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PG&E Letter DCL-11-136

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

10 CFR 54.21(b)

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
10 CFR 54.21(b) Annual Update to the DCPP License Renewal Application and License Renewal Application Amendment Number 45

Dear Commissioners and Staff:

By letter dated November 23, 2009, Pacific Gas and Electric Company (PG&E) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for the renewal of Facility Operating Licenses DPR-80 and DPR-82, for Diablo Canyon Power Plant (DCPP) Units 1 and 2, respectively. The application included the license renewal application (LRA), and Applicant's Environmental Report – Operating License Renewal Stage. As required by 10 CFR 54.21(b), each year following submittal of the LRA, an amendment to the LRA must be submitted that identifies any change to the current licensing basis (CLB) that materially affects the contents of the LRA, including the Final Safety Analysis Report (FSAR) supplement.

Enclosure 1 identifies DCPP LRA changes that are being made to reflect CLB that materially affect the LRA. Enclosure 2 contains the affected LRA pages with changes shown as electronic mark-ups (deletions crossed out and insertions italicized). The LRA update covers the period from October 1, 2010, through September 30, 2011. As a reviewer aid, all pages of the Appendix B aging management program section are provided, including unchanged pages, when there is a change on any of the pages in that section.

Changes to existing commitments are contained in the changes to LRA Table A4-1 in Enclosure 2.

If you have any questions regarding this response, please contact Mr. Terence L. Grebel, License Renewal Project Manager, at (805) 545-4160.

A139
NRR

I declare under penalty of perjury that the foregoing is true and correct.

Executed on December 21, 2011.

Sincerely,

James R. Becker
Site Vice President

jwh/50412026
Enclosures
cc: Diablo Distribution
cc/enc: Elmo E. Collins, NRC Region IV Regional Administrator
Nathanial B. Ferrer, NRC Project Manager, License Renewal
Michael S. Peck, NRC Senior Resident Inspector
Alan B. Wang, NRC Licensing Project Manager

DCPP License Renewal Application (LRA) Changes Reflected in the Annual LRA Update Amendment 45

Affected LRA Section	Reason for Change
Table 3.3.2-8 Table A4-1, #23 Section 3.3.2.2.14	Completed. PG&E replaced the carbon steel with stainless steel clad Centrifugal Charging Pump (CCP) 2-2 pump casings in the chemical and volume control system with a completely stainless steel pump casing.
Table A4-1, #71	Completed. The intake structure has been returned to (a)(2) status.
Section A1.15 Section B2.1.15	Updated to reflect the revised date for withdrawal of Unit 1 Capsule B as approved in NRC letter dated October 29, 2010 (ML103010159).
Table 3.3.2-7	Updated to remove External Surfaces Monitoring Program for regulators and solenoid valves containing copper alloy (> 15% Zinc). (Reference PG&E Letter DCL-10-130, dated October 12, 2010)
Table A4-1, #31	Completed. The Unit 2 gap repair work has been completed.
Table A4-1, #35	Completed. The procedure acceptance criteria to specifically preclude repositioning a tube more than once without capping or replacing has been revised. This precludes repositioning a tube having chrome plated surfaces from the chrome being moved out of the areas of known wear.
Table A4-1, #62	Completed. The Unit 2 diesel generator starting air and turbocharger air compressors have been upgraded.
Section 4.2.1 Table 4.2-1 Table 4.2-2 Table 4.2-3 Section 4.2.2 Table 4.2-4 Table 4.2-5 Section 4.2.3 Table 4.2-6 Table 4.2-7 Section 4.9 Section A3.1.2 Table A4-1, #24	Pressurized Thermal Shock analyses results are updated to reflect WCAP-17315-NP and WCAP-17299-NP. LRA Table A4-1, Item 24 is deleted.
Section 3.2.2.1.1 Table 3.2.2-1 Table 3.2.2-4 Section 3.3.2.1.3 Section 3.3.2.1.4 Section 3.3.2.1.5 Section 3.3.2.1.7 Section 3.3.2.1.8 Section 3.3.2.1.11 Section 3.3.2.1.12 Section 3.3.2.1.13	Updated to reflect the re-evaluation of cast iron and gray cast iron components based on lessons learned from a license renewal inspection at a different nuclear power plant. Also, added applicable aging management programs for components for which there are multiple aging effects.

Affected LRA Section	Reason for Change
Section 3.3.2.1.14 Section 3.3.2.1.16 Section 3.3.2.1.17 Section 3.3.2.1.18 Section 3.3.2.1.19 Table 3.3.2-3 Table 3.3.2-4 Table 3.3.2-5 Table 3.3.2-7 Table 3.3.2-8 Table 3.3.2-11 Table 3.3.2-12 Table 3.3.2-13 Table 3.3.2-14 Table 3.3.2-16 Table 3.3.2-17 Table 3.3.2-18 Table 3.3.2-19 Section 3.4.2.1.1 Section 3.4.2.1.2 Section 3.4.2.1.4 Table 3.4.2-1 Table 3.4.2-2 Table 3.4.2-4	
Table 2.3.1-2 Table 2.3.2-3 Table 2.3.3-4 Table 2.3.3-7 Table 2.4-1 Table 3.1.2-2 Section 3.2.2.1.3 Table 3.2.2-3 Table 3.3.2-4 Table 3.3.2-7 Table 3.5.2-1	Updated to reflect plant modifications (review of equipment changes).
Table 3.3.2-4 Table 3.3.2-5 Table 3.3.2-8 Table 3.3.2-17 Table 3.3.2-18 Table 3.4.2-2	Updated to reflect abandonment of equipment associated with the boric acid evaporator subsystem.

