	3.3.1-69	E
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Fire Protection	V.D2-16 (E-29)	3.2.1-32	E
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Filter housing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Fire Protection			G, 304
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Fire Protection	VII.G-19 (A-55)	3.3.1-69	E
Flow nozzle	Pressure boundary & flow control	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Flow nozzle	Pressure boundary & flow control	Carbon steel	Fire protection foam (int)	Loss of material	Fire Water System			G

Table 3.3.2-8: Fire Protection—Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Flow nozzle	Pressure boundary & flow control	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Flow nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Flow nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Fire protection foam (int)	Loss of material	Fire Water System			G
Flow nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Fire protection foam (int)	Loss of material	Selective Leaching			G
Flow nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B
Flow nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.G-13 (A-47)	3.3.1-84	A
Gear box	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Gear box	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E

Table 3.3.2-8: Fire Protection—Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.G-5 (AP-41)	3.3.1-59	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Lube oil (int)	Cracking-fatigue	Fire Protection			H
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E
Heat exchanger (bonnet)	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Heat exchanger (bonnet)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Fire Protection	VII.G-12 (A-45)	3.3.1-70	E
Heat exchanger (bonnet)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-4 (A-66)	3.3.1-84	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.G-5 (AP-41)	3.3.1-59	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Fire Protection			G, 304

Table 3.3.2-8: Fire Protection—Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (shell)	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Heat exchanger (shell)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Fire Protection	VII.G-12 (A-45)	3.3.1-70	E
Heat exchanger (shell)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-4 (A-66)	3.3.1-84	C
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Lube oil (int)	Fouling	Oil Analysis	V.D2-9 (EP-47)	3.2.1-9	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Raw water (ext)	Fouling	Fire Protection	VII.C1-6 (A-72)	3.3.1-83	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Raw water (int)	Fouling	Fire Protection	VII.C1-6 (A-72)	3.3.1-83	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water > 140°F (ext)	Fouling	Fire Protection			G, 304
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Cracking-fatigue	Fire Protection			H

Table 3.3.2-8: Fire Protection—Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.G-11 (AP-47)	3.3.1-26	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (ext)	Loss of material	Fire Protection	VII.G-12 (A-45)	3.3.1-70	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (ext)	Loss of material	Selective Leaching	VII.C1-4 (A-66)	3.3.1-84	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Fire Protection	VII.G-12 (A-45)	3.3.1-70	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.C1-4 (A-66)	3.3.1-84	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (ext)	Loss of material	Fire Protection			G, 304
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (ext)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	C, 306
Heater housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F-2 (EP-3)	3.2.1-50	C

Table 3.3.2-8: Fire Protection—Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heater housing	Pressure boundary	Aluminum	Treated water > 140°F (int)	Loss of material	Fire Protection			G, 304
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heater housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Air – outdoor (ext)	Loss of material	System Walkdown			G
Nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B
Nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.G-13 (A-47)	3.3.1-84	A
Orifice	Pressure boundary & flow control	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-8: Fire Protection—Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	Pressure boundary & flow control	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Fire Water System	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	Fire Protection			H
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Fire Protection	VII.H2-2 (A-27)	3.3.1-18	E
Piping	Pressure boundary	Carbon steel	Fire protection foam (int)	Loss of material	Fire Water System			G
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Cracking-fatigue	Fire Protection			H
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B

Table 3.3.2-8: Fire Protection—Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping Inspection	VII.G-25 (A-01)	3.3.1-19	B
Piping	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Fire Protection			G, 304
Piping	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Gray cast iron	Air – indoor (int)	Loss of material	Fire Water System	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A
Piping	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Buried Piping Inspection	VII.G-25 (A-01)	3.3.1-19	B
Piping	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Selective Leaching	VII.G-15 (A-02)	3.3.1-85	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-8: Fire Protection—Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Fire Protection			G, 304
Silencer	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking - fatigue	Fire Protection			H
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Fire Protection	VII.H2-2 (A-27)	3.3.1-18	E
Strainer	Filtration	Carbon steel	Raw water (ext)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Strainer	Filtration	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Strainer	Filtration	Stainless steel	Raw water (ext)	Loss of material	Fire Water System	VII.G-19 (A-55)	3.3.1-69	B

Table 3.3.2-8: Fire Protection—Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Stainless steel	Raw water (int)	Loss of material	Fire Water System	VII.G-19 (A-55)	3.3.1-69	B
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Strainer housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Strainer housing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Fire protection foam (int)	Loss of material	Fire Water System			G
Tank	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

Table 3.3.2-8: Fire Protection—Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (int)	None	None			G
Tubing	Pressure boundary	Copper alloy < 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.G-11 (AP-47)	3.3.1-26	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Fire Protection	VII.G-12 (A-45)	3.3.1-70	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water > 140°F (int)	Loss of material	Fire Protection			G, 304
Turbocharger	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Turbocharger	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Fire Protection	V.D2-16 (E-29)	3.2.1-32	E
Turbocharger	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	Fire Protection			H
Turbocharger	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Fire Protection	VII.H2-2 (A-27)	3.3.1-18	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-8: Fire Protection—Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.G-22 (AP-30)	3.3.1-14	E
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Valve body	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Fire Protection			G, 304
Valve body	Pressure boundary	Carbon steel	Fire protection foam (int)	Loss of material	Fire Water System			G
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Fire protection foam (int)	Loss of material	Fire Water System			G
Valve body	Pressure boundary	Copper alloy > 15% Zn	Fire protection foam (int)	Loss of material	Selective Leaching			G
Valve body	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.G-11 (AP-47)	3.3.1-26	E
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B
Valve body	Pressure boundary	Copper alloy > 15% Zn	Raw water (int)	Loss of material	Selective Leaching	VII.G-13 (A-47)	3.3.1-84	A

Table 3.3.2-8: Fire Protection—Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Fire Protection			G, 304
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	C, 306
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Fire protection foam (int)	Loss of material	Fire Water System			G
Valve body	Pressure boundary	Gray cast iron	Fire protection foam (int)	Loss of material	Selective Leaching			G
Valve body	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Buried Piping Inspection	VII.G-25 (A-01)	3.3.1-19	B
Valve body	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Selective Leaching	VII.G-15 (A-02)	3.3.1-85	A

Table 3.3.2-8: Fire Protection—Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Fire Protection			G, 304
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Fire Protection			G, 304

Table 3.3.2-9
Fire Protection (FP)—CO_2 System
Summary of Aging Management Evaluation

Table 3.3.2-9: Fire Protection—CO_2 System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Bolting	Pressure boundary	Stainless steel	Air - outdoor (ext)	Loss of material	System Walkdown			G
Coil	Pressure boundary	Copper alloy > 15% Zn	Gas (ext)	None	None	VII.J-4 (AP-9)	3.3.1-97	C
Coil	Pressure boundary	Copper alloy > 15% Zn	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	C
Filter housing	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A

Table 3.3.2-9: Fire Protection—CO_2 System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heater housing	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Heater housing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Nozzle	Pressure boundary & flow control	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Nozzle	Pressure boundary & flow control	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Nozzle	Pressure boundary & flow control	Copper alloy > 15% Zn	Air - indoor (int)	None	None			G
Nozzle	Pressure boundary & flow control	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Nozzle	Pressure boundary & flow control	Stainless steel	Air - indoor (int)	None	None			G

Table 3.3.2-9: Fire Protection—CO_2 System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	Pressure boundary & flow control	Stainless steel	Air - outdoor (ext)	Loss of material	System Walkdown			G
Orifice	Pressure boundary & flow control	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Piping	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Piping	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (int)	None	None			G
Piping	Pressure boundary	Copper alloy > 15% Zn	Air - outdoor (ext)	Loss of material	System Walkdown			G
Piping	Pressure boundary	Copper alloy > 15% Zn	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A

Table 3.3.2-9: Fire Protection—CO_2 System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Siren body	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Siren body	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (int)	None	None			G
Strainer	Pressure boundary & filtration	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Strainer	Pressure boundary & filtration	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Tank	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Tank	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	C

Table 3.3.2-9: Fire Protection—CO_2 System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (int)	None	None			G
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - outdoor (ext)	Loss of material	System Walkdown			G
Tubing	Pressure boundary	Copper alloy < 15% Zn	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Air - outdoor (ext)	Loss of material	System Walkdown			G
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-9: Fire Protection—CO_2 System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J-23 (AP-6)	3.3.1-97	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (int)	None	None			G
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air - outdoor (ext)	Loss of material	System Walkdown			G
Valve body	Pressure boundary	Copper alloy > 15% Zn	Gas (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Valve body	Pressure boundary	Stainless steel	Air - outdoor (ext)	Loss of material	System Walkdown			G

Table 3.3.2-9: Fire Protection—CO_2 System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A

Table 3.3.2-10
Heating, Ventilation and Air Conditioning (HVAC) Systems
Summary of Aging Management Evaluation

Table 3.3.2-10: Heating, Ventilation and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F1-4 (A-105)	3.3.1-55	A
Bolting	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Bolting	Pressure boundary	Stainless steel	Air - outdoor (ext)	Loss of material	System Walkdown			G
Compressor housing	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Compressor housing	Pressure boundary	Copper alloy < 15% Zn	Freon (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A
Damper housing	Pressure boundary	Aluminum	Air - outdoor (ext)	Loss of material	System Walkdown			G
Damper housing	Pressure boundary	Aluminum	Air - outdoor (int)	Loss of material	System Walkdown			G
Damper housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F1-2 (A-10)	3.3.1-56	A

Table 3.3.2-10: Heating, Ventilation and Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Damper housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Damper housing	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Damper housing	Pressure boundary	Carbon steel	Air - outdoor (int)	Loss of material	System Walkdown	VIII.B1-6 (SP-59)	3.4.1-30	E
Duct	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F1-2 (A-10)	3.3.1-56	A
Duct	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Duct	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Duct flexible connection	Pressure boundary	Elastomer	Air - indoor (ext)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.F1-7 (A-17)	3.3.1-11	E
Duct flexible connection	Pressure boundary	Elastomer	Air - indoor (ext)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.F1-7 (A-17)	3.3.1-11	E
Duct flexible connection	Pressure boundary	Fiberglass	Air - indoor (int)	None	None			F

Table 3.3.2-10: Heating, Ventilation and Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Expansion joint	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Expansion joint	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-20 (A-25)	3.3.1-47	B
Fan housing	Pressure boundary	Aluminum	Air - outdoor (ext)	Loss of material	System Walkdown			G
Fan housing	Pressure boundary	Aluminum	Air - outdoor (int)	Loss of material	System Walkdown			G
Fan housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F1-2 (A-10)	3.3.1-56	A
Fan housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Fan housing	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Fan housing	Pressure boundary	Carbon steel	Air - outdoor (int)	Loss of material	System Walkdown	VIII.B1-6 (SP-59)	3.4.1-30	E
Filter housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F1-2 (A-10)	3.3.1-56	A
Filter housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E

Table 3.3.2-10: Heating, Ventilation and Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Fouling	Service Water Integrity			H
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-3 (A-08)	3.3.1-72	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-11 (A-63)	3.3.1-48	B
Heat exchanger (tubes)	Heat transfer	Copper alloy < 15% Zn	Condensation (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H

Table 3.3.2-10: Heating, Ventilation and Air Conditioning Systems (Continued)								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Heat transfer	Copper alloy < 15% Zn	Condensation (ext)	Fouling	Service Water Integrity			H
Heat exchanger (tubes)	Heat transfer	Copper alloy < 15% Zn	Raw water (int)	Fouling	Service Water Integrity	VII.C1-6 (A-72)	3.3.1-83	D
Heat exchanger (tubes)	Heat transfer	Copper alloy < 15% Zn	Treated water (ext)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.F1-12 (AP-80)	3.3.1-52	B
Heat exchanger (tubes)	Heat transfer	Copper alloy < 15% Zn	Treated water (int)	Fouling	Water Chemistry Control – Closed Cooling Water	VII.F1-12 (AP-80)	3.3.1-52	B
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1-16 (A-46)	3.3.1-25	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	Service Water Integrity	VII.F1-16 (A-46)	3.3.1-25	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material-wear	Periodic Surveillance and Preventive Maintenance			H

Table 3.3.2-10: Heating, Ventilation and Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material-wear	Service Water Integrity			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Freon (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-3 (A-65)	3.3.1-82	D
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Steam > 220°f (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			G
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-8 (AP-34)	3.3.1-51	B
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Treated water (ext)	Loss of material-wear	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-8 (AP-34)	3.3.1-51	B
Heater housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F1-2 (A-10)	3.3.1-56	A

Table 3.3.2-10: Heating, Ventilation and Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heater housing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Heater housing	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VIII.B2-3 (S-05)	3.4.1-37	E
Humidifier housing	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Humidifier housing	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.C2-6 (AP-43)	3.3.1-84	C, 306
Humidifier housing	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VIII.F1-8 (AP-34)	3.3.1-51	E, 305
Louver housing	Pressure boundary	Aluminum	Air - outdoor (ext)	Loss of material	System Walkdown			G
Louver housing	Pressure boundary	Aluminum	Air - outdoor (int)	Loss of material	System Walkdown			G
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.F1-2 (A-10)	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Steam > 220°f (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

Table 3.3.2-10: Heating, Ventilation and Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VIII.B2-3 (S-05)	3.4.1-37	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-20 (A-25)	3.3.1-47	B
Piping	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Piping	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.C2-6 (AP-43)	3.3.1-84	C, 306
Piping	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VIII.F1-8 (AP-34)	3.3.1-51	E, 305
Pump casing	Pressure boundary	Copper alloy > 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Pump casing	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.F1-17 (AP-43)	3.3.1-84	C, 301
Pump casing	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-15 (AP-12)	3.3.1-51	B
Sight glass	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A

Table 3.3.2-10: Heating, Ventilation and Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-20 (A-25)	3.3.1-47	B
Sight glass	Pressure boundary	Glass	Condensation (ext)	None	None			G
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J-13 (AP-51)	3.3.1-93	A
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	D
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-20 (A-25)	3.3.1-47	B
Tank	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-20 (A-25)	3.3.1-47	B

Table 3.3.2-10: Heating, Ventilation and Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - outdoor (ext)	Loss of material	System Walkdown			G
Tubing	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Freon (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.F1-20 (A-25)	3.3.1-47	B
Valve body	Pressure boundary	Gray cast iron	Air - indoor (int)	Loss of material	System Walkdown	V.B-1 (E-25)	3.2.1-32	E
Valve body	Pressure boundary	Gray cast iron	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Valve body	Pressure boundary	Copper alloy < 15% Zn	Air - outdoor (ext)	Loss of material	System Walkdown			G
Valve body	Pressure boundary	Copper alloy < 15% Zn	Freon (int)	None	None	VII.J-4 (AP-9)	3.3.1-97	A

Table 3.3.2-11
Primary Containment Atmosphere Control (PCAC) and Containment Atmosphere Dilution (CAD) Systems
Summary of Aging Management Evaluation

Table 3.3.2-11: Primary Containment Atmosphere Control and Containment Air Dilution

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Diaphragm	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Diaphragm	Pressure boundary	Stainless steel	Silicone (ext)	None	None			G
Diaphragm	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Dryer	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Dryer	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Filter housing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G

Table 3.3.2-11: Primary Containment Atmosphere Control and Containment Air Dilution (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger	Heat transfer	Stainless steel	Air - indoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger	Heat transfer	Stainless steel	Air - indoor (int)	None	None			G
Heat exchanger	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Heat exchanger	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Orifice	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Orifice	Pressure boundary, Flow control	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary, Flow control	Stainless steel	Air - indoor (int)	None	None			G
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-11: Primary Containment Atmosphere Control and Containment Air Dilution (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Pump casing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Tank	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Trap	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-11: Primary Containment Atmosphere Control and Containment Air Dilution (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Trap	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Trap	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Trap	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Tubing	Pressure boundary	Stainless steel	Treated water > 482°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Tubing	Pressure boundary	Stainless steel	Treated water > 482°F (int)	Cracking-fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 482°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-11: Primary Containment Atmosphere Control and Containment Air Dilution (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Air - indoor (int)	None	None			G
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Stainless steel	Treated water > 482°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	E
Valve body	Pressure boundary	Stainless steel	Treated water > 482°F (int)	Cracking-fatigue	TLAA-metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 482°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	C

Table 3.3.2-12
John Deere Diesel (JDD)
Summary of Aging Management Evaluation

Table 3.3.2-12: John Deere Diesel								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Expansion joint	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking-fatigue	Periodic Surveillance and Preventive Maintenance			H
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Filter housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E

Table 3.3.2-12: John Deere Diesel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (radiator)	Heat transfer	Copper alloy > 15% Zn	Air - indoor (ext)	Fouling	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (radiator)	Heat transfer	Copper alloy > 15% Zn	Treated water > 140°F (int)	Fouling	Water Chemistry Control – Auxiliary Systems			G, 304
Heat exchanger (radiator)	Pressure boundary	Copper alloy > 15% Zn	Air - indoor (ext)	loss of material (wear)	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (radiator)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			G, 304
Heat exchanger (radiator)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	C, 306
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-5 (AP-39)	3.3.1-21	E

Table 3.3.2-12: John Deere Diesel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Lube oil (ext)	Fouling	Oil Analysis	V.D2-9 (EP-47)	3.2.1-9	E
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn	Treated water > 140°F (int)	Fouling	Water Chemistry Control – Auxiliary Systems			G, 304
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Lube oil (ext)	Loss of material-wear	Periodic Surveillance and Preventive Maintenance			H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			G, 304
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn	Treated water > 140°F (int)	Loss of material	Selective Leaching	VII.H2-12 (AP-43)	3.3.1-84	C, 306
Heater housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heater housing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			G, 304

Table 3.3.2-12: John Deere Diesel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air - indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air - outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	Periodic Surveillance and Preventive Maintenance			H
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Piping	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			G, 304
Pump casing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-12: John Deere Diesel (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Carbon steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			G, 304
Silencer	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	Periodic Surveillance and Preventive Maintenance			H
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air - indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-10 (AP-47)	3.3.1-26	E

Table 3.3.2-12: John Deere Diesel (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Turbocharger	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Turbocharger	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2-16 (E-29)	3.2.1-32	E
Turbocharger	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking-fatigue	Periodic Surveillance and Preventive Maintenance			H
Turbocharger	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-2 (A-27)	3.3.1-18	E

Table 3.3.2-13-1
Augmented Offgas (AOG) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-1: Augmented Offgas System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Filter housing	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Filter housing	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.E3-11 (AP-32)	3.3.1-84	C
Filter housing	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Tank	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tank	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.E3-11 (AP-32)	3.3.1-84	C

Table 3.3.2-13-1: Augmented Offgas System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.E3-11 (AP-32)	3.3.1-84	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C

Table 3.3.2-13-2
Condensate (C) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-2: Condensate System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-5 (SP-61)	3.4.1-15	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A

Table 3.3.2-13-3
Containment Air Dilution (CAD) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-3: Containment Air Dilution System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Duct	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tubing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E

Table 3.3.2-13-4
Condensate Demineralizer (CD) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-4: Condensate Demineralizer System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A

Table 3.3.2-13-5
Control Rod Drive (CRD) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management

Table 3.3.2-13-5: Control Rod Drive System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-13-5: Control Rod Drive System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C

Table 3.3.2-13-5: Control Rod Drive System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Strainer housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-13-5: Control Rod Drive System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C

Table 3.3.2-13-6
Core Spray (CS) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-6: Core Spray System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Bearing housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Bearing housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2-30 (EP-46)	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.3.2-13-6: Core Spray System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Valve body	Pressure boundary	Copper alloy > 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	V.D2-22 (EP-45)	3.2.1-6	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-28 (EP-32)	3.2.1-5	A

Table 3.3.2-13-7
Condensate Storage and Transfer (CST) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-7: Condensate Storage and Transfer System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VIII.H-1 (S-32)	3.4.1-22	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	System Walkdown			G
Orifice	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VIII.H-8 (S-41)	3.4.1-28	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VIII.H-8 (S-41)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A

Table 3.3.2-13-7: Condensate Storage and Transfer System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VIII.H-8 (S-41)	3.4.1-28	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – outdoor (ext)	Loss of material	System Walkdown			G
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-5 (SP-61)	3.4.1-15	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VIII.H-8 (S-41)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E-33 (S-09)	3.4.1-4	A

Table 3.3.2-13-8
RWCU Filter Demineralizer (CUFD) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-8: RWCU Filter Demineralizer System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-13-8: RWCU Filter Demineralizer System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J-13 (AP-51)	3.3.1-93	A

Table 3.3.2-13-8: RWCU Filter Demineralizer System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Sight glass	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Strainer housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

Table 3.3.2-13-8: RWCU Filter Demineralizer System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C

Table 3.3.2-13-9
Circulating Water (CW) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-9: Circulating Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VIII.H-1 (S-32)	3.4.1-22	E
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	None	None			G
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VIII.H-10 (S-42)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.E-6 (S-24)	3.4.1-31	E
Pump casing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VIII.H-10 (S-42)	3.4.1-28	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.E-6 (S-24)	3.4.1-31	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E

Table 3.3.2-13-9: Circulating Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.E-18 (SP-31)	3.4.1-32	E
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VIII.H-10 (S-42)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.E-6 (S-24)	3.4.1-31	E

Table 3.3.2-13-10
Diesel Generator & Auxiliaries (DG)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-10: Diesel Generator & Auxiliaries