LRA Amendment 45 Affected LRA Sections, Tables, and Figures
Table 2.3.1-2
Table 2.3.2-3
Table 2.3.3-4
Table 2.3.3-7
Table 2.4-1
Table 3.1.2-2
Section 3.2.2.1.1
Section 3.2.2.1.3
Table 3.2.2-1
Table 3.2.2-3
Table 3.2.2-4
Section 3.3.2.1.3
Section 3.3.2.1.4
Section 3.3.2.1.5
Section 3.3.2.1.7
Section 3.3.2.1.8
Section 3.3.2.1.11
Section 3.3.2.1.12
Section 3.3.2.1.13
Section 3.3.2.1.14
Section 3.3.2.1.16
Section 3.3.2.1.17
Section 3.3.2.1.18
Section 3.3.2.1.19
Section 3.3.2.2.14
Table 3.3.2-3
Table 3.3.2-4
Table 3.3.2-5
Table 3.3.2-7
Table 3.3.2-8
Table 3.3.2-11
Table 3.3.2-12
Table 3.3.2-13
Table 3.3.2-14
Table 3.3.2-16
Table 3.3.2-17
Table 3.3.2-18
Table 3.3.2-19
Section 3.4.2.1.1
Section 3.4.2.1.2
Section 3.4.2.1.4
Table 3.4.2-1
Table 3.4.2-2

LRA Amendment 45 Affected LRA Sections, Tables, and Figures
Table 3.4.2-4
Table 3.5.2-1
Section 4.2.1
Table 4.2-1
Table 4.2-2
Table 4.2-3
Section 4.2.2
Table 4.2-4
Table 4.2-5
Section 4.2.3
Table 4.2-6
Table 4.2-7
Section 4.9
Section A1.15
Section A3.1.2
Table A4-1, #23, 24, 31, 35, 62, 71
Section B2.1.15

Table 2.3.1-2 Reactor Coolant System

Component Type	Intended Function
Filter	*Leakage Boundary (spatial)* *Structural Integrity (attached)*

Table 2.3.2-3 Residual Heat Removal System

Component Type	Intended Function
Indicator	*Leakage Boundary (spatial)* *Structural Integrity (attached)*

Table 2.3.3-4 Component Cooling Water System

Component Type	Intended Function
Tubing	*Leakage Boundary (spatial)* Pressure Boundary *Structural Integrity (attached)*

Table 2.3.3-7 Compressed Air System

Component Type	Intended Function
Orifice	*Pressure Boundary* *Throttle*

Table 2.4-1 Containment Building

Component Type	Intended Function
Hatch	*Shelter, Protection* *Structural Support*
Structural Steel	*Missile Barrier*

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Filter	*LBS, SIA*	*Stainless Steel*	*Demineralized Water (Int)*	*Loss of material*	*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)*	*V.C-4*	*3.2.1.03*	*C*
Filter	*LBS, SIA*	*Stainless Steel*	*Plant Indoor Air (Ext)*	*None*	*None*	*IV.E-2*	*3.1.1.86*	*A*

3.2.2.1.1 Safety Injection System

Materials

The materials of construction for the safety injection system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

3.2.2.1.3 Residual Heat Removal System

Materials

The materials of construction for the residual heat removal system component types are:

- *Glass*

Table 3.2.2-1 Engineered Safety Features – Summary of Aging Management Evaluation – Safety Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Filter	PB	Cast Iron *(Gray Cast Iron)*	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-28	3.2.1.16	B
Filter	PB	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	B

Table 3.2.2-3 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Indicator	*LBS, SIA*	*Glass*	*Borated Water Leakage (Ext)*	*None*	*None*	*None*	*None*	*H, 5*
Indicator	*LBS, SIA*	*Glass*	*Treated Borated Water (Int)*	*None*	*None*	*V.F-9*	*3.2.1.52*	*A*
Indicator	*LBS, SIA*	*Stainless Steel*	*Borated Water Leakage (Ext)*	*None*	*None*	*V.F-13*	*3.2.1.57*	*A*
Indicator	*LBS, SIA*	*Stainless Steel*	*Treated Borated Water (Int)*	*Loss of material*	*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)*	*V.D1-30*	*3.2.1.49*	*E, 3*
Indicator	*LBS, SIA*	*Stainless Steel*	*Treated Borated Water (Int)*	*Cracking*	*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)*	*V.D1-31*	*3.2.1.48*	*E, 3*

Notes for Table 3.2.2-3:

Plant Specific Notes:

5 There are no aging effects associated with glass with borated water leakage. This non-NUREG-1801 Revision 1 line is based upon NUREG-1801 Revision 2 line VII.J.AP-96.

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation – Containment HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger (Containment Purge)	*HT, PB*	*Cast Iron (Gray Cast Iron)*	*Secondary Water (Int)*	*Loss of material*	*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)*	*VIII.F-28*	*3.4.1.03*	*A*
Tubing	*LBS,* PB*, SIA*	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Tubing	*LBS,* PB*, SIA*	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	PB	Cast Iron (Gray Cast Iron)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F3-3	3.3.1.72	D, *9*

Plant Specific Notes:

9 The operating temperature for these components is above dew point. Condensation can occur but rarely. Components surfaces are normally dry.

3.3.2.1.3 Saltwater and Chlorination System

Materials

The materials of construction for the saltwater and chlorination system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

3.3.2.1.4 Component Cooling Water System

Materials

The materials of construction for the component cooling water system component types are:

- ~~Cast Iron~~

3.3.2.1.5 Makeup Water System

Materials

The materials of construction for the makeup water system component types are:

- ~~Cast Iron~~

3.3.2.1.7 Compressed Air System

Materials

The materials of construction for the compressed air system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

3.3.2.1.8 Chemical and Volume Control System

Materials

The materials of construction for the chemical and volume control system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

3.3.2.1.11 Auxiliary Building HVAC System

Materials

The materials of construction for the auxiliary building HVAC system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

3.3.2.1.12 Fire Protection System

Materials

The materials of construction for the fire protection system component types are:

- ~~Cast Iron~~

3.3.2.1.13 Diesel Generator Fuel Oil System

Materials

The materials of construction for the diesel generator fuel oil system component types are:

- ~~Cast Iron~~
- *Ductile Iron*

3.3.2.1.14 Diesel Generator System

Materials

The materials of construction for the diesel generator system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

Aging Management Programs

The following aging management programs manage the aging effects for the diesel generator system component types:

- *Selective Leaching of Materials (B2.1.17)*

3.3.2.1.16 Gaseous Radwaste System

Materials

The materials of construction for the gaseous radwaste system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

3.3.2.1.17 Liquid Radwaste System

Materials

The materials of construction for the liquid radwaste system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

3.3.2.1.18 Miscellaneous Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2)

Materials

The materials of construction for the miscellaneous systems in scope ONLY based on Criterion 10 CFR 54.4(a)(2) component types are:

- ~~Cast Iron~~

3.3.2.1.19 Oily Water and Turbine Sump System

Materials

The materials of construction for the oily water and turbine sump system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

Aging Management Programs

The following aging management programs manage the aging effects for the oily water and turbine sump system component types:

- *Selective Leaching of Materials (B2.1.17)*

3.3.2.2.14 Loss of Material due to Cladding Breach

The Water Chemistry program (B2.1.2) and the One-Time Inspection program (B2.1.16) manage loss of material due to cladding breach for steel clad with stainless steel pump casings exposed to treated borated water. The one-time inspection includes each of the affected components and will address the full internal cladding surface exposed to treated borated water.

NRC Information Notice 80-38 and Information Notice 94-63 address loss of material due to cladding breach for CVCS pumps fabricated of steel with stainless steel cladding. DCPP identifies pumps CCP 1-1 and CCP 2-2 as fabricated of steel with stainless steel cladding. NRC Information Notice 80-38 advises that the condition presents a "potential source of degradation over long term operations" and recommends a "non-destructive examination of this pump type." Information Notice 94-63 provides additional information about the condition described based on the analysis of industry operating experience and concludes that "corrosion of the base metal due to cladding cracks is usually relatively easy to identify through visual inspection". The One-Time Inspection program (B2.1.16) provides a non-destructive visual examination consistent with the guidance of Information Notice 80-38 and 94-63.

~~Prior to the period of extended operation, DCPP will replace the current carbon steel with stainless steel clad CCP 2-2 pump casings with a completely stainless steel pump casings.~~*During the Unit 1 and Unit 2 sixteenth refueling outages, PG&E replaced the CCP 1-1 and CCP 2-2 carbon steel pump casings with completely stainless steel casings, respectively.*

Table 3.3.2-3 Auxiliary Systems – Summary of Aging Management Evaluation – Saltwater and Chlorination System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Piping	LBS	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	*LBS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C1-11*	*3.3.1.85*	*A*
Pump	*LBS*	*Cast Iron (Gray Cast Iron)*	*Demineralized Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.G-16*	*3.3.1.85*	*A*
Pump	LBS	Cast Iron *(Gray Cast Iron)*	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-11	3.4.1.04	A
Pump	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Strainer	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Strainer	LBS	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Strainer	*LBS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C1-11*	*3.3.1.85*	*A*
Valve	PB	Cast Iron *(Gray Cast Iron)*	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-9	3.3.1.58	B

Table 3.3.2-3 Auxiliary Systems – Summary of Aging Management Evaluation – Saltwater and Chlorination System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	*LBS*	*Cast Iron (Gray Cast Iron)*	*Demineralized Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.G-16*	*3.3.1.85*	*A*
Valve	LBS	Cast Iron *(Gray Cast Iron)*	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-11	3.4.1.04	A
Valve	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Valve	*LBS,* PB	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Valve	*LBS, PB*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C1-11*	*3.3.1.85*	*A*
Valve	*PB*	*Copper Alloy (Aluminum > 8%)*	*Raw Water (Int)*	*Loss of material*	*Open-Cycle Cooling Water System (B2.1.9)*	*VII.C1-9*	*3.3.1.81*	*A*

Table 3.3.2-4 Auxiliary Systems – Summary of Aging Management Evaluation – Component Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	*PB*	*Carbon Steel*	*Atmosphere/ Weather (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.I.9*	*3.3.1.58*	*E, 4*
Piping	*PB*	*Carbon Steel*	*Closed Cycle Cooling Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.C2-14*	*3.3.1.47*	*E, 5*
~~Regulators~~	~~PB~~	~~Cast Iron~~	~~Dry Gas (Int)~~	~~None~~	~~None~~	~~VII.J-23~~	~~3.3.1.97~~	~~A~~
~~Regulators~~	~~PB~~	~~Cast Iron~~	~~Plant Indoor Air (Ext)~~	~~Loss of material~~	~~External Surfaces Monitoring Program (B2.1.20)~~	~~VII.I-8~~	~~3.3.1.58~~	~~B~~
~~Regulators~~	~~PB~~	~~Cast Iron~~	~~Atmosphere/ Weather (Ext)~~	~~Loss of Material~~	~~External Surfaces Monitoring Program (B2.1.20)~~	~~VII.I-9~~	~~3.3.1.58~~	~~B~~
Valve	*PB*	*Carbon Steel*	*Closed Cycle Cooling Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.C2-14*	*3.3.1.47*	*E, 5*
Valve	*PB*	*Stainless Steel*	*Closed Cycle Cooling Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.C2-10*	*3.3.1.50*	*E, 5*