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Compressor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Compressor housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Compressor housing	Pressure boundary	Carbon steel	Untreated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E, 302
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Untreated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E, 302

Table 3.3.2-13-10: Diesel Generator & Auxiliaries (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H2-24 (A-30)	3.3.1-20	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Piping	Pressure boundary	Carbon steel	Untreated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E, 302
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H2-24 (A-30)	3.3.1-20	E
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H2-9 (AP-44)	3.3.1-32	E

Table 3.3.2-13-10: Diesel Generator & Auxiliaries (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-8 (AP-12)	3.3.1-51	B
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H2-24 (A-30)	3.3.1-20	E
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B
Valve body	Pressure boundary	Carbon steel	Untreated air (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.H2-21 (A-23)	3.3.1-71	E, 302

Table 3.3.2-13-11
Diesel Lube Oil (DLO) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-11: Diesel Lube Oil								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tubing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2-20 (AP-30)	3.3.1-14	E

Table 3.3.2-13-12
Demineralized Water (DW) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-12: Demineralized Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C

Table 3.3.2-13-12: Demineralized Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.E3-11 (AP-32)	3.3.1-84	C
Piping	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tubing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C

Table 3.3.2-13-12: Demineralized Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Selective Leaching	VII.E3-11 (AP-32)	3.3.1-84	C
Valve body	Pressure boundary	Copper alloy > 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C

Table 3.3.2-13-13
Feedwater (FDW) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-13: Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-5 (SP-61)	3.4.1-15	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Cracking - fatigue	TLAA – metal fatigue	VIII.D2-6 (S-11)	3.4.1-1	A

Table 3.3.2-13-13: Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Treated water > 220°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2-7 (S-09)	3.4.1-4	A

Table 3.3.2-13-14
Fuel Oil (FO) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-14: Fuel Oil System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-6 (AP-54)	3.3.1-32	E
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-13-14: Fuel Oil System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-6 (AP-54)	3.3.1-32	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-3 (AP-44)	3.3.1-32	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-6 (AP-54)	3.3.1-32	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-10 (A-30)	3.3.1-20	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1-6 (AP-54)	3.3.1-32	E

Table 3.3.2-13-15
Fire Protection (FP) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-15: Fire Protection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-1 (AP-28)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	System Walkdown			G
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Piping	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A

Table 3.3.2-13-15: Fire Protection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – outdoor (ext)	Loss of material	System Walkdown			G
Tubing	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Fire Water System	VII.G-12 (A-45)	3.3.1-70	B
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	System Walkdown	VII.I-9 (A-78)	3.3.1-58	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G-24 (A-33)	3.3.1-68	B

Table 3.3.2-13-15: Fire Protection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G-14 (A-51)	3.3.1-85	A

Table 3.3.2-13-16
Fuel Pool Cooling (FPC) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-16: Fuel Pool Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.F1-10 (AP-41)	3.3.1-59	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C

Table 3.3.2-13-16: Fuel Pool Cooling System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-7 (AP-64)	3.3.1-31	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-13-16: Fuel Pool Cooling System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-11 (A-58)	3.3.1-24	A

Table 3.3.2-13-17
Fuel Pool Cooling Filter Demineralizer (FPFD) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-17: Fuel Pool Cooling Filter Demineralizer System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-7 (AP-64)	3.3.1-31	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C

Table 3.3.2-13-18
House Heating Boiler (HB) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-18: House Heating Boiler System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking - fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A-17 (S-15)	3.4.1-29	C
Piping	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			G, 305
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 305

Table 3.3.2-13-18: House Heating Boiler System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 305
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Steam trap	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A-17 (S-15)	3.4.1-29	C
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			G, 305
Steam trap	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Steam trap	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 305
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-13-18: House Heating Boiler System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 305
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-4 (AP-12)	3.3.1-51	E, 305
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A-17 (S-15)	3.4.1-29	C
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Loss of material	Water Chemistry Control – Auxiliary Systems			G, 305
Valve body	Pressure boundary	Carbon steel	Steam > 220°F (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

Table 3.3.2-13-18: House Heating Boiler System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E, 305

**Table 3.3.2-13-19
Hydraulic Control Units (HCU)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-13-19: Hydraulic Control Units

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-13-19: Hydraulic Control Units (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C

Table 3.3.2-13-20
High Pressure Coolant Injection (HPCI) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-20: High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-31 (E-07)	3.2.1-19	A
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C

Table 3.3.2-13-20: High Pressure Coolant Injection System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-31 (E-07)	3.2.1-19	A
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A

Table 3.3.2-13-21
Heating, Ventilation & Air Conditioning (HVAC) Systems
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-21: Heating, Ventilation & Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.F1-4 (A-105)	3.3.1-55	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.F1-2 (A-10)	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D
Heat exchanger (tubes)	Pressure Boundary	Carbon Steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Heat exchanger (tubes)	Pressure Boundary	Carbon Steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-5 (A-64)	3.3.1-77	D
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	D

Table 3.3.2-13-21: Heating, Ventilation & Air Conditioning Systems (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.F1-2 (A-10)	3.3.1-56	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	D

Table 3.3.2-13-22
Instrument Air (IA) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-22: Instrument Air System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Compressor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Compressor housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	D
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Piping	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-2 (A-26)	3.3.1-53	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C

Table 3.3.2-13-22: Instrument Air System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Strainer housing	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-2 (A-26)	3.3.1-53	E
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Tank	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
Trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Trap	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.D-3 (A-80)	3.3.1-57	A
Valve body	Pressure boundary	Carbon steel	Treated air (int)	Loss of material	Instrument Air Quality	VII.D-2 (A-26)	3.3.1-53	E
Valve body	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G-24 (A-33)	3.3.1-68	E

Table 3.3.2-13-23
MG Lube Oil (MGLO) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-23: MG Lube Oil System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Heat exchanger (shell)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-5 (A-64)	3.3.1-77	D
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-13-23: MG Lube Oil System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-8 (AP-47)	3.3.1-26	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1-17 (AP-30)	3.3.1-14	E

Table 3.3.2-13-24
Nitrogen (N2) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-24: Nitrogen System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A

Table 3.3.2-13-25
Nuclear Boiler (NB) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-25: Nuclear Boiler System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Flow element	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Flow element	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C

Table 3.3.2-13-25: Nuclear Boiler System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Flow element	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	C
Flow element	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Flow element	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Piping	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-34 (E-09)	3.2.1-19	C

Table 3.3.2-13-25: Nuclear Boiler System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	C
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C

Table 3.3.2-13-25: Nuclear Boiler System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Valve body	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-34 (E-09)	3.2.1-19	C
Valve body	Pressure boundary	Carbon steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E4-15 (A-61)	3.3.1-38	C
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C

Table 3.3.2-13-26
Neutron Monitoring (NM) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-26: Neutron Monitoring System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Nitrogen (int)	None	None	VII.J-19 (AP-22)	3.3.1-97	A

Table 3.3.2-13-27
Post-Accident Sampling System (PASS) System
Summary of Aging Management Evaluation

Table 3.3.2-13-27: Post-Accident Sampling System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C

Table 3.3.2-13-28
Primary Containment Atmosphere Control (PCAC) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-28: Primary Containment Atmosphere Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	System Walkdown	V.D2-16 (E-29)	3.2.1-32	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-13-28: Primary Containment Atmosphere Control System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C

Table 3.3.2-13-29
Potable Water (PW) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-29: Potable Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.G-24 (A-33)	3.3.1-68	E

Table 3.3.2-13-30
Reactor Building Closed Cooling Water (RBCCW) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-30: Reactor Building Closed Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-1 (A-63)	3.3.1-48	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-13-30: Reactor Building Closed Cooling Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J-13 (AP-51)	3.3.1-93	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B

Table 3.3.2-13-30: Reactor Building Closed Cooling Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-4 (AP-12)	3.3.1-51	B
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-14 (A-25)	3.3.1-47	B

Table 3.3.2-13-31
Reactor Core Isolation Cooling (RCIC) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-31: Reactor Core Isolation Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-31 (E-07)	3.2.1-19	A
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Rupture disk	Pressure Boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Rupture disk	Pressure Boundary	Carbon steel	Steam > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C

Table 3.3.2-13-31: Reactor Core Isolation Cooling System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Rupture Disk	Pressure Boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	V.D2-31 (E-07)	3.2.1-19	A
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.A-15 (S-04)	3.4.1-2	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A

Table 3.3.2-13-32
Radwaste, Liquid & Solid (RDW)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-32: Radwaste, Liquid & Solid								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Orifice	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.G-24 (A-33)	3.3.1-68	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.G-24 (A-33)	3.3.1-68	E
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C

Table 3.3.2-13-32: Radwaste, Liquid & Solid (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.G-24 (A-33)	3.3.1-68	E
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Strainer housing	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.G-24 (A-33)	3.3.1-68	E
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Tank	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.G-24 (A-33)	3.3.1-68	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Untreated water (int)	Loss of material	One-Time Inspection	VII.G-12 (A-45)	3.3.1-70	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C

Table 3.3.2-13-32: Radwaste, Liquid & Solid (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.G-24 (A-33)	3.3.1-68	E

Table 3.3.2-13-33
Residual Heat Removal (RHR) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-33: Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-4 (EP-25)	3.2.1-23	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F-12 (EP-18)	3.2.1-53	C
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.E-7 (E-44)	3.2.1-31	A

Table 3.3.2-13-33: Residual Heat Removal System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2-33 (E-08)	3.2.1-14	A

Table 3.3.2-13-34
RHR Service Water (RHRSW) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-34: RHR Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Tubing	Pressure boundary	Copper alloy < 15% Zn	Condensation (ext)	Loss of material	System Walkdown	VII.F1-16 (A-46)	3.3.1-25	E
Tubing	Pressure boundary	Copper alloy < 15% Zn	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-9 (A-44)	3.3.1-81	B
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E

Table 3.3.2-13-34: RHR Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B

Table 3.3.2-13-35
Equipment Retired in Place (RIP)
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-35: Equipment Retired in Place

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Untreated water (int)	Loss of material	One-Time Inspection	VII.G-24 (A-33)	3.3.1-68	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	One-Time Inspection	V.D2-16 (E-29)	3.2.1-32	E

Table 3.3.2-13-36
Reactor Water Clean-Up (RWCU) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-36: Reactor Water Clean-Up System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Filter housing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Filter housing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Filter housing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E

Table 3.3.2-13-36: Reactor Water Clean-Up System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.A4-2 (A-70)	3.3.1-23	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Orifice	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Piping	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A

Table 3.3.2-13-36: Reactor Water Clean-Up System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Pump casing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Pump casing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Strainer housing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Strainer housing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Strainer housing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Tank	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A

Table 3.3.2-13-36: Reactor Water Clean-Up System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Tubing	Pressure boundary	Copper alloy < 15% Zn	Air – indoor (ext)	None	None	V.F-3 (EP-10)	3.2.1-53	C
Tubing	Pressure boundary	Copper alloy < 15% Zn	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-9 (AP-64)	3.3.1-31	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Tubing	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking	Water Chemistry Control – BWR	VII.E3-16 (A-60)	3.3.1-37	E
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3-14 (A-62)	3.3.1-2	A
Valve body	Pressure boundary	Stainless steel	Treated water > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	A

Table 3.3.2-13-37
Standby Fuel Pool Cooling (SBFPC) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-37: Standby Fuel Pool Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	D
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	D
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	D

Table 3.3.2-13-38
Standby Gas Treatment (SBGT) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-38: Standby Gas Treatment System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.B-3 (E-26)	3.2.1-31	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-8 (E-18)	3.2.1-36	D
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.B-3 (E-26)	3.2.1-31	A
Sight glass	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-8 (E-18)	3.2.1-36	D
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F-6 (EP-15)	3.2.1-52	A
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	V.F-8 (EP-28)	3.2.1-52	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	V.B-3 (E-26)	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2-8 (E-18)	3.2.1-36	D

Table 3.3.2-13-39
Stator Cooling (SC) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-39: Stator Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Cooler	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Cooler	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Auxiliary Systems	VII.C2-14 (A-25)	3.3.1-47	E

Table 3.3.2-13-40
Standby Liquid Control (SLC) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-40: Standby Liquid Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Orifice	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A

Table 3.3.2-13-40: Standby Liquid Control System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J-8 (AP-14)	3.3.1-93	A
Sight glass	Pressure boundary	Glass	Sodium pentaborate solution (int)	None	None			G
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Sight glass	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Strainer housing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A

Table 3.3.2-13-40: Standby Liquid Control System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2-1 (AP-73)	3.3.1-30	A

Table 3.3.2-13-41
Sampling (SPL) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-41: Sampling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A

Table 3.3.2-13-41: Sampling System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-18 (A-35)	3.3.1-17	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3-15 (A-58)	3.3.1-24	C

Table 3.3.2-13-42
Service Water (SW) System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-13-42: Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-4 (AP-27)	3.3.1-43	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	C
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A

Table 3.3.2-13-42: Service Water System (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	System Walkdown	VII.I-8 (A-77)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	System Walkdown	VII.I-11 (A-81)	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-19 (A-38)	3.3.1-76	B
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	System Walkdown	VII.F1-1 (A-09)	3.3.1-27	E
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1-15 (A-54)	3.3.1-79	B

3.4 STEAM AND POWER CONVERSION SYSTEMS

3.4.1 Introduction

This section provides the results of the aging management review for components in the steam and power conversion systems that are subject to aging management review. These systems are within the scope of license renewal primarily due to their support of the MSIV leakage pathway and components supporting this intended function are grouped in one aging management review. Components in the MSIV leakage pathway are credited with dose reduction under accident conditions for offsite dose and control room habitability considerations. The MSIV leakage pathway starts at the main steam piping at the outlets of the MSIVs and includes the piping and components up to and including the main condenser. The boundary includes the turbine stop valves, turbine bypass valves, and drain lines for the main steam lines. The components included in this aging management review are from various system codes that interface with the main condenser and MSIV leakage pathway: AOG, AS, C, MS, NB, SPL, and 101. The AOG and SPL systems are described in Section 2.3.3.13, Miscellaneous Systems in Scope for (a)(2). The NB system is described in Section 2.3.1, Reactor Coolant System. NB components in main steam line drains are in the MSIV leakage pathway. The remaining systems are described as referenced below.

- auxiliary steam (Section 2.3.4.1)
- condensate (Section 2.3.4.2)
- main steam (Section 2.3.4.3)
- 101 (main steam, extraction steam, and auxiliary steam instruments) (Section 2.3.4.4)

Table 3.4.1, Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the steam and power conversion system component group. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.4.2 Results

The following tables summarize the results of aging management review and the NUREG-1801 comparison for the main condenser and MSIV leakage pathway.

- Table 3.4.2-1 Main Condenser and MSIV Leakage Pathway—Summary of Aging Management Evaluation

3.4.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for steam and power conversion system components in the main condenser and MSIV leakage pathway. Programs are described in Appendix B. Further details are provided in Table 3.4.2-1.

3.4.2.1.1 Main Condenser and MSIV Leakage Pathway

Materials

Main condenser and MSIV leakage pathway components are constructed of the following materials.

- carbon steel
- copper alloy > 15% zinc (inhibited)
- elastomer
- stainless steel

Environment

Main condenser and MSIV leakage pathway components are exposed to the following environments.

- air—indoor
- raw water
- steam > 270°F
- treated water

Aging Effects Requiring Management

The following aging effects associated with the main condenser and MSIV leakage pathway require management.

- cracking
- cracking-fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on main condenser and MSIV leakage pathway components.

- Flow-Accelerated Corrosion
- System Walkdown
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Cooling Water

3.4.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.4.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the VYNPS approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.4.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

3.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

1. Loss of material due to general, pitting and crevice corrosion for carbon steel piping and components exposed to treated water or steam is an aging effect requiring management in the steam and power conversion systems at VYNPS, and is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control—BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

   At VYNPS there are no tanks or steel heat exchanger components included in the steam and power conversion systems. The condenser is included as part of the main condenser and MSIV leakage pathway but has no aging effects requiring management since their intended function is for holdup and plateout of radioactive materials.

2. Loss of material due to general, pitting and crevice corrosion could occur for steel piping and components in steam and power conversion systems exposed to lubricating oil. The steam and power conversion systems at VYNPS have no carbon steel components with intended functions that are exposed to lubricating oil. This item is not applicable to VYNPS.

3.4.2.2.3 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC), and Fouling

Loss of material due to general, pitting, crevice, and MIC, and fouling could occur in steel piping, piping components, and piping elements exposed to raw water. The steam and power conversion systems at VYNPS have no carbon steel components with intended functions that are exposed to raw water. This item is not applicable to VYNPS.

3.4.2.2.4 Reduction of Heat Transfer due to Fouling

1. Reduction of heat transfer due to fouling could occur for stainless steel and copper alloy heat exchanger tubes exposed to treated water. The steam and

power conversion systems at VYNPS have no heat exchanger tubes with an intended function of heat transfer and associated aging effect of fouling. However, reduction of heat transfer is managed by the Water Chemistry Control – BWR Program for copper alloy heat exchanger tubes in the high pressure coolant injection and reactor core isolation cooling systems. The effectiveness of the Water Chemistry Control—BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

2. Reduction of heat transfer due to fouling could occur for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The steam and power conversion systems at VYNPS have no heat exchanger tubes with an intended function of heat transfer and associated aging effect of fouling. This item is not applicable to VYNPS.

3.4.2.2.5 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

1. Loss of material due to general, pitting and crevice corrosion, and MIC could occur in carbon steel (with or without coating or wrapping) piping, piping components, piping elements and tanks exposed to soil. The steam and power conversion systems at VYNPS have no carbon steel components that are exposed to soil. This item is not applicable to VYNPS.

2. Loss of material due to general, pitting and crevice corrosion, and MIC could occur in carbon steel heat exchanger components exposed to lubricating oil. The steam and power conversion systems at VYNPS have no heat exchanger components that are exposed to lubricating oil. This item is not applicable to VYNPS.

3.4.2.2.6 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to SCC in stainless steel components exposed to steam is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control—BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3.4.2.2.7 Loss of Material due to Pitting and Crevice Corrosion

1. Loss of material due to pitting and crevice corrosion for copper alloy components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The steam and power conversion systems at VYNPS have no stainless steel components with intended functions that are exposed to treated water.

There are no aluminum components in the steam and power conversion systems. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

2. Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements exposed to soil. The steam and power conversion systems at VYNPS have no stainless steel components that are exposed to soil. This item is not applicable to VYNPS.

3. Loss of material due to pitting and crevice corrosion could occur for copper alloy piping, piping components, and piping elements exposed to lubricating oil. The steam and power conversion systems at VYNPS have no copper alloy components with intended functions that are exposed to lubricating oil. This item is not applicable to VYNPS.

3.4.2.2.8 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

Loss of material due to pitting, crevice, and MIC could occur in stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil. The steam and power conversion systems at VYNPS have no stainless steel components with intended functions that are exposed to lubricating oil. This item is not applicable to VYNPS.

3.4.2.2.9 Loss of Material due to General, Pitting, Crevice, and Galvanic Corrosion

Loss of material due to general, pitting, crevice, and galvanic corrosion can occur for steel heat exchanger components exposed to treated water. The steam and power conversion systems at VYNPS have no steel heat exchanger components with intended functions that are exposed to treated water. This item is not applicable to VYNPS.

3.4.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of VYNPS quality assurance procedures and administrative controls for aging management programs.

3.4.2.3 Time-Limited Aging Analysis

The only TLAA identified for the steam and power conversion systems components is metal fatigue. This is evaluated in Section 4.3 of this application.