Notes for Table 3.3.2-4:

Plant Specific Notes:

4 Closed Cooling Water piping with internal environment of atmosphere/weather.

5 *Components are associated with the boric acid evaporator subsystem which is abandoned-in-place. Thus, aging of the components will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program.*

Table 3.3.2-5 Auxiliary Systems – Summary of Aging Management Evaluation – Makeup Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	*LBS*	*Stainless Steel*	*Demineralized Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.E-29*	*3.4.1.16*	*E, 6*
Pump	*PB*	*Cast Iron (Gray Cast Iron)*	*Demineralized Water (Int)*	*Loss of material*	*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)*	*VIII.E-34*	*3.4.1.04*	*A*
Valve	PB	Cast Iron *(Gray Cast Iron)*	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-9	3.3.1.58	B
Valve	*PB*	*Cast Iron (Gray Cast Iron)*	*Buried (Ext)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.G-15*	*3.3.1.85*	*A*
Valve	PB	Cast Iron *(Gray Cast Iron)*	Buried (Ext)	Loss of Material	Buried Piping and Tanks Inspection (B2.1.18)	VII.G-25	3.3.1.19	B
Valve	LBS, *PB*	Cast Iron *(Gray Cast Iron)*	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-34	3.4.1.04	A
~~Valve~~	~~LBS~~	~~Cast Iron~~	~~Plant Indoor Air (Ext)~~	~~Loss of material~~	~~External Surfaces Monitoring Program (B2.1.20)~~	~~VII.I-8~~	~~3.3.1.58~~	~~B~~
~~Valve~~	~~LBS~~	~~Cast Iron~~	~~Potable Water (Int)~~	~~Loss of material~~	~~Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)~~	~~None~~	~~None~~	~~G~~
~~Valve~~	~~PB~~	~~Cast Iron~~	~~Raw Water (Int)~~	~~Loss of material~~	~~Fire Water System (B2.1.13)~~	~~VII.G-24~~	~~3.3.1.68~~	~~B~~

Table 3.3.2-5 Auxiliary Systems – Summary of Aging Management Evaluation – Makeup Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	*LBS*	*Cast Iron (Gray Cast Iron)*	*Potable Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*None*	*None*	*G*
Valve	*LBS*	*Cast Iron (Gray Cast Iron)*	*Potable Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*None*	*None*	*G*
Valve	*LBS*	*Stainless Steel*	*Demineralized Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.E-29*	*3.4.1.16*	*E, 6*

Notes for Table 3.3.2-5:

Plant Specific Notes:

6 *Components are associated with the boric acid evaporator subsystem which is abandoned-in-place. Thus, aging of the components will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program.*

Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Compressed Air System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Filter	*FIL, PB*	*Stainless Steel*	*Atmosphere/ Weather (Ext)*	*Loss of material*	*External Surfaces Monitoring Program (B2.1.20)*	*None*	*None*	*G*
Filter	*FIL, PB*	*Stainless Steel*	*Dry Gas (Int)*	*None*	*None*	*VII.J-19*	*3.3.1.97*	*A*
Orifice	*PB, TH*	*Stainless Steel*	*Plant Indoor Air (Ext)*	*None*	*None*	*VII.J-15*	*3.3.1.94*	*A*
Orifice	*PB, TH*	*Stainless Steel*	*Plant Indoor Air (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.D-4*	*3.3.1.54*	*E, 3*
Regulators	PB	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.D-3	3.3.1.57	B
Regulators	PB	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.D-2	3.3.1.53	E, 3
Regulators	*PB*	*Cast Iron (Gray Cast Iron)*	*Plant Indoor Air (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*None*	*None*	*G, 4*
~~Regulators~~	~~PB~~	~~Copper Alloy (> 15% Zinc)~~	~~Atmosphere/ Weather (Ext)~~	~~Loss of material~~	~~External Surfaces Monitoring Program (B2.1.20)~~	~~None~~	~~None~~	~~G~~
Regulators	*PB*	*Copper Alloy (> 15% Zinc)*	*Plant Indoor Air (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.G-9*	*3.3.1.28*	*E, 3*

Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Compressed Air System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
~~Solenoid Valve~~	~~PB~~	~~Copper Alloy (> 15% Zinc)~~	~~Atmosphere/ Weather (Ext)~~	~~Loss of material~~	~~External Surfaces Monitoring Program (B2.1.20)~~	~~None~~	~~None~~	~~G~~
Solenoid Valve	*PB*	*Copper Alloy (> 15% Zinc)*	*Plant Indoor Air (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.G-9*	*3.3.1.28*	*E, 3*

Notes for Table 3.3.2-7:

Plant Specific Notes:

4 Gray Cast Iron SSCs with surfaces exposed to Ventilation Atmosphere (Internal) or Plant Indoor Air (Internal) are subject to wetting due to condensation and thus are subject to loss of material due to selective leaching.