3.4.3 Conclusion

The steam and power conversion system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage aging effects for the steam and power conversion system components are identified in Section 3.4.2.1 and in the following table. A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging on steam and power conversion system components will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.4.1
Summary of Aging Management Programs for the Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-1	Steel piping, piping components, and piping elements exposed to steam or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. See Section 3.4.2.2.1
3.4.1-2	Steel piping, piping components, and piping elements exposed to steam	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	Consistent with NUREG-1801. Loss of material in steel components exposed to steam is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. This line applies to components in the ESF systems listed in Tables 3.2.2 and components in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-13-xx tables. See Section 3.4.2.2.2 item 1.
3.4.1-3	PWR only				

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-4	Steel piping, piping components, and piping elements exposed to treated water	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	Consistent with NUREG-1801. Loss of material in steel components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-13-xx tables. See Section 3.4.2.2.2 item 1.
3.4.1-5	Steel heat exchanger components exposed to treated water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no steel heat exchanger components exposed to treated water with intended functions in the steam and power conversion systems. See Section 3.4.2.2.9.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-6	Steel and stainless steel tanks exposed to treated water	Loss of material due to general (steel only) pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no steel or stainless steel tanks exposed to treated water with intended functions in the steam and power conversion systems. See Section 3.4.2.2.2 item 1.
3.4.1-7	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no steel components exposed to lubricating oil with intended functions in the steam and power conversion systems. See Section 3.4.2.2.2 item 2.
3.4.1-8	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling	Plant specific	Yes, plant specific	Not applicable. There are no steel components exposed to raw water with intended functions in the steam and power conversion systems. See Section 3.4.2.2.3.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-9	Stainless steel and copper alloy heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The reduction of heat transfer in copper alloy heat exchanger tubes exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. The components to which this NUREG-1801 line item applies are in the high pressure coolant injection and reactor core isolation cooling systems in Tables 3.2.2-4 and 3.2.2-5. See Section 3.4.2.2.4 item 1.
3.4.1-10	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no steel, stainless steel or copper alloy heat exchanger tubes exposed to lubricating oil with intended functions in the steam and power conversion systems. See Section 3.4.2.2.4 item 2.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-11	Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically-influenced 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	Not applicable. There are no steel components exposed to soil in the steam and power conversion systems. See Section 3.4.2.2.5 item 1.
3.4.1-12	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no steel heat exchanger components exposed to lubricating oil in the steam and power conversion systems. See Section 3.4.2.2.5 item 2.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-13	Stainless steel piping, piping components, piping elements exposed to steam	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Cracking in stainless steel components exposed to steam is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. See Section 3.4.2.2.6.
3.4.1-14	Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no stainless steel components exposed to treated water with intended functions in the steam and power conversion systems. See Section 3.4.2.2.6.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-15	Aluminum and copper alloy piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The loss of material in copper alloy components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-13-xx tables. There are no aluminum components with intended functions in the steam and power conversion systems. See Section 3.4.2.2.7 item 1.
3.4.1-16	Stainless steel piping, piping components, and piping elements; tanks, and heat exchanger components exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no stainless steel components exposed to treated water with intended functions in the steam and power conversion systems. See Section 3.4.2.2.7 item 1.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-17	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific	Not applicable. There are no stainless steel components exposed to soil with intended functions in the steam and power conversion systems. See Section 3.4.2.2.7 item 2.
3.4.1-18	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no copper alloy components exposed to lubricating oil with intended functions in the steam and power conversion systems. See Section 3.4.2.2.7 item 3.
3.4.1-19	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Not applicable. There are no stainless steel components exposed to lubricating oil with intended functions in the steam and power conversion systems. See Section 3.4.2.2.8.
3.4.1-20	Steel tanks exposed to air – outdoor (external)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Not applicable. There are no steel tanks exposed to outdoor air with intended functions in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable. High-strength steel closure bolting is not used in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-22	Steel bolting and closure bolting exposed to air with steam or water leakage, air – outdoor (external), or air – indoor uncontrolled (external);	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	The System Walkdown Program manages the loss of material for steel bolting through the use of visual inspections that are performed at least once per refueling cycle. Loss of preload is not an applicable aging effect. Loss of preload is a design driven effect and not an aging effect requiring management. Bolting at VYNPS is standard grade B7 carbon steel, or similar material, except in rare specialized applications such as where stainless steel bolting is utilized. Loss of preload due to stress relaxation (creep) would only be a concern in very high temperature applications (> 700°F) as stated in the ASME Code, Section II, Part D, Table 4. No VYNPS bolting operates at >700°F. Therefore, loss of preload due to stress relaxation (creep) is not an applicable aging effect for steam and power conversion systems. (continued below)

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					Other issues that may result in pressure boundary joint leakage are improper design or maintenance issues. Improper bolting application (design) and maintenance issues are current plant operational concerns and not related to aging effects or mechanisms that require management during the period of extended operation. To address these bolting operational concerns, VYNPS has taken actions to address NUREG–1339, “Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants.” These actions include implementation of good bolting practices in accordance with EPRI NP-5067, Good Bolting Practices. Proper joint preparation and make-up in accordance with industry standards is expected to preclude loss of preload. This has been confirmed by operating experience at VYNPS.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-23	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Not applicable. There are no stainless steel components exposed to closed cycle cooling water in the steam and power conversion systems.
3.4.1-24	Steel heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. There are no steel heat exchanger components exposed to closed cycle cooling water in the steam and power conversion systems.
3.4.1-25	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. The Water Chemistry Control – Closed Cooling Water Program manages loss of material for steel heat exchanger components.
3.4.1-26	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable. There are no copper alloy components exposed to closed cycle cooling water in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-27	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Not applicable. There are no heat exchanger tubes exposed to closed cycle cooling water in the steam and power conversion systems.
3.4.1-28	Steel external surfaces exposed to air – indoor uncontrolled (external), condensation (external), or air outdoor (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801 with exceptions. The System Walkdown Program manages the loss of material for external surfaces of steel components.
3.4.1-29	Steel piping, piping components, and piping elements exposed to steam or treated water	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Consistent with NUREG-1801. The Flow-Accelerated Corrosion Program manages loss of material in steel components exposed to steam. There are no steel components exposed to treated water with intended functions in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-30	Steel piping, piping components, and piping elements exposed to air outdoor (internal) or condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	The System Walkdown Program manages loss of material for steel components internally exposed to outdoor air. The System Walkdown Program manages loss of material for external carbon steel components by visual inspection of external surfaces. For systems where internal carbon steel surfaces are exposed to the same environment as external surfaces, external surfaces condition will be representative of internal surfaces. Thus, loss of material on internal carbon steel surfaces is also managed by the System Walkdown Program. The components to which this NUREG-1801 line item applies are listed in Table 3.3.2.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-31	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	For components of the circulating water system, the Periodic Surveillance and Preventive Maintenance Program manages loss of material for steel heat exchanger components exposed to raw water through periodic visual inspections. The circulating water system components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-13-xx tables.
3.4.1-32	Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System	No	The Periodic Surveillance and Preventive Maintenance Program manages loss of material for copper alloy components exposed to raw water through periodic visual inspections. There are no stainless steel components exposed to raw water with an intended function of pressure boundary in the steam and power conversion systems. The only components to which this NUREG-1801 line item applies are included in scope only under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-13-xx tables.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-33	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no stainless steel heat exchanger components exposed to raw water in the steam and power conversion systems.
3.4.1-34	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no heat exchanger tubes exposed to raw water with an intended function of heat transfer in the steam and power conversion systems.
3.4.1-35	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no copper alloy components subject to selective leaching in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-36	Gray cast iron piping, piping components, and piping elements exposed to soil, treated water, or raw water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no gray cast iron components exposed to raw water with intended functions in the steam and power conversion systems.
3.4.1-37	Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Consistent with NUREG-1801 for most systems. The loss of material in steel and stainless steel components exposed to steam is managed by the Water Chemistry Control – BWR Program. There are no nickel alloy components exposed to steam in the steam and power conversion systems. For components of the HVAC system exposed to steam from the house heating boiler system, listed in Table 3.3.2-10, the Water Chemistry Control – Auxiliary Systems Program manages loss of material.
3.4.1-38	PWR only				
3.4.1-39	PWR only				

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-40	Glass piping elements exposed to air, lubricating oil, raw water, and treated water	None	None	NA - No AEM or AMP	Not applicable. There are no glass components with intended functions in the steam and power conversion systems.
3.4.1-41	Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4.1-42	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. There are no steel components exposed to air – indoor controlled in the steam and power conversion systems.
3.4.1-43	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Not applicable. There are no steel or stainless steel components exposed to concrete in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-44	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Not applicable. There are no steel, stainless steel, aluminum, or copper alloy components exposed to gas in the steam and power conversion systems.

Notes for Table 3.4.2-1

Generic notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific notes

401. Aging management of the main condenser is not based on analysis of materials, environments and aging effects. Condenser integrity required to perform the post-accident intended function (holdup and plateout of MSIV leakage) is continuously confirmed by normal plant operation. This intended function does not require the condenser to be leak-tight, and the post-accident conditions in the condenser will be essentially atmospheric. Since normal plant operation assures adequate condenser pressure boundary integrity, the post-accident intended function to provide holdup volume and plateout surface is assured. Based on past precedence (NUREG-1796, Dresden and Quad Cities SER, Section 3.4.2.4.4, and NUREG-1769, Peach Bottom SER, Section 3.4.2.3), the staff concluded that main condenser integrity is continually verified during normal plant operation and no aging management program is required to assure the post-accident intended function.

Table 3.4.2-1
Main Condenser and MSIV Leakage Pathway
Summary of Aging Management Evaluation

3.4.2-1: Main Condenser and MSIV Leakage Pathway

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VIII.H-4 (S-34)	3.4.1-22	E
Bolting	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Condenser	Plateout	Carbon steel	Air - indoor (ext)	None	None			401
Condenser	Plateout	Carbon steel	Steam > 270°F (int)	None	None			401
Condenser	Plateout	Copper alloy > 15% Zn (inhibited)	Raw water (int)	None	None			401
Condenser	Plateout	Copper alloy > 15% Zn (inhibited)	Steam > 270°F (ext)	None	None			401
Condenser	Plateout	Stainless steel	Raw water (int)	None	None			401
Condenser	Plateout	Stainless steel	Steam > 270°F (ext)	None	None			401
Orifice	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A

3.4.2-1: Main Condenser and MSIV Leakage Pathway (Continued)								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Orifice	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Expansion joint	Plateout	Elastomer	Air - indoor (ext)	None	None			401
Expansion joint	Plateout	Elastomer	Steam > 270°F (int)	None	None			401
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA – metal fatigue			H
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Cooling Water	VIII.E-2 (S-25)	3.4.1-25	D
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A

3.4.2-1: Main Condenser and MSIV Leakage Pathway (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	B
Piping	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Steam trap	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Steam trap	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Steam trap	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	B
Steam trap	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Strainer housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Strainer housing	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Strainer housing	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A

3.4.2-1: Main Condenser and MSIV Leakage Pathway (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Thermowell	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Thermowell	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Thermowell	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	A
Thermowell	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			H
Thermowell	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	A
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	A
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			H

3.4.2-1: Main Condenser and MSIV Leakage Pathway (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	A
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System Walkdown	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue	VIII.B2-5 (S-08)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2-4 (S-15)	3.4.1-29	B
Valve body	Pressure boundary	Carbon steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-3 (S-05)	3.4.1-37	A
Valve body	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking	Water Chemistry Control – BWR	VIII.B2-1 (SP-45)	3.4.1-13	A
Valve body	Pressure boundary	Stainless steel	Steam > 270°F (int)	Cracking-fatigue	TLAA-metal fatigue			H
Valve body	Pressure boundary	Stainless steel	Steam > 270°F (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2-2 (SP-46)	3.4.1-37	A

3.5 STRUCTURES AND COMPONENT SUPPORTS

3.5.1 Introduction

This section provides the results of the aging management review for structural components and commodities that are subject to aging management review. The following structures and commodity groups are addressed in this section (descriptions are available in the referenced sections).

- primary containment (Section 2.4.1)
- reactor building (Section 2.4.2)
- intake structure (Section 2.4.3)
- process facilities (Section 2.4.4)
- yard structures (Section 2.4.5)
- bulk commodities (Section 2.4.6)

Table 3.5.1, Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for structures and component supports. Hyperlinks are provided to the program evaluations in Appendix B.

3.5.2 Results

The following tables summarize the results of aging management reviews and the NUREG-1801 comparison for structures and component supports.

- Table 3.5.2-1 Primary Containment (PC)—Summary of Aging Management Evaluation
- Table 3.5.2-2 Reactor Building (RB)—Summary of Aging Management Evaluation
- Table 3.5.2-3 Intake Structure (IS)—Summary of Aging Management Evaluation
- Table 3.5.2-4 Process Facilities—Summary of Aging Management Evaluation
- Table 3.5.2-5 Yard Structures—Summary of Aging Management Evaluation
- Table 3.5.2-6 Bulk Commodities—Summary of Aging Management Evaluation

3.5.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for structures and component supports. Programs are described in Appendix B. Further details are provided in the structure and commodities tables.

3.5.2.1.1 Primary Containment

Materials

Primary containment components are constructed of the following materials.

- carbon steel
- elastomer
- stainless steel
- concrete
- lubrite

Environment

Primary containment components are subject to the following environments.

- exposed to fluid environment
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with primary containment require management.

- change in material properties
- cracking
- cracking - fatigue
- cracking - cyclic loads
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on primary containment components.

- Containment Inservice Inspection (CII-IWE)
- Containment Leak Rate
- Inservice Inspection (ISI-IWF)
- Structures Monitoring

3.5.2.1.2 Reactor Building

Materials

Reactor building components are constructed of the following materials.

- aluminum
- carbon steel

- stainless steel
- concrete
- concrete block

Environment

Reactor building components are subject to the following environments.

- exposed to fluid environment
- exposed to weather
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with the reactor building require management.

- cracking
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the aging effects for the reactor building components.

- Fire Protection
- Masonry Wall
- Periodic Surveillance and Preventive Maintenance
- Structures Monitoring
- Water Chemistry Control – BWR

3.5.2.1.3 Intake Structure

Materials

Intake structure components are constructed of the following materials.

- aluminum
- carbon steel
- galvanized steel
- stainless steel
- concrete
- concrete block

Environment

Intake structure components are subject to the following environments.

- exposed to fluid environment

- exposed to weather
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with the intake structure requires management.

- cracking
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on intake structure components.

- Fire Protection
- Masonry Wall
- Structures Monitoring

3.5.2.1.4 Process Facilities

Materials

Process facilities components are constructed of the following materials.

- aluminum
- carbon steel
- concrete
- concrete block
- PVC
- wood

Environment

Process facilities components are subject to the following environments.

- exposed to fluid environment
- exposed to weather
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with the process facilities requires management.

- change in material properties
- cracking

- loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on process facilities components.

- Fire Protection
- Masonry Wall
- Structures Monitoring

3.5.2.1.5 Yard Structures

Materials

Yard structures components are constructed of the following materials.

- carbon steel
- galvanized steel
- stainless steel
- concrete
- concrete brick

Environment

Yard structures components are subject to the following environments.

- exposed to fluid environments
- exposed to weather
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with the yard structures requires management.

- loss of material
- cracking

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on yard structures components.

- Periodic Surveillance and Preventive Maintenance
- Structures Monitoring
- Vernon Dam FERC Inspection

3.5.2.1.6 Bulk Commodities

Materials

Bulk commodities are constructed of the following materials.

- aluminum
- carbon steel
- galvanized steel
- stainless steel
- concrete
- pyrocrete
- Stratafab®
- PVC
- elastomers
- fiberglass/ calcium silicate
- cera blanket
- cerafiber
- rubber

Environment

Bulk commodities are subject to the following environments.

- exposed to fluid environment
- exposed to weather
- protected from weather

Aging Effects Requiring Management

The following aging effects associated with bulk commodities require management.

- cracking
- cracking/delamination
- change in material properties
- loss of material
- separation

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on bulk commodities.

- Fire Protection
- Inservice Inspection (ISI-IWF)
- Periodic Surveillance and Preventive Maintenance

- Structures Monitoring
- Water Chemistry Control – BWR

3.5.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.5.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections, numbered in accordance with the corresponding discussions in NUREG-1800, explain the VYNPS approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Aging of Inaccessible Concrete Areas

VYNPS has a Mark I free standing steel containment located within the reactor building. Inaccessible and accessible concrete areas are designed in accordance with American Concrete Institute (ACI) specification ACI 318-63, Building Code Requirements for Reinforced Concrete, which results in low permeability and resistance to aggressive chemical solutions by requiring the following.

- high cement content
- low water-to-cement ratio
- proper curing
- adequate air entrainment

VYNPS concrete also meets requirements of later ACI guide ACI 201.2R-77, Guide to Durable Concrete, since both documents use the same American Society for Testing and Material (ASTM) standards for selection, application and testing of concrete.

The below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm). Concrete was provided with air content between 3% and 5% and a water/cement ratio between 0.44 and 0.60. Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not applicable for concrete in inaccessible areas. The absence of concrete aging effects is confirmed under the Structures Monitoring Program.

3.5.2.2.1.2 Crack and Distortion due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, Cracking and Differential Settlement due to Erosion of

Porous Concrete Subfoundations, if Not Covered by Structures Monitoring Program

VYNPS has a Mark I free standing steel containment located within the reactor building and supported by the reactor building foundation. VYNPS does not rely on a dewatering system for control of settlement. Category 1 structures are founded on sound bedrock which prevents significant settlement. Additionally, concrete within five feet of the highest known ground water level is protected by membrane waterproofing. This membrane protects the reactor building concrete against exposure to groundwater. VYNPS was not identified in IN 97-11 as a plant susceptible to erosion of porous concrete subfoundations. Groundwater was not aggressive during plant construction and there is no indication that groundwater chemistry has significantly changed. No changes in groundwater conditions have been observed at VYNPS.

As a result cracking and distortion due to increased stress levels from settlement; reduction of foundation strength, cracking and differential settlement due to erosion of porous concrete subfoundations are not applicable to VYNPS concrete structures.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

ASME Code, Section III, Division 2, Subsection CC indicates that aging due to elevated temperature exposure is not significant as long as concrete general area temperatures do not exceed 150°F and local area temperatures do not exceed 200°F. During normal operation, areas within primary containment are within these temperature limits. Therefore, reduction of strength and modulus of concrete structures due to elevated temperature is not an aging effect requiring management for VYNPS containment concrete.

3.5.2.2.1.4 Loss of Material due to General, Pitting and Crevice Corrosion

VYNPS containment is a Mark I steel containment located within the reactor building. VYNPS reactor building concrete in contact with the drywell shell is designed in accordance with specification ACI 318-63, Building Code Requirements for Reinforced Concrete. The concrete meets requirements of later ACI guide ACI 201.2R-77 since both documents use the same ASTM standards for selection, application and testing of concrete. Concrete is monitored for cracks under the Structures Monitoring Program. The drywell steel shell and the moisture barrier where the drywell shell becomes embedded in the drywell concrete floor are inspected in accordance with the Containment Inservice Inspection (IWE) Program and Structures Monitoring Program.

To prevent corrosion of the lower part of the drywell shell, the interior and exterior surfaces are protected from any contact with the atmosphere by complete concrete encasement. It is not credible for ground water to reach the drywell shell, assuming a crack in the concrete, since the concrete at this location is greater than 8 feet thick and poured in multiple separate horizontal planes. The exterior surface of the drywell shell at the sand cushion interface is effectively drained and protected from condensation or water that might enter the air gap from above. Therefore, significant corrosion of the drywell shell is not expected.

3.5.2.2.1.5 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

VYNPS is a Mark I containment structure and does not incorporate prestress concrete in its design. Therefore, loss of prestress due to relaxation, shrinkage, creep, and elevated temperature is not an applicable aging effect.

3.5.2.2.1.6 Cumulative Fatigue Damage

TLAA are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. Fatigue TLAAs for the steel drywell, torus, and associated penetrations are evaluated and documented in Section 4.6.

3.5.2.2.1.7 Cracking due to Stress Corrosion Cracking (SCC)

NUREG-1801 recommends further evaluation of inspection methods to detect cracking due to SCC since visual VT-3 examinations may be unable to detect this aging effect. Potentially susceptible components at VYNPS are penetration sleeves and bellows.

Stress corrosion cracking becomes significant for stainless steel if tensile stresses and a corrosive environment exist. The stresses may be applied (external) or residual (internal). The normal environment inside the drywell is dry. The penetration components are not exposed to corrosive environments. Therefore, stress corrosion cracking is not an aging effect requiring management for the penetration sleeves and bellows, since the conditions necessary for SCC do not exist.

3.5.2.2.1.8 Cracking due to Cyclic Loading

Cyclic loading can lead to cracking of penetration sleeves, penetration bellows, and torus pool steel. If a CLB analysis does not exist, further evaluation is recommended of inspection methods to detect cracking due to cyclic loading since visual VT-3 examinations may be unable to detect this aging effect.

The analysis of cracking due to cyclic loading of the drywell, torus, and associated penetrations is a TLAA which is evaluated as documented in Section 4.6.

3.5.2.2.1.9 Loss of Material (Scaling, Cracking, and Spalling) due to Freeze-Thaw

VYNPS has a Mark I free standing steel containment located within the reactor building. Loss of material (scaling, cracking, and spalling) due to freeze-thaw is applicable only to concrete containments. Therefore, loss of material and cracking due to freeze-thaw do not apply.

3.5.2.2.1.10 Cracking due to Expansion and Reaction with Aggregate, and Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide

VYNPS has a Mark I free standing steel containment located within the reactor building. In accordance with NUREG-1801, aging management is not required because VYNPS containment concrete (basemat) is designed in accordance with specification ACI 318-63, Building Code Requirements for Reinforced Concrete and concrete specification requires that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM C-289 and C-295.

3.5.2.2.2 Safety Related and Other Structures and Component Supports

3.5.2.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program

VYNPS concrete structures subject to aging management review are included in the Structures Monitoring Program. This is true for concrete items even if the aging management review did not identify aging effects requiring management. Aging effects discussed below for structural steel items are also addressed by the Structures Monitoring Program. Additional discussion of specific aging effects follows.

1. Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling) Due to Corrosion of Embedded Steel for Groups 1-5, 7, 9 Structures

   The aging mechanisms associated with cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are applicable only to below-grade concrete/grout structures owing to the slightly acidic pH of groundwater. The below-grade environment for VYNPS is not aggressive and concrete is designed in accordance with specification ACI 318-63, Building Code Requirements for Reinforced Concrete, which results in low permeability and resistance to aggressive chemical solutions by providing a high cement, low water/cement ratio (between 0.44 and 0.60), proper curing and adequate air content between 3 percent and 5 percent. Therefore, cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not aging effects requiring management for VYNPS Groups 1-5, 7, 9 structures.

2. Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling) Due to Aggressive Chemical Attack for Groups 1-5, 7, 9 Structures

   Aggressive chemical attack becomes significant to concrete exposed to an aggressive environment. Resistance to mild acid attack is enhanced by using a dense concrete with low permeability and a low water-to-cement ratio of less than 0.50. These groups of structures at VYNPS use a dense, low permeable concrete with an average water-to-cement ratio of 0.48, which provides an acceptable degree of protection against aggressive chemical attack. Water chemical analysis results confirm that the site groundwater is considered to be non-aggressive. VYNPS concrete is constructed in accordance with the recommendations in ACI 201.2R-77 for durability.

   VYNPS below-grade environment is not aggressive. Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack are not aging effects requiring management for VYNPS Groups 1-5, 7, 9 concrete structures.

3. Loss of Material Due to Corrosion for Groups 1-5, 7, 8 Structures

   VYNPS Structures Monitoring Program will be used to manage aging effect requiring management for VYNPS Groups 1-5, 7, 8 structures.

4. Loss of Material (Spalling, Scaling) and Cracking Due to Freeze-Thaw for Groups 1-3, 5, 7-9 Structures

   Aggregates were in accordance with specifications and materials conforming to ACI and ASTM standards. VYNPS structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318, and air entrainment percentages were within the range prescribed in NUREG-1801. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw are not aging effects requiring management for VYNPS Groups 1-3, 5, 7-9 structures.

5. Cracking Due to Expansion and Reaction with Aggregates for Groups 1-5, 7-9 Structures

   Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction, which are in accordance with the recommendations in ACI 201.2R-77 for concrete durability. VYNPS structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318, and air entrainment percentages were within the range prescribed in NUREG-1801. Therefore, cracking due to expansion and reaction with aggregates for Groups 1-3, 5, 7-9 structures is not an aging effect requiring management for VYNPS concrete.

6. Cracks and Distortion Due to Increased Stress Levels from Settlement for Groups 1-3, 5-9 Structures

   VYNPS Class 1 structures are founded on sound bedrock or supported by steel pilings which prevent significant settlement. Therefore, cracks and distortion due to increased stress levels from settlement are not aging effects requiring management for VYNPS Groups 1-3, 5-9 Structures.

7. Reduction in Foundation Strength, Cracking, Differential Settlement Due to Erosion of Porous Concrete Subfoundation for Groups 1-3, 5-9 Structures

   VYNPS structures are not constructed of porous concrete. Concrete was provided in accordance with ACI 318 requirements resulting in dense, well-cured, high-strength concrete with low-permeability. Therefore, reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation are not aging effects requiring management for VYNPS Groups 1-3, 5-9 structures.

8. Lock Up Due to Wear for Lubrite® Radial Beam Seats in BWR Drywell and Other Sliding Support Surfaces

   Owing to the wear-resistant material used, the low frequency (number of times) of movement, and the slow movement between sliding surfaces, lock-up due to wear is not considered to be an aging effect requiring management at VYNPS. However, Lubrite® plates are included within the Structures Monitoring Program and Inservice Inspection (ISI-IWF) Program to confirm the absence of aging effects requiring management for this component.

3.5.2.2.2.2 Aging Management of Inaccessible Areas

VYNPS concrete for Group 1-3, 5 and 7-9 inaccessible concrete areas was provided in accordance with specification ACI 318-63, Building Code Requirements for Reinforced Concrete, which requires the following, resulting in low permeability and resistance to aggressive chemical solution.

- high cement content
- low water permeability
- proper curing
- adequate air entrainment

VYNPS concrete also meets requirements of later ACI guide ACI 201.2R-77, Guide to Durable Concrete, since both documents use the same ASTM standards for selection, application and testing of concrete.

Inspections of accessible concrete have not revealed degradation related to corrosion of embedded steel. VYNPS below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm). Therefore, corrosion of embedded steel is not an aging effect requiring management for VYNPS concrete.

3.5.2.2.2.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

Group 1-5 concrete elements do not exceed the temperature limits associated with aging degradation due to elevated temperature. Therefore, reduction of strength and modulus of concrete due to elevated temperatures is not an aging effect requiring management for VYNPS.

3.5.2.2.2.4 Aging Management of Inaccessible Areas for Group 6 Structures

For inaccessible areas of certain Group 6 structures aging effect are covered by inspections in accordance with the Structures Monitoring Program.

1. Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)/Aggressive Chemical Attack; and Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)/Corrosion of Embedded Steel in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   Below-grade exterior reinforced concrete at VYNPS is not exposed to an aggressive environment (pH less than 5.5), or to chloride or sulfate solutions beyond defined limits (greater than 500 ppm chloride, or greater than 1500 ppm sulfate). Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel are not an aging effect requiring management for below-grade inaccessible concrete areas of VYNPS Group 6 structures.

2. Loss of Material (Spalling, Scaling) and Cracking Due to Freeze-thaw in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction. VYNPS structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318, and air entrainment percentages were within the range prescribed in NUREG-1801. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw are not aging effects requiring management for VYNPS Groups 6 structures below-grade.

3. Cracking Due to Stress Corrosion Cracking (SCC), Reaction with Aggregates, Increase in Porosity and Permeability, and Loss of Strength Due to Leaching of Calcium Hydroxide in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction, which are in accordance with the recommendations in ACI 201.2R-77 for concrete durability. VYNPS structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318-63, and air entrainment percentages were within the range prescribed in NUREG-1801. VYNPS below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm).

   Therefore, cracking due to expansion and reaction with aggregates, increase in porosity and permeability due to leaching of calcium hydroxide in below grade inaccessible concrete areas of Group 6 structures is not an aging mechanism for VYNPS concrete.

3.5.2.2.2.5 Cracking due to Stress Corrosion Cracking and Loss of Material due to Pitting and Crevice Corrosion

No tanks with stainless steel liners are included in the structural aging management reviews. Tanks subject to aging management review are evaluated with their respective mechanical systems.

3.5.2.2.2.6 Aging of Supports Not Covered by Structures Monitoring Program

NUREG-1801 recommends further evaluation of certain component support/aging effect combinations if they are not covered by the applicant's Structure Monitoring Program. Components supports at VYNPS are included in the Structures Monitoring Program for Groups B2 through B5 and Inservice Inspection (IWF) Program for Group B1.

(1) Reduction in concrete anchor capacity due to degradation of the surrounding concrete for Groups B1 through B5 supports

   VYNPS concrete anchors and surrounding concrete are included in the Structures Monitoring Program (Groups B2 through B5) and Inservice Inspection (IWF) Program (Group B1).

(2) Loss of material due to general and pitting corrosion, for Groups B2-B5 supports

Loss of material due to corrosion of steel support components is an aging effect requiring management at VYNPS. This aging effect is managed by the Structures Monitoring Program.

(3) Reduction/loss of isolation function due to degradation of vibration isolation elements for Group B4 supports

The VYNPS aging management review did not identify any component support structure/aging effect combination corresponding to NUREG-1801 Volume 2 Item III.B4.2-a.

3.5.2.2.2.7 Cumulative Fatigue Damage due to Cyclic Loading

TLAA are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4 of this application. During the process of identifying TLAAs in the VYNPS current licensing basis, no fatigue analyses were identified for component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3.

3.5.2.2.3 <u>Quality Assurance for Aging Management of Nonsafety-Related Components</u>

See Appendix B Section B.0.3 for discussion of VYNPS quality assurance procedures and administrative controls for aging management programs.

3.5.2.3 Time-Limited Aging Analyses

Potential TLAA identified for structural components and commodities include reactor vessel and drywell bellows, drywell to torus vent system, drywell to torus ventline bellows, torus shell, primary containment and torus penetrations. These topics are discussed in Section 4.6.

3.5.3 <u>Conclusion</u>

The structural components and commodities subject to aging management review have been identified in accordance with the criteria of 10 CFR 54.21. The aging management programs selected to manage the effects of aging on structural components and commodities are identified in the following tables and Section 3.5.2.1. A description of the aging management programs is provided in Appendix B of this application, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the structural components and commodities will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

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Table 3.5.1
Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
PWR Concrete (Reinforced and Prestressed) and Steel Containment BWR Concrete (Mark II and III) and Steel (Mark I, II, and III) Containment					
3.5.1-1	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment (as applicable).	Aging of accessible and inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	ISI (IWL) and for inaccessible concrete, an examination of representative samples of below-grade concrete and periodic monitoring of groundwater if environment is nonaggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if the environment is aggressive	Not applicable. The listed concrete elements apply to PWR containments and concrete BWR containments. VYNPS containment is a Mark I steel containment.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-2	Concrete elements; All	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. 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.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. VYNPS containment is a steel containment. Concrete elements are limited to floor slab and reactor vessel pedestal. These elements are not subject to the listed aging effect because they are founded on the reactor building base slab.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-3	Concrete elements: foundation, subfoundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. If a dewatering system is relied upon to control 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.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. VYNPS containment is a Mark I steel containment.
3.5.1-4	Concrete elements: dome, wall, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable)	Reduction of strength and modulus due to elevated temperature	A plant-specific aging management program is to be evaluated	Yes, plant-specific if temperature limits are exceeded	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. VYNPS is a Mark I steel containment.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-5	Steel elements: Drywell; torus; drywell head; embedded shell and sand pocket regions; drywell support skirt; torus ring girder; downcomers; liner plate, ECCS suction header, support skirt, region shielded by diaphragm floor, suppression chamber (as applicable)	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes, if corrosion is significant for inaccessible areas	Containment Inservice Inspection and Containment Leak Rate Program will manage this aging effect. Containment inservice inspection is a plant-specific program for VYNPS. Corrosion is not significant for inaccessible areas (i.e., drywell steel shell). To prevent corrosion of the lower part of the drywell, the interior and exterior surfaces are protected from contact with the atmosphere by complete concrete encasement. Concrete is designed in accordance with ACI standards and monitored under the Structures Monitoring Program. (continued)

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					The drywell steel where the drywell shell is embedded is inspected in accordance with the Containment Inservice Inspection (IWE) Program and Structures Monitoring Program. See Section 3.5.2.2.1.4
3.5.1-6	Steel elements: steel liner, liner anchors, integral attachments	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes, if corrosion is significant for inaccessible areas	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. VYNPS containment is a Mark I steel containment.
3.5.1-7	Prestressed containment tendons	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. This is applicable only to PWR and BWR prestressed concrete containments. VYNPS containment is a Mark I steel containment.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-8	Steel and stainless steel elements: vent line, vent header, vent line bellows; downcomers	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	See Section 3.5.2.2.1.6.
3.5.1-9	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. See Section 3.5.2.2.1.6.
3.5.1-10	Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J and additional appropriate examinations/ evaluations for bellows assemblies and dissimilar metal welds	Yes, detection of aging effects is to be evaluated	Not applicable. See Section 3.5.2.2.1.7.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-11	Stainless steel vent line bellows	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examination/ evaluation for bellows assemblies and dissimilar metal welds	Yes, detection of aging effects is to be evaluated	Not applicable. See Section 3.5.2.2.1.7.
3.5.1-12	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J supplemented to detect fine cracks	Yes, detection of aging effects is to be evaluated	Containment Inservice Inspection and Containment Leak Rate Programs will manage this aging effect. The Containment Inservice Inspection Program includes augmented ultrasonic exams to detect fine cracks.
3.5.1-13	Steel, stainless steel elements, dissimilar metal welds: torus; vent line; vent header; vent line bellows; downcomers	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J supplemented to detect fine cracks	Yes, detection of aging effects is to be evaluated	Containment Inservice Inspection and Containment Leak Rate Programs will manage this aging effect. The Containment Inservice Inspection Program includes augmented ultrasonic exams to detect fine cracks.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-14	Concrete elements: dome, wall, basemat ring girder, buttresses, containment (as applicable)	Loss of material (Scaling, cracking, and spalling) due to freeze-thaw	ISI (IWL) Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for plants located in moderate to severe weathering conditions	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. VYNPS containment is a Mark I steel containment.
3.5.1-15	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable).	Cracking due to expansion and reaction with aggregate; increase in porosity, permeability due to leaching of calcium hydroxide	ISI (IWL) for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. VYNPS containment is a Mark I steel containment.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-16	Seals, gaskets, and moisture barriers	Loss of sealing and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ISI (IWE) and 10 CFR Part 50, Appendix J	No	The aging effects cited in the NUREG-1801 item are loss of sealing and leakage. Loss of sealing is a consequence of the aging effects cracking and change in material properties. For VYNPS, the Containment Leak Rate Program manages cracking and change in material properties. Seals and gaskets are not included in the Containment Inservice Inspection Program at VYNPS.
3.5.1-17	Personnel airlock, equipment hatch and CRD hatch locks, hinges, and closure mechanisms	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms	10 CFR Part 50, Appendix J and Plant Technical Specifications	No	Locks, hinges, and closure mechanisms are active components and are therefore, not subject to aging management review. 10 CFR Part 50, Appendix J and VYNPS technical specifications require testing to ensure leak tightness of airlocks and hatches.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-18	Steel penetration sleeves and dissimilar metal welds; personnel airlock, equipment hatch and CRD hatch	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Containment Inservice Inspection and Containment Leak Rate Programs will manage this aging effect. Containment inservice inspection is a plant-specific program for VYNPS.
3.5.1-19	Steel elements: stainless steel suppression chamber shell (inner surface)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable. This is applicable to stainless steel suppression chambers. The VYNPS suppression chamber is carbon steel.
3.5.1-20	Steel elements: suppression chamber liner (interior surface)	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable. NUREG-1801 Volume 2 items referencing this item are associated with concrete containments. VYNPS containment is a Mark I steel containment.
3.5.1-21	Steel elements: drywell head and downcomer pipes	Fretting or lock up due to mechanical wear	ISI (IWE)	No	VYNPS plant operating experience has not identified fretting or lock up due to mechanical wear for the drywell head and downcomers.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-22	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion	ISI (IWL)	No	Not applicable. VYNPS containment is a Mark I steel containment without prestressed tendons.
Safety-Related and Other Structures; and Component Supports					
3.5.1-23	All Groups except Group 6: interior and above grade exterior concrete	Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Corrosion of embedded steel becomes significant if exposed to an aggressive environment. Corrosion is not significant if the concrete has a low water-to-cement ratio, low permeability, and is designed in accordance with ACI Standards (ACI-318 or ACI-349). Loss of bond is included with cracking for the purpose of this review. The design and construction of these structures at VYNPS prevents corrosion of embedded steel. See Section 3.5.2.2.2.1(1) for further discussion. Nonetheless, components are included in the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-24	All Groups except Group 6: interior and above grade exterior concrete	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Listed aging effects do not require management at VYNPS. See Section 3.5.2.2.2.1 (2) for further discussion. Nonetheless, components are included in the Structures Monitoring Program.
3.5.1-25	All Groups except Group 6: steel components: all structural steel	Loss of material due to corrosion	Structures Monitoring Program. If protective coatings are relied upon to manage the effects of aging, the structures monitoring program is to include provisions to address protective coating monitoring and maintenance.	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Structures Monitoring Program manages loss of material. Protective coatings are not relied upon to mange the effects of aging. In some cases the Structures Monitoring Program is supplemented by Periodic Surveillance and Preventive Maintenance and Fire Protection Programs.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-26	All Groups except Group 6: accessible and inaccessible concrete: foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, if not within the scope of the applicant's structures monitoring program or for plants located in moderate to severe weathering conditions	Freeze-thaw is not an applicable aging mechanism for these groups of structures at VYNPS. See Section 3.5.2.2.2.1(4) for further discussion. Nonetheless, components are included in the Structures Monitoring Program.
3.5.1-27	All Groups except Group 6: accessible and inaccessible interior/exterior concrete	Cracking due to expansion due to reaction with aggregates	Structures Monitoring Program None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if not within the scope of the applicant's structures monitoring program or concrete was not constructed as stated for inaccessible areas	Reaction with aggregates is not an applicable aging mechanism for concrete for these groups of structures at VYNPS. See Section 3.5.2.2.2.1(5) for further discussion. Nonetheless, components are included in the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-28	Groups 1-3, 5-9: all	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. 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.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	VYNPS structures are founded on compacted sand subgrade associated with bedrock. Plant operating experience has not identified settlement of structures resulting in cracks and distortion of component structures; therefore, cracks and distortion are not aging effects requiring management. See discussion in Section 3.5.2.2.2.1(6).

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-29	Groups 1-3, 5-9: foundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. 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.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	VYNPS structures are founded on compacted sand subgrade associated with bedrock. Plant operating experience has not identified settlement of structures resulting is cracks and distortion of component structures; therefore, the listed aging effects do not require management. See discussion in Section 3.5.2.2.2.1(7).

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-30	Group 4: Radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; Steam generator supports	Lock-up due to wear	ISI (IWF) or Structures Monitoring Program	Yes, if not within the scope of ISI or structures monitoring program	Lubrite plates are used in the drywell beam seats at VYNPS. Lubrite materials for nuclear applications are designed to resist deformation, have a low coefficient of friction, resist softening at elevated temperatures, resist corrosion, withstand high intensities of radiation, and will not score or mar; therefore, they are not susceptible to aging effects requiring management. Nonetheless, lubrite components associated with the drywell beam seats are included in the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-31	Groups 1-3, 5, 7-9: below-grade concrete components, such as exterior walls below grade and foundation	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures monitoring Program; Examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if environment is aggressive	VYNPS concrete has a low water-to-cement ratio, low permeability, and designed in accordance with ACI Standards (ACI-318 or ACI-349). The design and construction of these groups of structures at VYNPS prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Loss of bond is included with cracking for the purpose of this review. Aging effects are not significant for accessible and inaccessible below-grade areas. See discussion in Section 3.5.2.2.2.1(2).

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-32	Groups 1-3, 5, 7-9: exterior above and below grade reinforced concrete foundations	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	VYNPS concrete has a low water-to-cement ratio, low permeability, and designed in accordance with ACI Standards (ACI-318 or ACI-349). The design and construction of these groups of structures at VYNPS prevents the effect of this aging from occurring; therefore, this aging effect does not require management. See Section 3.5.2.2.2.1 (2). Nonetheless, components are included in the Structures Monitoring Program.
3.5.1-33	Groups 1-5: concrete	Reduction of strength and modulus due to elevated temperature	Plant-specific	Yes, plant-specific if temperature limits are exceeded	VYNPS concrete elements do not exceed specified temperature limits. See discussion in Section 3.5.2.2.2.3.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-34	Group 6: Concrete; all	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack; Cracking, loss of bond, loss of material due to corrosion of embedded steel	Insp of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs, and for inaccessible concrete, exam of rep. samples of below-grade concrete, and periodic monitoring of groundwater, if environment is non-aggressive. Plant specific if environment is aggressive.	Yes, plant-specific if environment is aggressive	The listed aging effects are not significant for accessible and inaccessible areas because VYNPS ground water is non-aggressive. Loss of bond is included with cracking for the purpose of this review. The Structures Monitoring Program will confirm the absence of aging effects requiring management for VYNPS Group 6 components exposed to a fluid environment.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-35	Group 6: exterior above and below grade concrete foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for plants located in moderate to severe weathering conditions	Aging effects are not significant for accessible and inaccessible areas. These concrete structures are exposed to saturated water conditions near the ground surface; however, the concrete used at VYNPS is designed with entrained air content of between 4% and 6% in conformance with ACI-301, and plant experience has not identified any degradation related to freeze-thaw. Nonetheless, the Structures Monitoring Program will confirm the absence of aging effects requiring management for VYNPS Group 6 concrete components.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-36	Group 6: all accessible/ inaccessible reinforced concrete	Cracking due to expansion/ reaction with aggregates	Accessible areas: Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Reaction with aggregates is not an applicable aging mechanism for VYNPS concrete components. See Section 3.5.2.2.2.1(5) for additional discussion. Nonetheless, the Structures Monitoring Program will confirm the absence of aging effects requiring management for VYNPS Group 6 concrete components.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-37	Group 6: exterior above and below grade reinforced concrete foundation interior slab	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide	For accessible areas, Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. See Section 3.5.2.2.2.4(3).
3.5.1-38	Groups 7, 8: Tank liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Plant-specific	Yes, plant specific	There are no concrete or steel tanks with stainless steel liners in the scope of VYNPS license renewal
3.5.1-39	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Structures Monitoring Program will manage aging effects identified by this line item.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-40	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	VYNPS concrete components are designed in accordance with accepted ACI standards. Plant experience has not identified reduction in concrete anchor capacity or other concrete aging mechanisms. Nonetheless, the Structures Monitoring Program will confirm absence of aging effects requiring management for VYNPS concrete components.
3.5.1-41	Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	No vibration isolation elements at VYNPS are in scope and subject to aging management review.
3.5.1-42	Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. No CLB fatigue analysis exists.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-43	Groups 1-3, 5, 6: all masonry block walls	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program	No	Consistent with NUREG-1801 for masonry walls within the station. The Masonry Wall Program manages this aging effect. In some cases a Masonry Wall Program is supplemented by Fire Protection Program. The Vernon Dam FERC Inspection Program manages masonry wall cracking at the Vernon Dam facility.
3.5.1-44	Group 6 elastomer seals, gaskets, and moisture barriers	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	No	Loss of sealing is a consequence of elastomer cracking and change in material properties. Component types include: moisture barrier, compressible joints and seals used for seismic gaps, and fire barrier seals. The Structures Monitoring Program manages cracking and change in material properties.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-45	Group 6: exterior above and below grade concrete foundation; interior slab	Loss of material due to abrasion, cavitation	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance	No	Abrasion and cavitation due to flowing water are insignificant at VYNPS due to the low flow velocities for these structures. Nonetheless, the Structures Monitoring Program will confirm absence of aging effects requiring management for VYNPS Group 6 concrete components. Loss of material of structural steel components of the Vernon Dam are managed by the Vernon Dam FERC Inspection Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-46	Group 5: Fuel pool liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Water Chemistry and Monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channel.	No	At VYNPS, the Water Chemistry Control Program manages aging effects on the spent fuel pool liner. Monitoring spent fuel pool water level in accordance with technical specifications and monitoring leakage from the leak chase channels will also continue during the period of extended operation. Cracking due to stress corrosion is not an aging effect requiring management for treated water < 140°F. There are no stainless steel spent fuel components with intended functions exposed to treated water > 60°C (> 140°F).