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Demineralizer	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VIII.E-29	3.4.1.16	~~A~~*E, 9*
Evaporator	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VII.E1-17	3.3.1.91	E, ~~5~~*9*
~~Evaporator~~	~~LBS~~	~~Stainless Steel~~	~~Treated Borated Water (Int)~~	~~Cracking~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VII.E1-20~~	~~3.3.1.90~~	~~E, 5~~
Filter	*LBS*	*Stainless Steel*	*Treated Borated Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.E1-17*	*3.3.1.91*	*E, 9*
Flow Element	*LBS, SIA*	*Stainless Steel*	*Treated Borated Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.E1-17*	*3.3.1.91*	*E, 9*
Heat Exchanger (Boric Acid Evaporator/ Condenser)	LBS, SIA, SS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Closed-Cycle Cooling Water System (B2.1.10)~~	VII.E1-6	3.3.1.48	*E, 9*~~B~~
Heat Exchanger (Boric Acid Evaporator/ Condenser)	*LBS, SS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.E-34*	*3.4.1.04*	*E, 9*

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
~~Heat Exchanger (Boric Acid Evaporator/ Condenser)~~	~~LBS, SS~~	~~Carbon Steel~~	~~Steam (Int)~~	~~Loss of material~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VIII.B1-8~~	~~3.4.1.37~~	~~E, 5~~
Heat Exchanger (Boric Acid Evaporator/ Condenser)	LBS, SS	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Closed Cycle Cooling Water System (B2.1.10)~~	VII.C2-10	3.3.1.50	*E, 9*~~D~~
Heat Exchanger (Boric Acid Evaporator/ Condenser)	LBS, SS	Stainless Steel	Secondary Water (Ext)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VIII.E-29	3.4.1.16	*E, 9*~~C~~
~~Heat Exchanger (Boric Acid Evaporator/ Condenser)~~	~~LBS, SS~~	~~Stainless Steel~~	~~Secondary Water (Ext)~~	~~Cracking~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VIII.E-30~~	~~3.4.1.14~~	~~C~~
Heat Exchanger (Boric Acid Distillate)	LBS, SS	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Closed Cycle Cooling Water System (B2.1.10)~~	VII.C2-10	3.3.1.50	*E, 9*~~D~~
Heat Exchanger (Boric Acid Distillate)	LBS, SIA, SS	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Closed Cycle Cooling Water System (B2.1.10)~~	VII.C2-10	3.3.1.50	*E, 9*~~D~~

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger (Boric Acid Distillate)	LBS, SS	Stainless Steel	Demineralized Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VIII.E-29	3.4.1.16	*E, 9*~~C~~
Heat Exchanger (Boric Acid Evaporator)	*LBS*	*Stainless Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.E-29*	*3.4.1.16*	*E, 9*
~~Heat Exchanger (Boric Acid Evaporator)~~	~~LBS~~	~~Stainless Steel~~	~~Steam (Int)~~	~~Cracking~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VIII.B1-2~~	~~3.4.1.39~~	~~E, 5~~
~~Heat Exchanger (Boric Acid Evaporator)~~	~~LBS~~	~~Stainless Steel~~	~~Steam (Int)~~	~~Loss of material~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VIII.B1-3~~	~~3.4.1.37~~	~~E, 5~~
~~Heat Exchanger (Boric Acid Evaporator)~~	~~LBS~~	~~Stainless Steel~~	~~Treated Borated Water (Ext)~~	~~Cracking~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VII.E1-5~~	~~3.3.1.08~~	~~E, 5~~
Heat Exchanger (Boric Acid Evaporator)	LBS	Stainless Steel	Treated Borated Water (Ext)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VII.E1-17	3.3.1.91	E, ~~5~~*9*
~~Heat Exchanger (Boric Acid Evaporator)~~	~~LBS, SIA, SS~~	~~Stainless Steel~~	~~Treated Borated Water (Int)~~	~~Cracking~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VII.E1-5~~	~~3.3.1.08~~	~~E~~

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger (Boric Acid Evaporator)	LBS, SIA, SS	Stainless Steel	Treated Borated Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-17	3.3.1.91	E, 59
Heat Exchanger (Boric Acid Feed)	LBS	Stainless Steel	Secondary Water (Ext)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-29	3.4.1.16	*E, 9*C
Heat Exchanger (Boric Acid Feed)	LBS	Stainless Steel	Secondary Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-30	3.4.1.14	C
Heat Exchanger (Boric Acid Feed)	*LBS*	*Stainless Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.E-29*	*3.4.1.16*	*E, 9*
Heat Exchanger (Boric Acid Feed)	LBS	Stainless Steel	Steam (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-2	3.4.1.39	E, 5
Heat Exchanger (Boric Acid Feed)	LBS	Stainless Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-3	3.4.1.37	E, 5
Heat Exchanger (Boric Acid Feed)	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-5	3.3.1.08	E

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger (Boric Acid Feed)	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VII.E1-17	3.3.1.91	E, ~~5~~*9*
Heat Exchanger (Boric Acid Vent)	LBS, SIA, SS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Closed-Cycle Cooling Water System (B2.1.10)~~	VII.E1-6	3.3.1.48	*E, 9*~~B~~
Heat Exchanger (Boric Acid Vent)	LBS, SS	Carbon Steel	Demineralized Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VIII.E-37	3.4.1.03	*E, 9*~~A~~
Heat Exchanger (Boric Acid Vent)	LBS, SS	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Closed-Cycle Cooling Water System (B2.1.10)~~	VII.C2-10	3.3.1.50	*E, 9*~~D~~
Heat Exchanger (Boric Acid Vent)	LBS, SS	Stainless Steel	Secondary Water (Ext)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VIII.E-29	3.4.1.16	*E, 9*~~C~~
~~Heat Exchanger (Boric Acid Vent)~~	~~LBS, SS~~	~~Stainless Steel~~	~~Secondary Water (Ext)~~	~~Cracking~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VIII.E-30~~	~~3.4.1.14~~	~~C~~