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-47	Group 6: all metal structural members	Loss of material due to general (steel only), pitting and crevice corrosion	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. If protective coatings are relied upon to manage aging, protective coating monitoring and maintenance provisions should be included.	No	The listed aging management program is not used. The Structures Monitoring Program will confirm absence of aging effects requiring management for VYNPS Group 6 steel components. Loss of material of structural steel components of the Vernon Dam are managed by the Vernon Dam FERC Inspection Program.
3.5.1-48	Group 6: earthen water control structures - dams, embankments, reservoirs, channels, canals, and ponds	Loss of material, loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs.	No	Not applicable. VYNPS does not have earthen water control structures.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-49	Support members; welds; bolted connections; support anchorage to building structure	Loss of material/ general, pitting, and crevice corrosion	Water Chemistry and ISI (IWF)	No	This aging effect is managed by the VYNPS Water Chemistry Control and ISI-IWF Programs.
3.5.1-50	Groups B2, and B4: galvanized steel, aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program	No	Not applicable. The ambient environment at VYNPS is not chemically polluted by vapors of sulfur dioxide or other similar substances and the external environment does not contain saltwater or high chlorides. Therefore, loss of material due to pitting and crevice corrosion is not an aging effect requiring management for aluminum, stainless steel and galvanized steel components exposed to the external environment.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-51	Group B1.1: high strength low-alloy bolts	Cracking due to stress corrosion cracking; loss of material due to general corrosion	Bolting Integrity	No	SCC of high strength anchor bolts is not an aging effect requiring management at VYNPS for two reasons. (1) High strength bolting at VYNPS is not exposed to a corrosive environment or high tensile stresses. (2) High strength structural bolts are installed with friction-type contact surfaces via the turn-of-the-nut method; therefore, for bolts greater than 1" in diameter, a significant preload (in the order of 70% of ultimate strength) is not practical to develop. The VYNPS ISI-IWF Program manages loss of material for high strength low-alloy bolts.
3.5.1-52	Groups B2, and B4: sliding support bearing and sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Structures Monitoring Program	No	Loss of mechanical function due to the listed mechanisms is not an aging effect. Proper design prevents distortion, overload, and fatigue due to vibratory and cyclic thermal loads.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-53	Groups B1.1, B1.2, and B1.3: support members: welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	ISI (IWF)	No	This aging effect is managed by the VYNPS ISI-IWF Program.
3.5.1-54	Groups B1.1, B1.2, and B1.3: Constant and variable load spring hangers; guides; stops	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Loss of mechanical function due to the listed mechanisms is not an aging effect. Proper design prevents distortion, overload, and fatigue due to vibratory and cyclic thermal loads.
3.5.1-55	PWR only				

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-56	Groups B1.1, B1.2, and B1.3: Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Lubrite plates are used in the torus support saddles at VYNPS. Lubrite materials for nuclear applications are designed to resist deformation, have a low coefficient of friction, resist softening at elevated temperatures, resist corrosion, withstand high intensities of radiation, and will not score or mar; therefore, they are not susceptible to aging effects requiring management. Nonetheless, lubrite components associated with the torus supports are included in the VYNPS ISI-IWF Program.
3.5.1-57	Groups B1.1, B1.2, and B1.3: Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	ISI (IWF)	No	No supports with vibration isolation elements have been identified in the scope of license renewal for VYNPS.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-58	Galvanized steel and aluminum support members; welds; bolted connections; support anchorage to building structure exposed to air - indoor uncontrolled	None	None	None NA - No AEM or AMP	Consistent with NUREG 1801.
3.5.1-59	Stainless steel support members; welds; bolted connections; support anchorage to building structure	None	None	NA - No AEM or AMP	Consistent with NUREG 1801.

Notes for Table 3.5.2-1 through 3.5.2-6

Generic notes

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP takes some exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with material, environment, aging effect, and aging management program for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

D. Component is different, but consistent with material, environment, aging effect, and aging management program for NUREG-1801 line item. AMP takes some exceptions to NUREG-1801 AMP description.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific notes

501. The VYNPS environment is not conducive to the listed aging effects. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.

502. Loss of insulating characteristics due to insulation degradation is not an aging effect requiring management for insulation material. Insulation products, which are made from fiberglass fiber, calcium silicate, stainless steel, and similar materials, that are protected from weather do not experience aging effects that would significantly degrade their ability to insulate as designed. A review of site operating experience identified no aging effects for insulation used at VYNPS.

503. The ambient environment at VYNPS is not chemically polluted by vapors of sulfur dioxide or other similar substances and the external environment does not contain saltwater or high chloride content. Therefore, aging management is not required for aluminum, stainless steel and galvanized steel components exposed to the external environment.

504. Steel piles driven in undisturbed soils show no significant effects due to corrosion, regardless of the soil type or soil properties. Likewise, piles driven in disturbed soil above the water table zone do not reflect any significant corrosion. Therefore, aging management is not required.

Table 3.5.2-1
Primary Containment (PC)
Summary of Aging Management Evaluation

Table 3.5.2-1: Primary Containment								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bellows (reactor vessel and drywell)	PB, SSR	Stainless steel	Protected from weather	Cracking - cyclic loading	CII-IWE Containment Leak Rate	II.B1.1-3 (C-20)	3.5.1-13	C
CRD removal hatch	EN, FLB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-6 (C-16)	3.5.1-18	E
Drywell head	EN, FLB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Drywell shell	EN, FLB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Drywell shell protection panels (jet deflectors)	EN, MB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	C

Table 3.5.2-1: Primary Containment (Continued)								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Drywell sump liner	SSR	Carbon steel	Exposed to fluid environment	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Drywell to torus vent line bellows	PB, SSR	Stainless steel	Protected from weather	Cracking - cyclic loading	CII-IWE Containment Leak Rate	II.B1.1-3 (C-20)	3.5.1-13	E
Drywell to torus vent system	PB, SSR	Carbon steel	Protected from weather	Cracking - Fatigue	TLAA – metal fatigue	II.B1.1-4 (C-21)	3.5.1-8	A
Drywell to torus vent system	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Equipment hatch	EN, FLB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-6 (C-16)	3.5.1-18	E
Personnel airlock	EN, FLB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-6 (C-16)	3.5.1-18	E
Primary containment electrical penetrations	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-1 (C-12)	3.5.1-18	E

Table 3.5.2-1: Primary Containment (Continued)								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Primary containment mechanical penetrations (includes those with bellows)	PB, SSR	Carbon steel	Protected from weather	Cracking - cyclic loading	CII-IWE Containment Leak Rate	II.B4-3 (C-14)	3.5.1-12	E
Reactor vessel support assembly	SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Reactor vessel stabilizer supports	SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Sacrificial shield wall lateral supports	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	C
Sacrificial shield wall (steel portion)	EN, MB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	C
Structural steel: plates, columns and beams	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	C
Torus electrical penetrations	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-1 (C-12)	3.5.1-18	E
Torus external supports (columns, saddles)	SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E

Table 3.5.2-1: Primary Containment (Continued)

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Torus manway	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus mechanical penetrations	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B4-1 (C-12)	3.5.1-18	E
Torus ring girder	SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus ring girder	SSR	Carbon steel	Exposed to fluid environment	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus shell	HS, PB, SSR	Carbon steel	Protected from weather	Cracking - Fatigue	TLAA – metal fatigue	II.B1.1-4 (C-21)	3.5.1-8	E
Torus shell	HS, PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus shell	HS, PB, SSR	Carbon steel	Exposed to fluid environment	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E

Table 3.5.2-1: Primary Containment (Continued)

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Torus thermowell	PB, SSR	Carbon steel	Protected from weather	Loss of material	CII-IWE Containment Leak Rate	II.B1.1-2 (C-19)	3.5.1-5	E
Vent header support	SSR	Carbon steel	Exposed to fluid environment	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Drywell sump	FLB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Equipment hatch concrete plug	EN, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Floor slabs, walls	EN, FLB, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Foundation	EN, FLB, MB, PB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Reactor vessel support pedestal	SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Sacrificial shield wall (concrete portion)	EN, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Drywell floor liner seal	EN, SSR	Elastomer	Protected from weather	Cracking Change in material properties	Structures Monitoring	II.B4-7 (C-18)	3.5.1-16	E

Table 3.5.2-1: Primary Containment (Continued)								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Primary containment electrical penetration seals and sealant	PB, SSR	Elastomer	Protected from weather	Cracking Change in material properties	Containment Leak Rate	II.B4-7 (C-18)	3.5.1-16	E
Lubrite sliding supports	SSR	Lubrite	Protected from weather	None	ISI-IWF Structures Monitoring			I, 501

Table 3.5.2-2
Reactor Building (RB)
Summary of Aging Management Evaluation

Table 3.5.2-2: Reactor Building								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Blowout or blow-off panels	EN, PB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	C
Blowout or blow-off panels	EN, PB, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	C
Equipment lock (sliding doors)	EN, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring Periodic Surveillance and Preventive Maintenance	III.A1-12 (T-11)	3.5.1-25	C
Metal partition walls	EN, FB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring Fire Protection	III.A1-12 (T-11)	3.5.1-25	C
Metal siding	EN, FB, PB	Aluminum	Exposed to weather	None	None			F
New fuel storage racks	EN, SSR	Aluminum	Protected from weather	None	None	III.B5-2 (TP-8)	3.5.1-58	C
RCIC steel enclosure	EN, FB, SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring Fire Protection	III.A1-12 (T-11)	3.5.1-25	C

Table 3.5.2-2: Reactor Building (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Reactor building crane, rails, and girders	SNS	Carbon steel	Protected from weather	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.B-3 (A-07)	3.3.1-73	E
Refueling platform	SNS	Carbon steel	Protected from weather	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.B-3 (A-07)	3.3.1-73	E
Spent fuel pool liner plate and gates	EN, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR Spent fuel pool level monitoring per Tech Spec and monitoring leak chase from the channel leakage	III.A5-13 (T-14)	3.5.1-46	C
Spent fuel pool storage racks	SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR			H
Structural steel: beams, columns, plates, trusses	EN, MB, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	C
Beams, columns, floor slabs, and interior walls	EN, FB, FLB, MB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501

Table 3.5.2-2: Reactor Building (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Biological shield wall	EN, MB, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Exterior walls below elev 254’	FLB, PB, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Exterior walls above elev 254’	FB, MB, PB, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Foundation	FLB, PB, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Masonry walls	EN, FB, MB, SNS, SSR	Concrete block	Protected from weather	Cracking	Masonry Wall Fire Protection	III.A1-11 (T-12)	3.5.1-43	A
New fuel storage vault	EN, MB, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Spent fuel pool bottom slab and walls	EN, MB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Sump	SSR	Concrete	Exposed to fluid environment	None	Structures Monitoring			I, 501

Table 3.5.2-3
Intake Structure (IS)
Summary of Aging Management Evaluation

Table 3.5.2-3: Intake Structure								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Metal siding	SRE	Aluminum	Exposed to weather	None	None			F
Structural steel: beams, columns, plates	EN, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural steel: beams, columns, plates	EN, SNS, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural steel: beams, columns, plates	EN, SNS, SSR	Galvanized steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural steel: beams, columns, plates	EN, SNS, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Beams, columns, floor slabs, interior walls	EN, FB, FLB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Exterior walls below grade (SW area)	SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-7 (T-20)	3.5.1-45	E

Table 3.5.2-3: Intake Structure (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Exterior walls below grade (CWS area)	FLB, SNS	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-7 (T-20)	3.5.1-45	E
Exterior walls above grade (CWS area)	SNS	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Exterior walls above grade (SW area)	FB, FLB, MB, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Foundation	EN, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-7 (T-20)	3.5.1-45	E
Interior walls below grade	FLB, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-7 (T-20)	3.5.1-45	E
Masonry walls	EN, FB, SRE	Concrete block	Protected from weather	Cracking	Masonry Wall Fire Protection	III.A6-10 (T-12)	3.5.1-43	A
Roof slab	FB, MB, SNS,SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501

Table 3.5.2-4
Process Facilities
Summary of Aging Management Evaluation

Table 3.5.2-4: Process Facilities								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Blowout or blow-off panels	EN, PB, SNS, SSR	Aluminum	Protected from weather	None	None	III.B5-2 (TP-8)	3.5.1-58	C
Blowout or blow-off panels	EN, PB, SNS, SSR	Aluminum	Exposed to weather	None	None			I, 503
Blowout or blow-off panels	EN, PB, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Control room ceiling support system	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Crane rails and girders	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	VII.B-3 (A-07)	3.3.1-73	E
Metal partition walls	EN, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Metal siding	EN, PB	Aluminum	Exposed to weather	None	None			F
Steel piles	SNS	Carbon steel	Exposed to weather	None	None			I, 504
Structural steel: beams, columns, plates	EN, SNS, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E

Table 3.5.2-4: Process Facilities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Structural steel: beams, columns, plates	EN, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	A
Structural steel: beams, columns, plates	EN, SNS, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	C
Turbine north shield wall	MB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Beams, columns, floor slab, interior walls	EN, FB, FLB MB, PB, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Exterior walls above grade	HS, SNS	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-7 (T-20)	3.5.1-45	E
Exterior walls above grade	FLB, MB, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Exterior walls below grade	HS, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-7 (T-20)	3.5.1-45	E
Foundation (cooling tower)	EN, HS, SNS	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-7 (T-20)	3.5.1-45	E
Foundations	FLB, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501

Table 3.5.2-4: Process Facilities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Masonry wall	EN, FB, FLB, MB, SRE	Concrete block	Protected from weather	Cracking	Masonry Wall Fire Protection	III.A1-11 III.A3-11 (T-12)	3.5.1-43	A
Plant stack	EN, SNS, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Plant stack	EN, SNS, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Roof slab	EN, FB, MB, PB, SNS, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring Fire Protection			I, 501
Turbine west shield wall	EN	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Cooling cell No. 2-1	HS, SNS	Wood	Exposed to fluid environment	Loss of material Cracking and change in material properties	Structures Monitoring			J
Cooling cell No. 2-1	HS, SNS	Wood	Exposed to weather	Loss of material Cracking and change in material properties	Structures Monitoring			J

Table 3.5.2-4: Process Facilities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Cooling cell No. 2-2	SNS	Wood	Exposed to fluid environment	Loss of material Cracking and change in material properties	Structures Monitoring			J
Cooling cell No. 2-2	SNS	Wood	Exposed to weather	Loss of material Cracking and change in material properties	Structures Monitoring			J
Cooling tower fill	HS	PVC	Exposed to fluid environment	Cracking Change in material properties	Structures Monitoring			J
Pipe supports	SNS	Wood	Exposed to fluid environment	Loss of material Cracking and change in material properties	Structures Monitoring			J
Pipe supports	SNS	Wood	Exposed to weather	Loss of material Cracking and change in material properties	Structures Monitoring			J

Table 3.5.2-5
Yard Structures
Summary of Aging Management Evaluation

Table 3.5.2-5: Yard Structures								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
CST enclosure	EN	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
CO_2 tank enclosure	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Fuel oil transfer pump house structural steel	EN, MB, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
John Deere diesel building	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
N_2 tank steel supports	SNS	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
N_2 tank steel supports	SNS	Stainless steel	Exposed to weather	None	None			I, 503
N_2 tank enclosure	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Switchyard relay house	SRE	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Transmission towers	SRE	Galvanized steel	Exposed to weather	None	None			I, 503

Table 3.5.2-5: Yard Structures (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Vernon Dam structural steel	SRE	Carbon steel	Exposed to weather	Loss of material	Vernon Dam FERC Inspection	III.A6-11 (T-21)	3.5.1-47	E
Vernon Dam structural steel	SRE	Carbon steel	Protected from weather	Loss of material	Vernon Dam FERC Inspection	III.A6-11 (T-21)	3.5.1-47	E
Vernon Dam structural steel	SRE	Carbon steel	Exposed to fluid environment	Loss of material	Vernon Dam FERC Inspection	III.A6-11 (T-21)	3.5.1-47	E
CST enclosure wall	EN, MB, SNS	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Duct banks	EN	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Foundation (tanks, startup transformer, switchyard relay house, transmission towers, Vernon-tie transformer, John Deere diesel building)	SNS, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Fuel oil tank exterior walls above grade	MB, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Fuel oil tank exterior walls below grade	MB, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Fuel oil transfer pump house exterior wall	FLB, MB, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501

Table 3.5.2-5: Yard Structures (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG 1801 Vol. 2 Item	Table 1 Item	Notes
Fuel oil transfer pump house roof slab	MB, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Manholes and handholes	EN	Concrete	Exposed to weather	None	Periodic Surveillance and Preventive Maintenance			I, 501
N_2 tank restraining wall	SNS	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Trenches	EN, FLB, MB, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Vernon Dam external walls above/below grade	SRE	Concrete	Exposed to fluid environment	Loss of material	Vernon Dam FERC Inspection	III.A6-7 (T-20)	3.5.1-45	E
Vernon Dam external walls, floor slabs and interior walls	SRE	Concrete	Protected from weather	None	Vernon Dam FERC Inspection			I, 501
Vernon Dam masonry walls	SRE	Concrete brick	Exposed to weather	Cracking	Vernon Dam FERC Inspection	III.A6-10 (T-12)	3.5.1-43	E

Table 3.5.2-6
Bulk Commodities
Summary of Aging Management Evaluation

Table 3.5.2-6: Bulk Commodities								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR ISI-IWF	III.B1.1-11 (TP-10)	3.5.1-49	E
Anchorage / embedments	SNS, SRE, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR ISI-IWF	III.B1.1-11 (TP-10)	3.5.1-49	E
Base plates	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Base plates	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Battery racks	SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Cable tray	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	C
Cable tray	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Cable tray support	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
Cable tray support	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Component and piping supports ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Component and piping supports ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Component and piping supports	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Component and piping supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Conduit	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Conduit	SNS, SRE, SSR	Galvanized steel	Exposed to weather	None	None			I, 503
Conduit support	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
Conduit support	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
Conduit support	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Conduit support	SNS, SRE, SSR	Galvanized steel	Exposed to weather	None	None			I, 503

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Damper framing	FB	Carbon steel	Protected from weather	Loss of material	Fire Protection	III.B2-10 (T-30)	3.5.1-39	E
Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B3-3 (TP-11)	3.5.1-58	A
Electrical and instrument panels and enclosures	EN, SNS, SRE, SSR	Galvanized steel	Exposed to weather	None	None			I, 503
Fire doors	FB	Carbon steel	Protected from weather	Loss of material	Fire Protection	VII.G-3 (A-21)	3.3.1-63	C
Fire hose reels	SRE	Carbon steel	Protected from weather	Loss of material	Fire Protection	III.B2-10 (T-30)	3.5.1-39	E
Flood curb	EN, FLB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 III.A3-12 (T-11)	3.5.1-25	C

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flood curb	EN, FLB	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	A
Flood, pressure and specialty doors	EN, FLB, MB, PB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 III.A3-12 (T-11)	3.5.1-25	C
Flood, pressure and specialty doors	EN, FLB, MB, PB	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 III.A3-12 (T-11)	3.5.1-25	C
HVAC duct supports	SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
HVAC duct supports	SNS, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Instrument line support	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Instrument line supports	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
Instrument racks, frames, and tubing trays	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	A

Table 3.5.2-6: Bulk Commodities (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG 1801 Vol. 2 Item	Table 1 Item	Notes
Instrument racks, frames, and tubing trays	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Manway hatches and hatch covers	EN, FLB, MB, PB, SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 III.A3-12 (T-11)	3.5.1-25	C
						III.A6-11 (T-21)	3.5.1-47	E
Manway hatches and hatch covers	EN, FLB, MB, PB, SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 III.A3-12 (T-11)	3.5.1-25	C
						III.A6-11 (T-21)	3.5.1-47	E
Mirror insulation	INS, SNS	Stainless steel	Protected from weather	None	None	III.B1.3-7 (TP-5)	3.5.1-59	C, 502
Missile shields	EN, MB	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Monorails	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	VII.B-3 (A-07)	3.3.1-73	E

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Penetration sleeves (mechanical/electrical not penetrating primary containment boundary)	FLB, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	C
Pipe whip restraints	EN, SNS, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Stairway, handrail, platform, decking, and ladder (including torus catwalk)	SNS	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Stairway, handrail, platform, decking, and ladder (including torus catwalk)	SNS	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	A
Vents and louvers	SNS, SRE, SSR	Aluminum	Exposed to weather	None	None			I, 503
Vents and louvers	SNS, SRE, SSR	Carbon steel	Protected from weather	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	C
Vents and louvers	SNS, SRE, SSR	Carbon steel	Exposed to weather	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	C

Table 3.5.2-6: Bulk Commodities (Continued)

Structure and/or Component/ Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG 1801 Vol. 2 Item	Table 1 Item	Notes
Anchor bolts	SNS, SRE, SSR	Carbon steel (threaded fasteners)	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchor bolts	SNS, SRE, SSR	Carbon steel (threaded fasteners)	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Anchor bolts	SNS, SRE, SSR	Carbon steel (threaded fasteners)	Exposed to weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchor bolts	SNS, SRE, SSR	Carbon steel (threaded fasteners)	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Anchor bolts	SNS, SRE, SSR	Stainless steel (threaded fasteners)	Exposed to weather	None	None			I, 503