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	*LBS, SIA*	*Stainless Steel*	*Demineralized Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.E-29*	*3.4.1.16*	*E, 9*
Piping	*LBS, SIA*	*Stainless Steel*	*Sodium Hydroxide (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*None*	*None*	*G, 9*
Piping	*LBS, PB, SIA*	*Stainless Steel*	*Treated Borated Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.E1-17*	*3.3.1.91*	*E, 9*
Pump	LBS, ~~PB,~~ SIA	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	VII.E1-1	3.3.1.89	A
Pump	LBS	Carbon Steel with Stainless Steel Cladding	Demineralized Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VIII.E-29	3.4.1.16	*E, 9*~~A~~
~~Pump~~	~~PB~~	~~Carbon Steel with Stainless Steel Cladding~~	~~Treated Borated Water (Int)~~	~~Cracking~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VII.E1-7~~	~~3.3.1.09~~	~~E~~
Pump	LBS, ~~PB,~~ SIA	Carbon Steel with Stainless Steel Cladding	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-17	3.3.1.91	E, 5

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump	PB	Carbon Steel with Stainless Steel Cladding	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-21	3.3.1.35	E
Pump	*LBS*	*Stainless Steel*	*Treated Borated Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.E1-17*	*3.3.1.91*	*E, 9*
Sight Gauge	*LBS, SIA*	*Stainless Steel*	*Treated Borated Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.E1-17*	*3.3.1.91*	*E, 9*
Tank	*LBS*	*Stainless Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.E-29*	*3.4.1.16*	*E, 9*
Tank	LBS	Stainless Steel	Steam (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-2	3.4.1.39	E, 5
Tank	LBS	Stainless Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-3	3.4.1.37	E, 5
Tank	LBS	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-17	3.3.1.91	E, 5*9*
Trap	*LBS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.E-34*	*3.4.1.04*	*E, 9*
Trap	LBS	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-8	3.4.1.37	E, 5
Valve	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS	Cast Iron *(Gray Cast Iron)*	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	V.A-19	3.2.1.32	B
Valve	*LBS*	*Cast Iron (Gray Cast Iron)*	*Ventilation Atmosphere (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*None*	*None*	*G, 8*
Valve	*LBS, PB, SIA*	*Stainless Steel*	*Demineralized Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.E-29*	*3.4.1.16*	*E, 9*
Valve	*LBS, SIA*	*Stainless Steel*	*Sodium Hydroxide (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*None*	*None*	*G, 9*
Valve	*LBS, PB, SIA*	*Stainless Steel*	*Treated Borated Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.E1-17*	*3.3.1.91*	*E, 9*
Valve	*LBS, SIA*	*Stainless Steel Cast Austenitic*	*Treated Borated Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.E1-17*	*3.3.1.91*	*E, 9*
Vessel	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VII.E1-17	3.3.1.91	E, ~~5~~*9*

Notes for Table 3.3.2-8:

Plant Specific Notes:

8 Gray Cast Iron SSCs with surfaces exposed to Ventilation Atmosphere (Internal) or Plant Indoor Air (Internal) are subject to wetting due to condensation and thus are subject to loss of material due to selective leaching.

9 Components are associated with the boric acid evaporator subsystem which is abandoned-in-place. Thus, aging of the components will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program.

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Damper	PB	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-2	3.3.1.56	B
Damper	PB	Cast Iron *(Gray Cast Iron)*	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	B
Damper	*PB*	*Cast Iron (Gray Cast Iron)*	*Ventilation Atmosphere (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*None*	*None*	*G, 5*
Pump	*LBS*	*Carbon Steel*	*Closed Cycle Cooling Water (Int)*	*Loss of material*	*Closed-Cycle Cooling Water System (B2.1.10)*	*VII.F2-18*	*3.3.1.47*	*B*
Pump	*LBS*	*Carbon Steel*	*Plant Indoor Air (Ext)*	*Loss of material*	*External Surfaces Monitoring Program (B2.1.20)*	*VII.I-8*	*3.3.1.58*	*B*
Pump	LBS	Cast Iron *(Gray Cast Iron)*	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Pump	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Pump	*LBS*	*Cast Iron (Gray Cast Iron)*	*Closed Cycle Cooling Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C2-8*	*3.3.1.85*	*A*
Valve	*LBS*	*Copper Alloy (> 15% Zinc)*	*Closed Cycle Cooling Water (Int)*	*Loss of material*	*Closed-Cycle Cooling Water System (B2.1.10)*	*VII.F2-13*	*3.3.1.51*	*B*
Valve	*LBS*	*Copper Alloy (> 15% Zinc)*	*Demineralized Water (Int)*	*Loss of material*	*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)*	*VIII.A-5*	*3.4.1.15*	*A*

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	*LBS*	*Copper Alloy (> 15% Zinc)*	*Potable Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*None*	*None*	*G*

Notes for Table 3.3.2-11:

Plant Specific Notes:

5 Gray Cast Iron SSCs with surfaces exposed to Ventilation Atmosphere (Internal) or Plant Indoor Air (Internal) are subject to wetting due to condensation and thus are subject to loss of material due to selective leaching.

Table 3.3.2-12 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Hydrant	PB	~~Cast Iron~~ *Carbon Steel*	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.G-25	3.3.1.19	B
Hydrant	PB	~~Cast Iron~~ *Carbon Steel*	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13)	VII.G-24	3.3.1.68	B
Piping	*PB*	*Cast Iron (Gray Cast Iron)*	*Buried (Ext)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.G-15*	*3.3.1.85*	*A*
Piping	PB	Cast Iron *(Gray Cast Iron)*	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.G-25	3.3.1.19	B
Piping	*PB*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.G-14*	*3.3.1.85*	*A*
Piping	PB	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13)	VII.G-24	3.3.1.68	B
Pump	PB, SS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Pump	*PB, SS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.G-14*	*3.3.1.85*	*A*
Pump	PB, SS	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13)	VII.G-24	3.3.1.68	B
~~Strainer~~	~~PB~~	~~Cast Iron~~	~~Plant Indoor Air (Ext)~~	~~Loss of Material~~	~~External Surfaces Monitoring Program (B2.1.20)~~	~~VII.I-8~~	~~3.3.1.58~~	~~B~~
~~Strainer~~	~~PB~~	~~Cast Iron~~	~~Raw Water (Int)~~	~~Loss of Material~~	~~Fire Water System (B2.1.13)~~	~~VII.G-24~~	~~3.3.1.68~~	~~B~~
~~Valve~~	~~PB~~	~~Cast Iron~~	~~Atmosphere/ Weather (Ext)~~	~~Loss of material~~	~~External Surfaces Monitoring Program (B2.1.20)~~	~~VII.I-9~~	~~3.3.1.58~~	~~B~~