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
ASME Class 1, 2, 3 and MC Supports bolting	SNS, SRE, SSR	Carbon steel (threaded fasteners)	Protected from weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
ASME Class 1, 2, 3 and MC Supports bolting	SNS, SRE, SSR	Carbon steel (threaded fasteners)	Exposed to weather	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Structural bolting	SNS, SRE, SSR	Carbon steel (threaded fasteners)	Protected from weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Structural bolting	SNS, SRE, SSR	Carbon steel (threaded fasteners)	Exposed to weather	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Structural bolting	SNS, SRE, SSR	Carbon steel (threaded fasteners)	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Structural bolting	SNS, SRE, SSR	Stainless steel (threaded fasteners)	Protected from weather	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5 (TP-5)	3.5.1-59	A
Structural bolting	SNS, SRE, SSR	Stainless steel (threaded fasteners)	Exposed to weather	None	None			I, 503
Structural bolting	SNS, SRE, SSR	Galvanized steel	Protected from weather	None	None	III.B5-3 (TP-11)	3.5.1-58	A
Structural bolting	SNS, SRE, SSR	Galvanized steel	Exposed to weather	None	None			I, 503
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Fire proofing	FB	Pyrocrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Flood curbs	FLB	Concrete	Protected from weather	None	Structures Monitoring			I, 501

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Manway hatches and hatch covers	EN, FB, FLB, MB, PB, SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring Fire Protection			I, 501
Missile shields	MB	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Support pedestals	SNS, SRE, SSR	Concrete	Protected from weather	None	Structures Monitoring			I, 501
Support pedestals	SNS, SRE, SSR	Concrete	Exposed to weather	None	Structures Monitoring			I, 501
Support pedestals	SNS, SRE, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-7 (T-20)	3.5.1-45	E
Fire stops	FB, PB	Cera blanket	Protected from weather	Cracking/ delamination Separation	Fire Protection			J
Fire wrap	FB	Cerafiber, cera blanket	Protected from weather	Loss of material	Fire Protection			J
Insulation	INS, SNS	Fiberglass/ calcium silicate Stratafab®	Protected from weather	None	None			J, 502

Table 3.5.2-6: Bulk Commodities (Continued)								
Structure and/or Component/ Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG 1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Penetration sealant (fire, flood, radiation)	EN, FB, FLB, PB, SNS	Elastomer	Protected from weather	Cracking Change in material properties	Fire Protection Structures Monitoring	VII.G-1 (A-19)	3.3.1-61	C
Seals and gaskets (doors, manways and hatches)	PB, SSR	Rubber	Protected from weather	Cracking Change in material properties	Periodic Surveillance and Preventive Maintenance	II.B4-7 (C-18)	3.5.1-16	E
					Structures Monitoring	III.A6-12 (TP-7)	3.5.1-44	
Seismic isolation joint	FB, SSR	Elastomers	Protected from weather	Cracking Change in material properties	Fire Protection	VII.G-1 (A-19)	3.3.1-61	C
Water stops	FLB	PVC	Protected from weather	None	None			J

3.6 ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1 Introduction

This section provides the results of the aging management review for electrical components which are subject to aging management review. Consistent with the methods described in NEI 95-10, the electrical and I&C aging management reviews focus on commodity groups rather than systems. The following electrical commodity groups requiring aging management review are addressed in this section.

- insulated cables and connections
- transmission conductors
- switchyard bus
- high voltage insulators

Table 3.6.1, Summary of Aging Management Programs for Electrical Components Evaluated in Chapter VI of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the electrical and I&C components. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.6.2 Results

Table 3.6.2-1, Electrical and I&C (EIC) Components—Summary of Aging Management Evaluation, summarizes the results of aging management reviews and the NUREG-1801 comparison for electrical and I&C components.

3.6.2.1 Materials, Environment, Aging Effects Requiring Management, and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for electrical and I&C components subject to aging management review. Programs are described in Appendix B. Further details are provided in the system tables.

Materials

Electrical and I&C components subject to aging management review are constructed of the following materials.

- aluminum
- copper and copper alloys
- galvanized metal
- organic polymers
- steel and steel alloys
- porcelain

Environment

Electrical and I&C components subject to aging management review are exposed to the following environments.

- heat and air
- radiation and air
- moisture and voltage stress
- outdoor weather

Aging Effects Requiring Management

The following aging effects associated with electrical and I&C components require management.

- reduced insulation resistance (IR)

Aging Management Programs

The following aging management programs will manage the effects of aging on electrical and I&C components:

- Non-EQ Insulated Cables and Connections
- Non-EQ Instrumentation Circuits Test Review
- Non-EQ Inaccessible Medium-Voltage Cable

3.6.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.6.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections, numbered corresponding to the discussions in NUREG-1800, explain the VYNPS approach to these areas requiring further evaluation. Programs are described in Appendix B of this application.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Environmental qualification analysis are TLAAs as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in Section 4.4 of this application.

3.6.2.2.2 Degradation of Insulator Quality due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear

The discussion in NUREG-1800 concerns effects of these aging mechanisms on high voltage insulators.

The insulators evaluated for VYNPS license renewal are those used to support uninsulated, high-voltage electrical components such as transmission conductors and switchyard buses.

Various airborne materials such as dust, salt and industrial effluents can contaminate insulator surfaces. The buildup of surface contamination in most areas is washed away by rain. The glazed insulator surface aids this contamination removal. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. VYNPS is not located near the seacoast where salt spray is considered. At VYNPS contamination build-up on insulators is not a concern. Therefore, surface contamination is not an applicable aging mechanism for high-voltage insulators at VYNPS.

Mechanical wear is an aging effect for strain and suspension insulators in that they are subject to movement. Wear has not been apparent during routine inspections. If left unmanaged for the period of extended operation surface rust would not cause a loss of intended function and thus is not a significant concern. Loss of material due to wear will not cause a loss of intended function of the insulators. Therefore, loss of material is not an aging effect requiring management for insulators.

There are no aging effects requiring management for VYNPS high-voltage insulators.

3.6.2.2.3 Loss of Material due to Wind Induced Abrasion and Fatigue, Loss of Conductor Strength due to Corrosion, and Increased Resistance of Connection due to Oxidation or Loss of Pre-load

Transmission conductors are uninsulated, stranded electrical cables used outside buildings in high voltage applications. The transmission conductor commodity group includes the associated fastening hardware, but excludes the high-voltage insulators. Major active equipment assemblies include their associated transmission conductor terminations.

Transmission conductors are subject to aging management review if they are necessary for recovery of offsite power following an SBO. At VYNPS, transmission conductors located between switchyard breakers K-1/K-186 and startup transformers T-3-1A/T-3-1B support recovery from an SBO event. Other transmission conductors are not subject to aging management review since they do not perform a license renewal intended function.

Switchyard bus is uninsulated, un-enclosed, rigid electrical conductors used in medium and high voltage applications. Switchyard bus includes the hardware used to secure the bus to high-voltage insulators. Switchyard bus establishes electrical connections to disconnect switches, switchyard breakers, and transformers. Switchyard bus located at the disconnect switches at the Vernon Hydroelectric

Station switchyard are necessary for connecting the alternate AC power source from the Vernon dam to essential station switchgear are subject to aging management review. Also, switchyard bus located at the switchyard breakers K-1/K-186 and at startup transformers T-3-1A/T-3-1B that support recovery from an SBO event are subject to aging management review. Other switchyard bus does not require aging management review since they do not perform a license renewal intended function.

Connection surface oxidation for aluminum switchyard bus is not applicable since switchyard bus connections requiring AMR are welded connections. For ambient environmental conditions at VYNPS, no aging effects have been identified that could cause a loss of intended function for the period of extended operation. Vibration is not applicable since flexible connectors connect switchyard bus. Therefore, there are no aging effects requiring management for aluminum switchyard bus.

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of VYNPS quality assurance procedures and administrative controls for aging management programs.

3.6.2.3 Time-Limited Aging Analysis

The only TLAAs identified for the electrical and I&C commodity components are evaluations for environmental qualification (EQ). The EQ TLAA is evaluated in Section 4.4 of this application.

3.6.3 Conclusion

The electrical and I&C components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21(a)(1). The aging management programs selected to manage aging effects for the electrical and I&C components are identified in Section 3.6.2.1 and in the following tables. A description of aging management programs is provided in Appendix B of this application, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Based on the demonstrations provided in Appendix B, the effects of aging associated with electrical and I&C components will be managed such that there is reasonable assurance the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.6.1
Summary of Aging Management Programs for the Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-1	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental qualification of electric components	Yes, TLAA	EQ equipment is not subject to aging management review because it is replaced based on qualified life. EQ analyses are evaluated as TLAAs in Section 4.4.
3.6.1-2	Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements	Reduced insulation resistance (IR) and electrical failure due to various physical, thermal, radiolytic, photolytic and chemical mechanisms	Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG-1801. The Non-EQ Insulated Cables and Connections Program will manage the effects of aging.
3.6.1-3	Conductor insulation for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance (IR)	Reduced insulation resistance (IR) and electrical failure due to various physical, thermal, radiolytic, photolytic and chemical mechanisms	Electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG-1801. Management of aging effects will be provided by the Non-EQ Instrumentation Circuits Test Review Program. This program includes review of calibration and surveillance testing results of instrumentation circuits.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-4	Conductor insulation for inaccessible medium-voltage (2kV to 35kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	Localized damage and breakdown of insulation leading to electrical failure due to moisture intrusion, water trees	Inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG-1801. The Non-EQ Inaccessible Medium-Voltage Cable Program will manage the effects of aging. This program includes inspection of medium-voltage cables exposed to significant moisture and voltage and testing as required.
3.6.1-5	PWR only				
3.6.1-6	Fuse holders (not part of a larger assembly) - metallic clamp	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse holders	No	NUREG-1801 aging effect is not applicable to VYNPS. A review of VYNPS documents indicated that fuse holders utilizing metallic clamps are either part of an active device or located in circuits that perform no license renewal intended function. Therefore, fuse holders with metallic clamps at VYNPS are not subject to aging management review.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-7	Metal enclosed bus – Bus / connections	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal Enclosed Bus	No	NUREG-1801 aging effect is not applicable to VYNPS. An evaluation of phase bus for VYNPS determined that VYNPS does not have any phase bus that supports a license renewal function. Therefore, phase bus at VY is not subject to aging management review.
3.6.1-8	Metal enclosed bus – Insulation / insulators	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure due to thermal/ thermoxidative degradation of organics / thermoplastics, radiation-induced oxidation; moisture/debris intrusion, and ohmic heating	Metal Enclosed Bus	No	NUREG-1801 aging effect is not applicable to VYNPS. An evaluation of metal enclosed bus for VYNPS determined that VYNPS does not have any phase bus that supports a license renewal function. Therefore, metal enclosed bus at VY is not subject to aging management review.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1 (Continued)					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-9	Metal enclosed bus – Enclosure assemblies	Loss of material due to general corrosion	Structures monitoring program	No	NUREG-1801 aging effect is not applicable to VYNPS. An evaluation of metal enclosed bus for VYNPS determined that VYNPS does not have any phase bus that supports a license renewal function. Therefore, metal enclosed bus at VY is not subject to aging management review.
3.6.1-10	Metal enclosed bus – Enclosure assemblies	Hardening and loss of strength / elastomers degradation	Structures monitoring program	No	NUREG-1801 aging effect is not applicable to VYNPS. An evaluation of metal enclosed bus for VYNPS determined that VYNPS does not have any phase bus that supports a license renewal function. Therefore, metal enclosed bus at VY is not subject to aging management review.
3.6.1-11	High voltage insulators	Degradation of insulation quality due to presence of any salt deposits and surface contamination; loss of material caused by mechanical wear due to wind blowing on transmission conductors	Plant specific	Yes, plant specific	NUREG-1801 aging effect is not applicable to VYNPS. See Section 3.6.2.2.2 for further evaluation.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1 (Continued)

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-12	Transmission conductors and connections; Switchyard bus and connections	Loss of material due to wind induced abrasion and fatigue; loss of conductor strength due to corrosion; increased resistance of connection due to oxidation or loss of preload	Plant specific	Yes, plant specific	NUREG-1801 aging effect is not applicable to VYNPS. See Section 3.6.2.2.3 for further evaluation.
3.6.1-13	Cable connections metallic parts	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements	No	NUREG-1801 aging effect is not applicable to VYNPS. Cable connections outside of active devices are taped or sleeved for protection. Operating experience with metallic parts of electrical cable connections at VYNPS indicated no aging effects requiring management.
3.6.1-14	Fuse holders (not part of a larger assembly) – Insulation material	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.

Notes for Table 3.6.2-1

Generic notes

A. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific notes

None

Table 3.6.2-1
Electrical and I&C (EIC) Components
Summary of Aging Management Evaluation

Table 3.6.2-1: Electrical Components								
Component Type	**Component Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Cable connections (metallic parts)	CE	Various metals used for electrical connections	Heat and air Outdoor weather	None	None			I
Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements (includes electrical penetration conductors and connections)	CE	Insulation material – various organic polymers	Heat and air Radiation and air	Reduced insulation resistance (IR)	Non-EQ Insulated Cables and Connections	VI.A-2 (L-01) VI.A-6 (LP-03)	3.6.1-2	A
Electrical cables not subject to 10 CFR 50.49 environmental qualification requirements used in instrumentation circuits	CE	Insulation material – various organic polymers	Heat and air Radiation and air	Reduced insulation resistance (IR)	Non-EQ Instrumentation Circuits Test Review	VI.A-3 (L-02)	3.6.1-3	A

Table 3.6.2-1: Electrical Components (Continued)

Component Type	Component Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fuse holders (insulation material)	IN	Insulation material—various organic polymers	Indoor air	None	None	VI.A-7 (LP-02)	3.6.1-14	A
High voltage insulators	IN	Porcelain, cement	Outdoor weather	None	None			I
Inaccessible medium-voltage (4.16kV to 22kV) cables (e.g., installed underground in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	CE	Insulation material – various organic polymers	Moisture and voltage stress	Reduced insulation resistance (IR)	Non-EQ Inaccessible Medium-Voltage Cable	VI.A-4 (L-03)	3.6.1-4	A
Switchyard bus (switchyard bus for SBO), connections	CE	Aluminum, copper	Outdoor weather	None	None			I
Transmission conductors	CE	Aluminum, steel, steel alloy	Heat and air Outdoor weather	None	None			I

4.0 TIME-LIMITED AGING ANALYSIS

4.1 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES AND EXEMPTIONS

The definition of time-limited aging analyses is in 10 CFR 54.3.

> *Time-limited aging analyses*, for the purposes of this part, are those licensee calculations and analyses that:
>
> (1) Involve systems, structures, and components within the scope of license renewal, as delineated in §54.4(a);
>
> (2) Consider the effects of aging;
>
> (3) Involve time-limited assumptions defined by the current term of operation, for example, 40 years;
>
> (4) Were determined to be relevant by the license in making a safety determination;
>
> (5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in §54.4(b); and
>
> (6) Are contained or incorporated by reference in the current licensing basis.

Section 10 CFR 54.21(c) requires a list of time-limited aging analyses (TLAA) in the application for a renewed license. Section 10 CFR 54.21(c)(2) requires a list of current exemptions to 10 CFR 50 based on TLAA in the application for a renewed license.

> §54.21 Contents of application -- technical information.
>
> (c) An evaluation of time-limited aging analyses.
>
> (1) A list of time-limited aging analyses, as defined in §54.3, must be provided. The applicant shall demonstrate that—
>
> (i) The analyses remain valid for the period of extended operation;
>
> (ii) The analyses have been projected to the end of the period of extended operation; or
>
> (iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.
>
> (2) A list must be provided of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on time-limited aging analyses as defined in §54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.

4.1.1 Identification of TLAA

The process used to identify the time-limited aging analyses is consistent with the guidance provided in NEI 95-10, *Industry Guidelines for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule*, Revision 6, June 2005. Calculations and analyses that could potentially meet the definition of 10CFR 54.3 were identified by searching CLB documents including the following.

- Technical Specifications
- UFSAR
- docketed licensing correspondence
- fire protection program documents
- NRC safety evaluation reports
- BWRVIP documents

Industry documents that list generic time-limited aging analyses were also reviewed to provide additional assurance of the completeness of the plant-specific list. These documents included NEI 95-10; NUREG-1800, *Standard Review Plan (SRP) for Review for License Renewal Applications for Nuclear Power Plants*, Revision 1, September 2005; NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 1, September 2005; and NRC safety evaluation reports related to license renewal applications by other BWR licensees.

Table 4.1-1 provides a summary listing of the identified TLAA.

4.1.2 Identification of Exemptions

A review of docketed correspondence identified VYNPS exemptions. No VYNPS exemptions depend on time-limited aging analyses.

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Table 4.1-1
List of VYNPS TLAA and Resolution

TLAA Description	Resolution Option	Section
Reactor Vessel Neutron Embrittlement Analyses		4.2
Pressure-temperature limits	Analyses remain valid 10 CFR 54.21(c)(1)(i)	4.2.2
Charpy upper-shelf energy	Analyses projected 10 CFR 54.21(c)(1)(ii)	4.2.3
Adjusted reference temperature	Analyses projected 10 CFR 54.21(c)(1)(ii)	4.2.4
Reactor vessel circumferential welds inspection relief	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.5
Reactor vessel axial welds failure probability	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.6
Metal Fatigue Analyses		4.3
Class 1 fatigue	Analyses remain valid 10 CFR 54.21(c)(1)(i) OR Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.1
Non-Class 1 fatigue	Analyses remain valid 10 CFR 54.21(c)(1)(i)	4.3.2
Effects of reactor water environment on fatigue life	Analyses remain valid 10 CFR 54.21(c)(1)(i) OR Analyses projected 10 CFR 54.21(c)(1)(ii) OR Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.3
Environmental Qualification Analyses for Electrical Components	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.4
Concrete Containment Tendon Prestress Analysis	Not applicable for VYNPS	4.5

Table 4.1-1
List of VYNPS TLAA and Resolution (Continued)

TLAA Description	Resolution Option	Section
Containment Liner Plate, Metal Containment, and Penetrations Fatigue Analyses		4.6
Fatigue of the torus	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.6.1
Fatigue of safety relief valve (SRV) discharge piping	Analysis remains valid 10 CFR 54.21(c)(1)(i) AND Analysis projected 10 CFR 54.21(c)(1)(ii)	4.6.2
Fatigue of other torus-attached piping	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.6.3
Other TLAA		4.7
Reflood thermal shock of the reactor vessel internals	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.7.1
TLAA in BWRVIPs		4.7.2
BWRVIP-05, RPV circumferential welds analysis	Updated by BWRVIP-74. See BWRVIP-74 entry.	4.7.2.1
BWRVIP-25, core plate rim hold-down bolts loss of preload analysis	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.7.2.2
BWRVIP-38, shroud support fatigue analysis	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.7.2.3
BWRVIP-47, lower plenum fatigue analysis	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.7.2.4
BWRVIP-48, vessel ID attachment welds fatigue analysis	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.7.2.5
BWRVIP-49, instrument penetrations fatigue analysis	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.7.2.6

Table 4.1-1
List of VYNPS TLAA and Resolution (Continued)

TLAA Description	Resolution Option	Section
BWRVIP-74, reactor vessel P/T curves analysis Fatigue analysis C_VUSE analysis Circ/Axial welds analysis	 Addressed in Section 4.2.2. Addressed in Section 4.3.1. Addressed in Section 4.2.3. Addressed in Sections 4.2.5 and 4.2.6.	4.7.2.7
BWRVIP-76, core shroud	Analysis remains valid 10 CFR 54.21(c)(1)(i).	4.7.2.8

4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

The regulations governing reactor vessel integrity are in 10 CFR 50. Section 50.60 requires that all light-water reactors meet the fracture toughness, pressure-temperature limits, and material surveillance program requirements for the reactor coolant pressure boundary as set forth in Appendices G and H of 10 CFR 50.

The VYNPS current licensing basis analyses evaluating reduction of fracture toughness of the VYNPS reactor vessel for 40 years are TLAA. The reactor vessel neutron embrittlement TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii) as summarized below. Fifty-four effective full-power years (EFPY) are projected for the end of the period of extended operation (60 years) assuming an average capacity factor of 90% for 60 years.

4.2.1 Reactor Vessel Fluence

GE's Licensing Topical Report NEDC-32983P-A, approved by the NRC for licensing applications (Reference 4.2-1), documents the method used for the neutron flux calculation. The NRC found that, in general, this method adheres to the guidance in Regulatory Guide 1.190 for neutron flux evaluation. The calculated reactor vessel ID fluence for 51.6 EFPY is 5.16×10^{17}n/cm^2 (E > 1 MeV). Extrapolated to 54 EFPY, the vessel surface (ID) fluence is 5.39×10^{17} n/cm^2 (E > 1 MeV). Using Regulatory Guide 1.99, Revision 2, Equation (3), results in a 54 EFPY 1/4T fluence of 3.98×10^{17} n/cm^2 (E > 1 MeV).