Table 3.3.2-12 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
~~Valve~~	~~PB~~	~~Cast Iron~~	~~Buried (Ext)~~	~~Loss of material~~	~~Buried Piping and Tanks Inspection (B2.1.18)~~	~~VII.G-25~~	~~3.3.1.19~~	~~B~~
~~Valve~~	~~PB~~	~~Cast Iron~~	~~Plant Indoor Air (Int)~~	~~Loss of material~~	~~Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)~~	~~VII.G-23~~	~~3.3.1.71~~	~~B~~
~~Valve~~	~~PB~~	~~Cast Iron~~	~~Raw Water (Int)~~	~~Loss of material~~	~~Fire Water System (B2.1.13)~~	~~VII.G-24~~	~~3.3.1.68~~	~~B~~
~~Valve~~	~~PB~~	~~Cast Iron~~	~~Dry Gas (Int)~~	~~None~~	~~None~~	~~VII.J-23~~	~~3.3.1.97~~	~~A~~
Valve	*PB*	*Cast Iron (Gray Cast Iron)*	*Plant Indoor Air (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.G-23*	*3.3.1.71*	*B*
Valve	*PB*	*Cast Iron (Gray Cast Iron)*	*Plant Indoor Air (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*None*	*None*	*G, 4*

Notes for Table 3.3.2-12:

Plant Specific Notes:

4 Gray Cast Iron SSCs with surfaces exposed to Ventilation Atmosphere (Internal) or Plant Indoor Air (Internal) are subject to wetting due to condensation and thus are subject to loss of material due to selective leaching.

Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Diesel Generator Fuel Oil System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump	PB	~~Cast Iron~~*Ductile Iron*	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H1-10	3.3.1.20	B
Pump	PB	~~Cast Iron~~*Ductile Iron*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
~~Valve~~	~~PB~~	~~Cast Iron~~	~~Fuel Oil (Ext)~~	~~Loss of material~~	~~Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)~~	~~VII.H1-10~~	~~3.3.1.20~~	~~B~~
~~Valve~~	~~PB~~	~~Cast Iron~~	~~Fuel Oil (Int)~~	~~Loss of material~~	~~Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)~~	~~VII.H1-10~~	~~3.3.1.20~~	~~B~~

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Compressor	SIA	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Compressor	SIA	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VIII.G-34	3.4.1.30	D
Compressor	*SIA*	*Cast Iron (Gray Cast Iron)*	*Plant Indoor Air (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*None*	*None*	*G, 3*
Pump	*PB*	*Cast Iron (Gray Cast Iron)*	*Closed Cycle Cooling Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C2-8*	*3.3.1.85*	*A*
Pump	PB	Cast Iron *(Gray Cast Iron)*	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	B
Pump	LBS, PB, SIA	Cast Iron *(Gray Cast Iron)*	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H2-24	3.3.1.20	B
Pump	LBS, PB	Cast Iron *(Gray Cast Iron)*	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B
Pump	LBS, PB, SIA	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Sight Gauge	*PB*	*Carbon Steel*	*Fuel Oil (Int)*	*Loss of material*	*Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)*	*VII.H2-24*	*3.3.1.20*	*B*
Sight Gauge	*PB*	*Carbon Steel*	*Plant Indoor Air (Ext)*	*Loss of material*	*External Surfaces Monitoring Program (B2.1.20)*	*VII.I-8*	*3.3.1.58*	*B*

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Sight Gauge	PB	Cast Iron *(Gray Cast Iron)*	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H2-24	3.3.1.20	B
Sight Gauge	PB	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Valve	*PB*	*Cast Iron (Gray Cast Iron)*	*Closed Cycle Cooling Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C2-8*	*3.3.1.85*	*A*
Valve	PB	Cast Iron *(Gray Cast Iron)*	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	B
~~Valve~~	~~PB~~	~~Cast Iron~~	~~Fuel Oil (Int)~~	~~Loss of material~~	~~Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)~~	~~VII.H2-24~~	~~3.3.1.20~~	~~B~~
Valve	PB	Cast Iron *(Gray Cast Iron)*	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B
Valve	PB	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Valve	PB	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.H2-21	3.3.1.71	B
Valve	*PB*	*Cast Iron (Gray Cast Iron)*	*Plant Indoor Air (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*None*	*None*	*G, 3*

Notes for Table 3.3.2-14:

Plant Specific Notes:

3 *Gray Cast Iron SSCs with surfaces exposed to Ventilation Atmosphere (Internal) or Plant Indoor Air (Internal) are subject to wetting due to condensation and thus are subject to loss of material due to selective leaching.*

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation – Gaseous Radwaste System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Compressor	LBS, SS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Compressor	LBS, SS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	B
Compressor	*LBS, SS*	*Cast Iron (Gray Cast Iron)*	*Plant Indoor Air (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*None*	*None*	*G, 6*
Compressor	*LBS, SS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C1-11*	*3.3.1.85*	*A*
Compressor	LBS, SS	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 3
Valve	*LBS*	*Copper Alloy (> 15% Zinc)*	*Plant Indoor Air (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.G-9*	*3.3.1.28*	*E, 5*
Valve	*LBS, SS*	*Copper Alloy (> 15% Zinc)*	*Raw Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.C1-9*	*3.3.1.81*	*E, 3*