At VYNPS, the beltline for 40 years consists of four plates (1-14, 1-15, 1-16, 1-17) and their connecting welds, all adjacent to the active fuel zone. There are no nozzles in the beltline region (Reference 4.2-2). The beltline was re-evaluated for 60 years using the axial distribution of fast fluence at the RPV wall. Based on the additional fluence incurred during the period of extended operation, the vertical section of the reactor vessel ID that will receive greater than 1×10^{17} n/cm^2 (E > 1 MeV) extends from 3.5 inches below the bottom of the active fuel to 10 inches above the top of the active fuel. There are no nozzles in this region. The limiting plate and weld material in the beltline for 40 years remain the limiting materials for the period of extended operation.

Fluence, calculated based on the operating term, is a time-limited assumption for the TLAA that evaluate reactor vessel embrittlement. The reactor vessel fluence calculation has been projected to the end of the period of extended operation and that result is used throughout the remainder of Section 4.2.

4.2.2 Pressure/Temperature Limits

Appendix G of 10 CFR 50 requires the reactor vessel to remain within established pressure-temperature (P-T) limits during reactor vessel boltup, hydrotest, pressure tests, normal operation, and anticipated operational occurrences. These limits are from calculations that use the materials and fluence data obtained through the Reactor Vessel Surveillance Program.

In March 2003, VYNPS submitted a license amendment request to change the P-T limits to incorporate data from analysis of the first VYNPS surveillance capsule and to extend the curves to 32 EFPY. The NRC approved this submittal as Amendment 218 to the VYNPS license (Reference 4.2-7). As stated in that SER, VYNPS used conservative values for determining the P-T limits. Those values were peak vessel fluence of 1.24 x 10^{18} n/cm^2 (E > 1 MeV), 1/4T ART of 89°F and a 3/4T ART of 73°F. Table 4.2-1 compares the bases for the present curves with the projected fluence and ARTs for 54 EFPY and shows that the projected values at 54 EFPY (fluence of 5.39 x 10^{17} n/cm^2, 1/4T ART of 68.5°F and a 3/4T ART of 56.9°F) are still less that those used for the P-T curves. As such the TLAA for pressure-temperature limits remains valid in accordance with 10 CFR 54.21(c)(1)(i).

4.2.3 Charpy Upper-Shelf Energy (C_VUSE)

Appendix G of 10 CFR 50 requires that reactor vessel beltline materials "have Charpy upper-shelf energy … of no less than 75 ft-lb initially and must maintain Charpy upper-shelf energy throughout the life of the vessel of no less than 50 ft-lb…."

Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," provides two methods for estimating Charpy upper-shelf energy (C_VUSE) at end of life. Position 1 applies for material that does not have surveillance data, and Position 2 applies for material with surveillance data. Position 2 requires a minimum of two sets of credible material surveillance data. Since VYNPS has data from only one material surveillance capsule, Position 2 does not apply. For Position 1, the percent drop in C_VUSE for a stated copper content and neutron fluence is determined by reference to Figure 2 of Regulatory Guide 1.99, Revision 2. This percentage drop is applied to the initial C_VUSE to obtain the adjusted C_VUSE. Table 4.2-2 calculates the end of life C_VUSE by this method.

Safety analysis report NEDC-33090P (Reference 4.2-3) documents the most recent calculations of C_VUSE. Analyses were done for 51.6 EFPY. Results of NEDC-33090P are extrapolated to 54 EFPY.

The VYNPS unirradiated surveillance specimens were from plate 1-14 with a C_VUSE of 89 ft-lb (137 ft-lb times 0.65). The 54 EFPY C_VUSE value for plate 1-14 was calculated using Regulatory Guide 1.99, Position 1, Figure 2. Specifically, the formulae for the lines were used to calculate the percent drop in C_VUSE. The calculation used the fluence determined in Section 4.2.1 above. For 54 EFPY, Table 4.2-2 shows the minimum projected C_VUSE for plate 1-14 remains above the 50 ft-lb requirement of Appendix G of 10 CFR 50. As such, this TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Initial (un-irradiated) upper-shelf energy data for the weld materials and for plates 1-15, 1-16, and 1-17 do not exist. The BWR Owners Group prepared an equivalent margins analysis (EMA) for plants without this data. The NRC reviewed and accepted the evaluation, as documented in an SER (Reference 4.2-4). Rather than calculating end of life C_VUSE (impossible without an initial C_VUSE), a plant may calculate the percent drop in C_VUSE and show that the percent drop is less than the percent drop in the equivalent margins analysis. Appendix B of BWRVIP-74 provides a method to evaluate USE at 54 EFPY using plant-specific surveillance data. BWRVIP-74 gives allowable percent drops in C_VUSE of 23.5% for BWR 3-6 plate and 39% for welds. The NRC approved the use of these values in an SER (Reference 4.2-5). Table 4.2-3 uses the BWRVIP-74 method to verify that the VYNPS reductions in USE remain less than the reduction calculated in the BWRVIP-74 equivalent margins analyses at 54 EFPY for beltline welds and plates 1-15, 1-16, 1-17. As such, this TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.4 Adjusted Reference Temperature

Irradiation by high-energy neutrons raises the value of RT_{NDT} for the reactor vessel. RT_{NDT} is the reference temperature for nil-ductility transition as defined in Section NB-2320 of the ASME Code. The initial RT_{NDT} is determined through testing un-irradiated material specimens. The shift in reference temperature, ΔRT_{NDT}, is the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. The ART = RT_{NDT} + ΔRT_{NDT} + margin. (RG 1.99, Revision 2)

Safety analysis report NEDC-33090P (Reference 4.2-3) includes the most recent calculations of RT_{NDT}. The report calculated the adjusted RT_{NDT} for the welds and plates. This report provided initial RT_{NDT} for each plate, rather than the maximum plate value found in the reactor vessel integrity database.

VYNPS response to GL 92-01 (Reference 4.2-6) included chemistry data. Chemistry factors (CF) were interpolated from Table 1 in RG 1.99. Initial RT_{NDT} values and standard deviations were taken from VYNPS NEDC-33090P, Table 3-2a. Standard deviations for ΔRT_{NDT}, σ_Δ, were calculated as one-half the ΔRT_{NDT} since in all instances 0.5 times the ΔRT_{NDT} was less than 28 °F for welds and 17°F for plates. Margins were calculated as twice the square root of the sum of the squares of the two standard deviations. Adjusted reference temperatures use 1/4T fluence. Fluence factors (FF) were calculated using Equation 2 in Regulatory Guide 1.99, Revision 2.

Extrapolated ΔRT_{NDT} values were calculated by multiplying the CF and the FF for each plate and weld. The initial RT_{NDT}, the calculated ΔRT_{NDT} and the calculated margins were then added to get the new value of ART. Table 4.2-4 shows the 54 EFPY values of ART. As indicated in the table, the plates remain the limiting subcomponents rather than the welds, and plate 1-14 remains the limiting plate. All calculated values are well below the 200°F suggested in Section 3 of RG 1.99 and are thus acceptable for the period of extended operation. The TLAA for RT_{NDT} is thus projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.5 Reactor Vessel Circumferential Welds

BWRVIP-74 reiterated the recommendation of BWRVIP-05 that RPV circumferential welds could be exempted from examination. The NRC SER for BWRVIP-74 agreed, but required that plants apply for this relief request individually. The relief request should demonstrate that at the expiration of the current license, the circumferential welds satisfy the limiting conditional failure probability for circumferential welds in the (BWRVIP-05) evaluation. VYNPS has applied for the relief request (Reference 4.2-8) but has only evaluated the welds to the end of the current operating license. The changes in metallurgical conditions expected over the period of extended operation require additional analysis for 54 EFPY to extend the reactor vessel circumferential weld inspection relief request. The evaluations have been projected to 54 EFPY.

The VYNPS relief request submittal included an analysis that showed that the reactor vessel parameters after 32 EFPY were within the NRC's 32 EFPY bounding Chicago Bridge & Iron (CBI) vessel parameters from the BWRVIP-05 SER. As such, there is a lower conditional probability of failure for circumferential welds at VYNPS than that stated in the NRC's Final Safety Evaluation Report of BWRVIP-05.

Table 4.2-5 reproduces the table from the submittal, with an added section providing the values for 54 EFPY. Consistent with earlier submittals, this table conservatively uses surface fluence rather than ¼ T fluence, so the resulting change in RT_{NDT} is slightly higher than shown in Section 4.2.4.

The VYNPS reactor pressure vessel circumferential weld parameters at 54 EFPY will remain within the NRC's (64 EFPY) bounding CBI vessel parameters from the BWRVIP-05 SER. As such, the conditional probability of failure for circumferential welds remains below that stated in the NRC's Final Safety Evaluation of BWRVIP-05. Therefore, this analysis has been projected for the period of extended operation per 10 CFR 54.21(c)(1)(ii).

4.2.6 Reactor Vessel Axial Weld Failure Probability

Applicants must evaluate axially oriented RPV welds to show that their failure frequency remains below the $5x10^{-6}$ calculated in the BWRVIP-74 SER. The SER states that an acceptable way to do this is to show that the mean RT_{NDT} of the limiting axial beltline weld at the end of the period of extended operation is less than the values specified in Table 1 of that SER. Table 4.2-6 reproduces the 32 EFPY and 64 EFPY data from the SER, and adds the VYNPS data for 32 and 54 EFPY. The table shows that the VYNPS mean RT_{NDT} is well below that in the SER, and thus the VYNPS axial weld failure frequency is well below the acceptable limit of $5x10^{-6}$. Therefore, this analysis has been projected for the period of extended operation per 10 CFR 54.21 (c)(1)(ii).

4.2.7 References

4.2-1 Richards, S. A. (NRC) to J. F. Klapproth, "Safety Evaluation for NEDC-32983P, General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation (TAC No. MA9891)," MFN 01-050, letter dated September 14, 2001.

4.2-2 US NRC, Reactor Vessel Integrity Database (RVID), Version 2.0.1, July 2000.

4.2-3 Thayer, J.K. (Entergy) to US NRC Document Control Desk, "Technical Specification Proposed Change No. 263, Extended Power Uprate," BVY 03-80, letter dated September 10, 2003.

4.2-4 Wiggins, J. T. (NRC) to L. A. England, "Acceptance for Referencing of Topical Report NEDO-32205, Revision 1, 10 CFR 50 Appendix G Equivalent Margin Analysis for Low Upper-Shelf Energy in BWR/2 through BWR/6 Vessels," letter dated December 8, 1993.

4.2-5 Grimes, C.I. (NRC), to C. Terry (BWRVIP Chairman), "Acceptance for Referencing of EPRI Proprietary Report TR-113596, BWR Vessel and Internals Project, BWR Reactor Vessel Inspection and Flaw Evaluation Guidelines (BWRVIP-74) and Appendix A, Demonstration of Compliance with the Technical Information requirements of the License Renewal Rule (10CRF54.21)," letter dated October 18, 2001.

4.2-6 Tremblay, Jr., L. A. (Entergy) to NRC Document Control Desk, "Response to Request for Additional Information, GL 92-01 - Reactor Vessel Structural Integrity," BVY 93-107, letter dated September 24, 1993.

4.2-7 Ennis, R. B. (NRC) to M. Kansler (Entergy), "Issuance of Amendment re: Reactor Pressure Vessel Fracture Toughness and Material Surveillance Requirements (TAC NOS. MB8119 and MB8379)," NVY 04-027, letter dated March 29, 2004.

4.2-8 DeVincentis, J. M. (Entergy), to USNRC Document Control Desk, "Supplement to Fourth-Interval Inservice Inspection (ISI) Program Plan - Submittal of Relief Request ISI-06," BVY 03-83, letter dated September 25, 2003.

4.2-9 Lainas, G. C. (NRC), to C. Terry (Niagara Mohawk Power Company, BWRVIP Chairman), Final Safety Evaluation of the BWRVIP Vessel and Internals Project BWRVIP-05 Report, (TAC No. M93925), July 28, 1998.

Table 4.2-1
VYNPS P-T Curve Bases, (32 EFPY and 54 EFPY)

	Material Description					32 EFPY P-T Curve Bases					
Reactor Vessel Beltline Region Location (Beltline ID)	**Initial RT_{NDT} (Deg F)**	σ_u	**Chemistry Factor**	**Location**	**Thickness (inches)**	**Fluence (10^{19} n/ cm^2)**	**Fluence Factor**	**ΔRT_{NDT} (Deg F)**	σ_Δ	**Margin (Deg F)**	**Adjusted RT_{NDT} (Deg F)**
Plate 1-14	30.0	0	74.5	ID	0 (5.06)	1.24E+18	0.461	34.3	17.0	34.0	98.3
Plate 1-14	30.0	0	74.5	¼ T	1.3	9.15E+17	0.399	29.7	14.9	29.7	89.5
Plate 1-14	30.0	0	74.5	¾ T	3.8	4.99E+17	0.292	21.8	10.9	21.8	73.5
						54 EFPY					
Plate 1-14						5.39E+17	0.305	22.7	11.3	22.7	75.4
Plate 1-14						3.98E+17	0.258	19.2	9.6	19.2	68.5
Plate 1-14						2.17E+17	0.181	13.5	6.7	13.5	56.9

Table 4.2-2
VYNPS Charpy Upper-Shelf Energy Data for 54 Effective Full-Power Years (EFPY)

Material Description						54 EFPY Projection		
Reactor Vessel Beltline Region Plates	**Material Type**	**Plate ID**	**Heat #**	**%Cu**	**Initial USE**	**1/4 T fluence (10^{19} n/cm^2)**	**%Drop in USE**	**USE (1/4T)**
Plate 1-17	A533B	330	C2640-1	0.12	EMA	0.0398	9.79%	EMA
Plate 1-16	A533B	329	C2653-3	0.13	EMA	0.0398	10.3%	EMA
Plate 1-15	A533B	328	C3116-2	0.14	EMA	0.0398	10.7%	EMA
Plate 1-14	A533B	327	C3017-2	0.11	89	0.0398	9.32%	67.7
ReactorVessel Beltline Region Welds	**Weld Type**	**Plate ID**	**Heat #**	**%Cu**	**Initial USE**	**1/4 T fluence (10^{19} n/cm^2)**	**%Drop in USE**	**USE (1/4T)**
Welds	SMAW	955	NA/W-A	0.04	EMA	0.0398	8.39%	EMA

Table 4.2-3
Equivalent Margins Analysis

VYNPS Plate Material USE at 54 EFPY

Surveillance Plate % Cu	0.11%
Surveillance Plate Fluence (10^{19} n/cm^2)	4.49E+16
Surveillance Plate Measured Decrease	8.03%
RG 1.99 Predicted Decrease	5.55%
Ratio of Measured to Predicted	1.448
Beltline Plate % Cu	0.14%
1/4 T fluence (10^{19} n/cm^2)	0.0398
RG 1.99 Predicted Decrease	10.7%
Adjusted % Decrease	15.5%
Limiting % Decrease	23.5%
Plate Acceptable	Yes

The above decrease is less than the 23.5% decrease in the bounding equivalent margin analysis, so the analysis conclusions apply to the vessel plates.

VYNPS Weld Material USE at 54 EFPY

Surveillance Weld % Cu	0.03%
Surveillance Weld Fluence (10^{19} n/cm^2)	4.49E+16
Surveillance Weld Measured Decrease	4.80%
RG 1.99 Predicted Decrease	4.77%
Ratio of Measured to Predicted	1.005
Beltline Weld % Cu	0.10%
1/4 T fluence (10^{19} n/cm^2)	0.0398
RG 1.99 Predicted Decrease	11.19%
Adjusted % Decrease	11.24%
Limiting % Decrease	39.0%
Weld Acceptable	Yes

The above decrease is less than the 39% decrease in the bounding equivalent margins analysis, so the analysis conclusions apply to the vessel welds.

Table 4.2-4
VYNPS RT_{NDT} for 54 Effective Full-Power Years (EFPY)

	Material Description								54 EFPY					
Reactor Vessel Beltline ID	Base Metal	Plate ID	Heat #	%Cu	%Ni	Initial RT_{NDT} (Deg F)[1]	σ_u	Chemistry Factor	1/4 T fluence (10^{19} n/cm^2)	Fluence Factor	RT_{NDT} (Deg F)	σ_Δ	Margin (Deg F)	Adjusted RT_{NDT} (Deg F)
1-17	A533B	330	C2640-1	0.12	0.61	0.0	0	83.2	0.0398	0.258	21.5	10.7	21.5	42.9
1-16	A533B	329	C2653-3	0.13	0.59	0.0	0	90.7	0.0398	0.258	23.4	11.7	22.8	46.8
1-15	A533B	328	C3116-2	0.14	0.66	10.0	0	101.5	0.0398	0.258	26.2	13.1	25.6	42.4
1-14	A533B	327	C3017-2	0.11	0.63	30.0	0	74.5	0.0398	0.258	19.2	9.6	18.8	68.4
Welds[2]	SMAW	955	NA/W-A	0.04	1.00	0	13	54	0.0398	0.258	13.9	10.0	29.3	43.4
Welds[3]	SMAW	955	NA/W-A	0.04	1.00	0	0	54	0.0398	0.258	13.9	7.0	13.6	27.9

1. The initial RT_{NDT} values supersede RVID2, as agreed to by the NRC in their SER (Reference 4.2-9).
2. This line mimics RVID2 and uses override values for σ_u and σ_Δ. Results in conservative margin.
3. This line mimics NEDC-33090P and uses 0 for σ_u and calculates σ_Δ per RG 1.99, consistent with the way RVID2 calculates the plates.

Table 4.2-5
VYNPS RPV Circumferential Shell Welds

Parameter Description	USNRC 32 EFPY Bounding Parameters[1]	VYNPS Beltline Circ Weld 32 EFPY[2]	USNRC 64 EFPY Bounding Parameters[3]	VYNPS Beltline Circ Weld 54 EFPY[4]
Initial (unirradiated) reference temperature (RT_{NDT}), °F	-65	-70	-65	0
Neutron fluence at the end of the requested relief period (peak surface fluence entire beltline), n/cm^2	5.1 x 10^{18}	2.99 x 10^{17}	1.02 x 10^{19}	5.39 x 10^{17}
Fluence factor (calculated per RG 1.99 based on fluence in previous line)	0.812	0.219	1.006	0.305
Weld copper content, %	0.10	0.04	0.10	0.04
Weld nickel content, %	0.99	1.00	0.99	1.00
Weld chemistry factor (CF), °F	109.5	54	109.5	54
Chemistry factor times fluence factor	88.9	11.8	110.1	16.5
Margin (implied), °F	20.6	0.0	25.5	16.5
Increase in reference temperature (ΔRT_{NDT}), °F	109.5	11.8	135.6	32.9
Mean adjusted reference temperature, °F (ART= RT_{NDT} + ΔRT_{NDT})	44.5	-58.2	70.6	32.9

1. The first column is from Table 2.6-4 of the NRC SER for BWRVIP-05 (Reference 4.7-2).
2. The second column is from BVY 03-83 (Reference 4.7-3)
3. The third column is from Table 2.6-5 of the NRC SER for BWRVIP-05.
4. The fourth column is new material.

Table 4.2-6
VYNPS RPV Axial Shell Welds

Parameter Description	NRC Limiting Plant-Specific Data	VYNPS Data for Axial Weld	NRC Limiting Plant-Specific Data	VYNPS Data for Axial Weld
EFPY	32	32	64	54
Initial (unirradiated) reference temperature (RT_{NDT}), °F	-30	0	-30	0
Neutron Fluence	6.90E+18	2.99E+17	1.38E+18	5.39E+17
FF = Fluence Factor	0.896	0.219	1.089	0.305
Weld Copper content, %	0.10%	0.04%	0.10%	0.04%
Weld Nickel Content, %	1.08%	1.00%	1.08%	1.00%
CF = Chemistry Factor	135.0	54	135.0	54.00
Increase in reference temperature (ΔRT_{NDT}), °F = FF x CF	121.0	11.8	147.1	16.5
Mean adjusted reference temperature (ART), °F = $RT_{NDT} + \Delta RT_{NDT}$	91.0	11.8	117.1	16.5

4.3 METAL FATIGUE

Fatigue analyses are potential TLAA for Class 1 and selected non-Class 1 mechanical components. Fatigue is an age-related degradation mechanism caused by cyclic stressing of a component by either mechanical or thermal stresses that becomes evident by cracking of the component. Fatigue analyses are treated as TLAA if they are based on a set of design transients that are based on the life of the plant.

When TLAA—metal fatigue is identified in the aging management program column, the TLAA associated with fatigue is applicable. Review of the TLAA, per 10 CFR 54.21 (c)(1), determines whether:

(i) the TLAA remains valid for the period of extended operation,

(ii) the TLAA can be projected to the end of the period of extend operation, or

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

If the TLAA does not remain valid or cannot be satisfactorily projected to the end of the period of extended operation, then cracking due to fatigue is an aging effect requiring management under 10 CFR 54.21(c)(1)(iii).

Class 1 components (reactor vessel and recirculation system piping) are subject to a fatigue analysis in accordance with ASME Section III, Subsection NB. ASME Section III requires evaluation of fatigue by considering design thermal and loading cycles. VYNPS monitors transient cycles that contribute to fatigue usage in accordance with requirements in VYNPS Technical Specification 5.5.5. Reactor coolant system pressure boundary piping (with the exception of reactor recirculation piping) was designed to ANSI B31.1 and secondary stresses (e.g., stress due to thermal expansion and anchor movements) are analyzed for fatigue using stress intensification factors (SIFs) and stress range allowables. The stress range allowables are a function of thermal design cycles.

The non-Class 1 aging management reviews for VYNPS identify non-Class 1 mechanical components that are within the scope of license renewal and are subject to aging management review. Based on exposure to mechanical and thermal cycling, specific components are subject to cracking by fatigue.

Fatigue evaluations that meet the definition of TLAA for Class 1 and non-Class 1 mechanical components at VYNPS are described and evaluated below. Cumulative usage factors have been documented and the actual numbers of design transient cycles have been projected to 60 years. Although some transients are projected to exceed the cycle limits before the end of 60 years, a program is in place to track cycles and to provide corrective actions if limits are approached. The maximum cumulative usage factors (CUF) identified for VYNPS components are summarized in Table 4.3-1.

In addition to metal fatigue analyses, fracture mechanics analyses of flaw indications discovered during inservice inspection are TLAA for those analyses based on time-limited assumptions defined by the current operating term. When a flaw is detected during inservice inspections, the component that contains the flaw can be evaluated for continued service in accordance with ASME Section XI. These evaluations may show that the component is acceptable to the end of the license term based on projected inservice flaw growth. Flaw growth is typically predicted based on the design thermal and loading cycles.

4.3.1 Class 1 Fatigue

VYNPS Class 1 components evaluated for fatigue and flaw growth include the reactor pressure vessel (RPV) and appurtenances, certain reactor vessel internals, the reactor recirculation system (RRS), and the reactor coolant system (RCS) pressure boundary. The VYNPS Class 1 systems include components within the ASME Section XI, Subsection IWB inspection boundary (see Section 2.3.1 and Section 3.1).

Fatigue evaluations were performed in the design of the VYNPS Class 1 components designed in accordance with the requirements specified in ASME Section III. The fatigue evaluations are contained in analyses and stress reports, and because they are based on a number of transient cycles assumed for a 40-year plant life, these evaluations are considered TLAA.

Design cyclic loadings and thermal conditions for the Class 1 components are defined by the applicable design specifications for each component. The original design specifications provided the initial set of transients that were used in the design of the components and are included as part of each component analysis or stress report. The component analyses and stress reports contain the fatigue evaluations for each component.

A review of the fatigue evaluations reveals the maximum cumulative usage factors (CUFs) for applicable VYNPS Class 1 components. The documents reviewed are current design basis fatigue evaluations that do not consider the effects of reactor water environment on fatigue life. The maximum cumulative usage factors (CUF) for Class 1 components are summarized in Table 4.3-1.

Table 4.3-1
Cumulative Usage Factors

Location	CUF
Bottom head and support skirt	0.40
Closure flange	0.57
Closure studs	0.62
Core spray nozzle	0.63
Core spray safe end[1]	0.18
Core support structure	0.06
CRD penetration	0.13
CRD return nozzle	0.39
Feedwater nozzle	0.75
Feedwater piping[1]	0.43
Refueling bellows	0.67
RHR return piping[1]	0.03
RR inlet nozzle	0.61
RR outlet nozzle	0.81
RR piping tee[1]	0.40
Shroud repair rod threaded ends	0.12
Shroud support plate slotted holes	0.23
Steam outlet nozzle	0.17

1. Plant-specific CUFs were not found. Generic CUFs from NUREG-6260 were used

Current design basis fatigue evaluations, including the CUFs, are based on design transients. The design transients are listed in Table 4.3-2.

The VYNPS Fatigue Monitoring Program tracks and evaluates the cycles and requires corrective actions if limits are approached. The VYNPS Fatigue Monitoring Program ensures that the numbers of transient cycles experienced by the plant remain within the allowable numbers of cycles, and hence the component CUFs remain below the code allowable value of 1.0. Further details on the Fatigue Monitoring Program are provided in Appendix B.

The numbers of cycles accrued to date have been extrapolated to determine the numbers of cycles expected at the end of 60 years of operation. The results of the 60-year projections

(Table 4.3-2) show that for the five VYNPS transients with design allowable limits, the numbers will remain below the design allowable numbers during the period of extended operation.

Table 4.3-2
Allowable and Projected Number of Thermal Cycles

	Design Transient	Design Basis Cycles	Current Cycles Logged as of 05/05/04	Projection Factor[1]	Projected Cycles at 60 Years of Operation	% Used in 60 years
1	Closure Flange Bolting	200	32	1.908	61	31%
2	Closure Flange Unbolting	200	32	1.908	61	31%
3	System Pressure Tests	120	32	1.908	61	31%
4	Heatup	300	90	1.908	172	57%
5	Cooldown	300	88	1.908	168	56%
6	Reactor Startup/Shutdown Cycles		32	1.908	61	

1. The projection factor for 60 years was calculated as the ratio of 60 years to the operating time through the last cycle update.
Date of commercial operation for VYNPS = November 20, 1972
Date after 60 years of operation = November 20, 2032
Date of latest program report = May 4, 2004
Projection factor = (November 20, 2032 – November 20,1972)/
(May 4, 2004 – November 20, 1972)
= 1.908

4.3.1.1 Reactor Pressure Vessel

The reactor pressure vessel fatigue analyses were performed in accordance with the requirements of ASME Section III.

Design cyclic loadings and thermal conditions for the reactor pressure vessel were originally defined in the design specifications for the vessel. The original design specifications provided the set of transients that were used in the design of the components. Subsequent evaluations by VYNPS modified the list of transients to one which more closely reflected actual plant transients that were easier to track, while still bounding the original design transients.

The VYNPS Fatigue Monitoring Program will assure that the allowed number of transient cycles is not exceeded. The program requires corrective action if transient cycle limits are approached. Consequently, the TLAA (fatigue analyses) based on those transients will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) or the effects of aging on the intended function(s) will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.2 Reactor Vessel Internals

Although not mandatory, the design of the reactor vessel internals is in accordance with the intent of ASME Section III.

In response to the NRC's Request for Additional Information on the core shroud repair, VYNPS stated that a fatigue analysis had been performed for the shroud repair hardware (Reference 4.3-1). This calculation included a fatigue analysis of the slotted hole in the shroud support plate where the shroud repair ligaments attach. This analysis is treated as a TLAA. The resulting CUF was 0.23. This CUF is based on the numbers of design transients in the original reactor vessel design report.

The VYNPS Fatigue Monitoring Program will assure that the allowed number of transient cycles is not exceeded. The program requires corrective action if transient cycle limits are approached. Consequently, the TLAA (fatigue analyses) based on those transients will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) or the effects of aging on the intended function(s) will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.3 Class 1 Piping and Components

VYNPS replaced reactor recirculation (RR) system piping in 1986. Also replaced were connecting portions of the residual heat removal (RHR) system piping. The new piping was designed and analyzed to ANSI B31.1 but was inspected and tested to ASME Section III requirements. Stress analyses for the reactor recirculation system were performed to B31.1 requirements. Even though B31.1 does not require a fatigue analysis, such an analysis was done for the highest anticipated usage factor location, the RHR to RR tee. These analyses were based on a number of cycles not expected to be exceeded in 40 years and as such are treated as TLAA.

The VYNPS Fatigue Monitoring Program will assure that the allowed number of transient cycles is not exceeded. The program requires corrective action if transient cycle limits are approached. Consequently, the TLAA (fatigue analyses) based on those transients will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) or the effects of aging on the intended function(s) will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

UFSAR Section 4.6.3 states that the main steam isolation valves are designed for 40 years based on 100 cycles of operation the first year and 50 cycles of operation per year thereafter. This statement may be interpreted to imply a TLAA. This TLAA will remain valid through the period of extended operation per 10 CFR 54.21(c)(1)(i). The MSIVs will not exceed 2050 cycles in 60 years (34 cycles per year).

4.3.2 Non-Class 1 Fatigue

The design of ASME III Code Class 2 and 3 piping systems incorporates the Code stress reduction factor for determining acceptability of piping design with respect to thermal stresses. The design of ASME B31.1 Code components also incorporates stress reduction factors based upon an assumed number of thermal cycles. In general, 7000 thermal cycles are assumed, leading to a stress reduction factor of 1.0 in the stress analyses. VYNPS evaluated the validity of this assumption for 60 years of plant operation. The results of this evaluation indicate that the 7000 thermal cycle assumption is valid and bounding for 60 years of operation. Therefore, the pipe stress calculations are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Some applicants for license renewal have estimated that piping in the primary sampling system will have more than 7000 thermal cycles before the end of the period of extended operation. The sampling system is used to take reactor coolant samples every 96 hours during normal operation. However, the normal samples are taken from the RWCU filter influent, where the water has already been cooled. Thus normal sampling does not cause a thermal cycle. Alternate samples may be taken directly from the B discharge header of the reactor recirculation system via containment penetration X-41; however, this is an infrequently performed procedure and this piping, designed to ASME B31.1, will not exceed 7000 cycles prior to 60 years of operation.

4.3.3 Effects of Reactor Water Environment on Fatigue Life

NUREG/CR-6260 applied fatigue design curves that incorporated environmental effects to several plants and identified locations of interest for consideration of environmental effects. Section 5.7 of NUREG/CR-6260 identified the following component locations as most sensitive to environmental effects for VYNPS-vintage General Electric plants. These locations and the subsequent calculations are directly relevant to VYNPS.

1. reactor vessel shell and lower head
2. reactor vessel feedwater nozzle
3. reactor recirculation piping (including inlet and outlet nozzles)
4. core spray line reactor vessel nozzle and associated piping
5. residual heat removal (RHR) return piping
6. feedwater piping

Entergy evaluated the limiting locations (a total of nine components corresponding with the above six locations) using the guidance provided in NUREG-1801 (Volume 2, Section X.M.1). Seven of nine components reviewed have an environmentally adjusted CUF of greater than 1.0 (see Table 4.3-3). The ASME Code does not require environmental adjustment to fatigue analyses. Prior to entering the period of extended operation, for each location that may exceed a

CUF of 1.0 when considering environmental effects, VYNPS will implement one or more of the following:

(1) further refinement of the fatigue analyses to lower the predicted CUFs to less than 1.0;

(2) management of fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC);

(3) repair or replacement of the affected locations.

Should VYNPS select the option to manage environmental-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be provided to the NRC prior to the period of extended operation.

The effects of environmental-assisted thermal fatigue for the limiting locations identified in NUREG-6260 have been evaluated. Cracking by environmentally-assisted fatigue of these locations is addressed using one of the above three approaches in accordance with 10 CFR 54.21(c)(1).

Table 4.3-3
VYNPS Cumulative Usage Factors for NUREG/CR-6260 Limiting Locations

	NUREG-6260 Location	CUF	Material	F_{en}	Environmentally Adjusted CUF
1	Vessel shell and bottom head	0.400	Low alloy steel	2.45	0.98
2	Feedwater nozzle	0.750	Low alloy steel	3.81	2.86
3	RR inlet nozzle	0.610	Low alloy steel	2.45	1.49
3	RR outlet nozzle	0.810	Low alloy steel	2.45	1.98
3	RR piping tee	0.397[1]	Stainless steel	15.35	6.09
4	Core spray nozzles	0.625	Low alloy steel	2.45	1.53
4	Core spray safe end	0.182[1]	Stainless steel	15.35	2.79
5	RHR return piping	0.032[1]	Stainless steel	15.35	0.49
6	Feedwater piping	0.427[1]	Carbon steel	3.01	1.29

1. No plant-specific CUF is available; used generic value from NUREG/CR-6260

4.3.4 References

4.3-1 Sojka, R. E. (VYNPS), to USNRC Document Control Desk, "Response to Request for Additional Information Regarding Vermont Yankee Core Shroud Modification," BVY 96-48, letter dated August 7, 1996.

4.4 ENVIRONMENTAL QUALIFICATION OF ELECTRICAL COMPONENTS

The VYNPS Environmental Qualification of Electric Components (EQ) Program manages component thermal, radiation and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered TLAA for license renewal. The EQ Program ensures that these EQ components are maintained in accordance with their qualification bases.

The VYNPS program is an existing program established to meet VYNPS commitments for 10 CFR 50.49. It is consistent with NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components."

The VYNPS program includes consideration of operating experience to modify qualification bases and conclusions, including qualified life. Compliance with 10 CFR 50.49 provides reasonable assurance that components can perform their intended function(s) during accident conditions after experiencing the effects of inservice aging. Consistent with NRC guidance provided in RIS 2003-09, no additional information is required to address GSI-168, "EQ of Electrical Components."

Based upon a review of the existing program and associated operating experience, continued implementation of the VYNPS EQ Program provides reasonable assurance that the aging effects will be managed and that the in-scope EQ components will continue to perform their intended function(s) for the period of extended operation. The effects of aging will be managed by the VYNPS program in accordance with the requirements of 10 CFR 54.21(c)(1)(iii).

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

This section is not applicable as VYNPS does not have pre-stressed tendons in the containment building.

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENT, AND PENETRATIONS FATIGUE ANALYSES

The torus and torus attached piping systems were analyzed as part of the Mark 1 containment long-term program, using methods and assumptions consistent with NUREG-0661. The fatigue analyses performed included the torus, SRV piping and penetrations, and other torus attached piping.

4.6.1 Fatigue of the Torus

The fatigue analyses of the torus looked at both the torus shell and attached piping systems.

The VYNPS plant-specific fatigue usage factor for the torus shell is 0.001 for normal operation and 0.078 for design basis accident. These values are so small that when multiplied by 1.5 to account for 60 years rather than 40 years, they are still insignificant usage factors. The fatigue analysis of the torus during normal operation and upset conditions has thus been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.6.2 Fatigue of Safety Relief Valve (SRV) Discharge Piping

The fatigue analysis of the SRV piping, along with all the other torus attached piping, is bounded by MPR-751, the GE Mark 1 containment program. MPR-751 was designed to bound all BWR plants which utilize the Mark I containment design. The analysis concluded that for all plants and piping systems considered, in all cases the fatigue usage factors for an assumed 40-year plant life was less than 0.5. In a worst-case scenario, extending plant life by an additional 20 years would produce usage factors below 0.75. Since this is less than 1.0, the fatigue criteria are satisfied. The MPR-751 generic fatigue analysis is thus projected for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A VYNPS plant-specific analysis addresses the torus SRV penetration sleeves and bellows. This analysis states that the SRV penetrations are qualified for 7500 cycles of maximum load while the SRVs are expected to see less than 50 cycles at maximum load and less than 4500 cycles at partial load. Increasing the 40 year cycles by 1.5 for the period of extended operation would still be less than the 7500 maximum load cycles permitted. The fatigue analysis for torus penetrations thus remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.6.3 Fatigue of Other Torus-Attached Piping

The VYNPS plant-specific analysis references the generic GE Mark 1 containment program for other torus-attached piping. The results of the GE Mark 1 program (based on 40 years of operation) were that 92% of the torus-attached piping would have cumulative usage factors of less than 0.3, and that 100% would have usage factors less than 0.5. Conservatively multiplying the CUFs by 1.5 shows that for 60 years of operation, 92% of the torus-attached piping would have CUFs below 0.45, and 100% would have CUFs below 0.75. This analysis has thus been projected through the period of extended operation in accordance with 10 CFR 50.21(c)(ii).

4.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

4.7.1 Reflood Thermal Shock of the Reactor Vessel Internals

UFSAR Section 3.3.5.4 addresses reflood thermal shock of the reactor vessel internals (core shroud). This evaluation of thermal shock is a TLAA as it is based on the shroud receiving a maximum integrated neutron fluence of 2.7 x 10^{20} n/cm^2 (greater than 1 MeV) by the end of plant life. The value of 2.7 x 10^{20} n/cm^2 is a generic value that bounds all BWRs. To show that VYNPS remains bounded for the period of extended operation, it is adequate to show that shroud fluence for 54 EFPY remains below 2.7 x 10^{20} n/cm^2.

The peak shroud fluence was calculated for the extended power uprate at 9.67 x 10^{10} n/cm^2-sec. Integrating this and the pre-uprate flux gives an end of life shroud fluence of 1.5 x 10^{20} n/cm^2. This value remains below the 2.7 x 10^{20} n/cm^2 value used in the evaluation discussed in the UFSAR, and thus that evaluation remains valid for the period of extended operation. As such, this TLAA remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2 TLAA in BWRVIP Documents

BWR Vessel and Internals Project (BWRVIP) documents identify various potential TLAA. The TLAA applicable to VYNPS are described below.

4.7.2.1 BWRVIP-05, Reactor Vessel Axial Welds

BWRVIP-05 justified elimination of reactor vessel circumferential welds from examination. BWRVIP-74 extended this justification to cover the period of license renewal. See Section 4.2.5 for evaluation of the TLAA associated with this issue.

4.7.2.2 BWRVIP-25, Core Plate

This document concerns loss of preload and cracking for core plate rim hold-down bolts.

The calculation of loss of preload on the core plate rim hold-down bolts is a TLAA. BWRVIP-25 calculated the loss of preload for these bolts for 40 years. Appendix B to BWRVIP-25 projected this calculation to 60 years, showing that the VYNPS bolts would experience only 5 to 19 percent loss of preload. This TLAA is thus projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

There is no TLAA associated with cracking of the core plate bolts. The inspection recommendations of BWRVIP-25 manage cracking of the core plate bolts for the period of extended operation. VYNPS implements the inspection requirements of BWRVIP-25 in the VYNPS BWR Vessel Internals Program, which will adequately manage cracking of the core plate rim hold down bolts for the period of extended operation.

4.7.2.3 BWRVIP-38, Shroud Support

The BWRVIP-38 fatigue analysis of the shroud support is a TLAA. Fatigue of the reactor vessel internals, including the shroud, is discussed in Section 4.3.1.2. The CUFs for the shroud are based on the design basis transients and the associated analyses remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2.4 BWRVIP-47, Lower Plenum Fatigue Analysis

BWRVIP-47 identified fatigue analyses, especially of lower plenum pressure boundary components, as TLAA. The only lower plenum CUF identified for VYNPS was a CUF for the CRD penetrations equal to 0.13. This CUF is maintained by limiting the allowed number of transients and as such the associated analysis remains valid for the period of extended operation per 10 CFR 54.21(c)(1)(i).

4.7.2.5 BWRVIP-48, Vessel ID Attachment Welds Fatigue Analysis

The BWRVIP-48 fatigue analyses for various configurations of different vessel ID bracket attachments are considered TLAA. The analyses addressed VYNPS bracket configurations. VYNPS has no unique bracket configurations. Analysis of fatigue for 60 years showed that no CUFs are above 0.4. This analysis remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2.6 BWRVIP-49, Instrument Penetrations Fatigue Analysis

The BWRVIP-49 fatigue analysis for several configurations of instrumentation penetrations, including the VYNPS configuration, is considered a TLAA. Analysis of fatigue for 60 years showed that all CUFs are below 0.4. This analysis remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2.7 BWRVIP-74, Reactor Pressure Vessel

BWRVIP-74 and the NRC SER for BWRVIP-74 (Reference 4.7-1) discuss the following four TLAA.

1. Pressure/Temperature Curves

   The SER concludes "a set of P-T curves should be developed for the heatup and cooldown operating conditions in the plant at a given EFPY in the LR period." Section 4.2.2 addresses the VYNPS P-T curves.

2. Fatigue

   The SER states that the license renewal applicant should not rely solely on the analysis in BWRVIP-74, but should also verify that the number of cycles assumed in the original fatigue design is conservative. Section 4.3 addresses fatigue of the reactor pressure vessel.

The SER also states that NRC staff concerns on environmental fatigue were not resolved and that each applicant should address environmental fatigue for the components covered by BWRVIP-74. Section 4.3.4 addresses environmentally-assisted fatigue.

3. Equivalent Margins Analysis for RPV Materials with Charpy USE Less than 50 ft-lbs

BWRVIP-74 addresses the percent reductions in Charpy USE for limiting BWR/3-6 plates and BWR non-Linde 80 submerged arc welds. Section 4.2.3 addresses Charpy USE for reactor pressure vessel materials.

4. Material Evaluation for Exempting RPV Welds from Inspection

See Sections 4.2.5 and 4.2.6 for a discussion of the RPV welds.

4.7.2.8 BWRVIP-76, Core Shroud

BWRVIP-76, Appendix K, states that plant-specific analyses for shroud fatigue will be reviewed to determine if there is a TLAA. A review of the VYNPS plant-specific shroud analyses identified one TLAA.

The VYNPS calculation of the allowable interval between inspections for various core shroud welds uses the limit load analysis techniques described in ASME Code, Section XI, which is valid as long as total neutron fluence remains below 3×10^{20} n/cm^2. Extrapolation of neutron fluence shows that shroud fluence will be approximately 1.5×10^{20} n/cm^2 at the end of the period of extended operation (54 EFPY). Therefore, this calculation remains valid for the period of extended operation per 10 CFR 54.21(c)(1)(i).

4.7.3 References

4.7-1 Grimes, C. I. (NRC), to C. Terry, (BWRVIP Chairman), "Acceptance for referencing of EPRI Proprietary Report TR-113596, BWR Vessel and Internals Project, BWR Reactor Vessel Inspection and Flaw Evaluation Guidelines (BWRVIP-74) and Appendix A, Demonstration of Compliance with the Technical Information requirements of the License Renewal Rule (10CRF54.21)," October 18, 2001.

4.7-2 Lainas, G. C. (NRC), to C. Terry (Niagara Mohawk Power Company, BWRVIP Chairman), Final Safety Evaluation of the BWRVIP Vessel and Internals Project BWRVIP-05 Report, (TAC No. M93925), July 28, 1998.

4.7-3 BVY 03-83, Supplement to Fourth-Interval Inservice Inspection (ISI) Program Plan - Submittal of Relief Request ISI-06, September 25, 2003.