Notes for Table 3.3.2-16:

Plant Specific Notes:

5 *NUREG-1801, Section XI.M24, Compressed Air Monitoring applies to monitoring of the piping and components associated with the air compressors and dryers. Air compressor and dryer piping and components are not in scope for DCPP. In scope piping and components are associated with containment penetrations and air/nitrogen gas piping and components for backup operation of valves. Therefore NUREG-1801, Section XI.M24 is not considered applicable to DCPP and different aging management programs are specified for the in scope piping and components.*

6 *Gray Cast Iron SSCs with surfaces exposed to Ventilation Atmosphere (Internal) or Plant Indoor Air (Internal) are subject to wetting due to condensation and thus are subject to loss of material due to selective leaching.*

Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	*LBS*	*Carbon Steel*	*Raw Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.C1-19*	*3.3.1.76*	*E, 8*
Piping	*LBS*	*Stainless Steel*	*Raw Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.C1-15*	*3.3.1.79*	*E, 8*
Sample Cooler	*LBS, SIA*	*Copper Alloy (> 15% Zinc)*	*Raw Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.C1-9*	*3.3.1.81*	*E, 3*
Strainer	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Strainer	*LBS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C1-11*	*3.3.1.85*	*A*
Strainer	LBS	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2
Trap	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Trap	*LBS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C1-11*	*3.3.1.85*	*A*

Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Trap	LBS	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2
Valve	LBS, PB, SIA	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Valve	*LBS, SIA*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C1-11*	*3.3.1.85*	*A*
Valve	LBS, PB, SIA	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2
Valve	*LBS*	*Copper Alloy (> 15% Zinc)*	*Demineralized Water (Int)*	*Loss of material*	*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)*	*VIII.F-15*	*3.4.1.15*	*A*
Valve	*LBS*	*Stainless Steel*	*Raw Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VII.C1-15*	*3.3.1.79*	*E, 8*

Notes for Table 3.3.2-17:

Plant Specific Notes:

8 Components are associated with the boric acid evaporator subsystem which is abandoned-in-place. Thus, aging of the components will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program.

Table 3.3.2-18 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	*LBS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.C-7*	*3.4.1.04*	*E, 7*
Piping	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Piping	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	B
Piping	*LBS*	*Cast Iron (Gray Cast Iron)*	*Plant Indoor Air (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*None*	*None*	*G, 6*
Piping	*LBS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C1-11*	*3.3.1.85*	*A*
Piping	LBS	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 5

Table 3.3.2-18 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VII.E1-17	3.3.1.91	E, 47
~~Piping~~	~~LBS~~	~~Stainless Steel~~	~~Treated Borated Water (Int)~~	~~Cracking~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VII.E1-20~~	~~3.3.1.90~~	~~E, 4~~
~~Pump~~	~~LBS~~	~~Cast Iron~~	~~Closed Cycle Cooling Water (Int)~~	~~Loss of material~~	~~Closed-Cycle Cooling Water System (B2.1.10)~~	~~VII.C2-14~~	~~3.3.1.47~~	~~B~~
~~Pump~~	~~LBS~~	~~Cast Iron~~	~~Plant Indoor Air (Ext)~~	~~Loss of material~~	~~External Surfaces Monitoring Program (B2.1.20)~~	~~VII.I-8~~	~~3.3.1.58~~	~~B~~
Strainer	*LBS*	*Cast Iron (Gray Cast Iron)*	*Closed Cycle Cooling Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C2-8*	*3.3.1.85*	*A*
Strainer	LBS	Cast Iron *(Gray Cast Iron)*	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Strainer	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
~~Valve~~	~~LBS~~	~~Cast Iron~~	~~Closed Cycle Cooling Water (Int)~~	~~Loss of material~~	~~Closed-Cycle Cooling Water System (B2.1.10)~~	~~VII.C2-14~~	~~3.3.1.47~~	~~B~~
~~Valve~~	~~LBS~~	~~Cast Iron~~	~~Plant Indoor Air (Ext)~~	~~Loss of material~~	~~External Surfaces Monitoring Program (B2.1.20)~~	~~VII.I-8~~	~~3.3.1.58~~	~~B~~

Table 3.3.2-18 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	*LBS*	*Stainless Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.D1-4*	*3.4.1.16*	*E, 7*
Valve	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	VII.E1-17	3.3.1.91	E, 47
~~Valve~~	~~LBS~~	~~Stainless Steel~~	~~Treated Borated Water (Int)~~	~~Cracking~~	~~Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VII.E1-20~~	~~3.3.1.90~~	~~E, 4~~

Notes for Table 3.3.2-18:

Plant Specific Notes:

6 Gray Cast Iron SSCs with surfaces exposed to Ventilation Atmosphere (Internal) or Plant Indoor Air (Internal) are subject to wetting due to condensation and thus are subject to loss of material due to selective leaching.

7 Components are associated with the boric acid evaporator subsystem which is abandoned-in-place. Thus, aging of the components will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program.

Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Oily Water and Turbine Sump System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Cast Iron *(Gray Cast Iron)*	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	A
Piping	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Piping	LBS, PB	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	B
Piping	*LBS, PB*	*Cast Iron (Gray Cast Iron)*	*Plant Indoor Air (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*None*	*None*	*G, 3*
Piping	*LBS, PB*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C1-11*	*3.3.1.85*	*A*
Piping	LBS, PB	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2
Pump	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	B
Pump	*LBS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VII.C1-11*	*3.3.1.85*	*A*

Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Oily Water and Turbine Sump System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump	LBS	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 2

Notes for Table 3.3.2-19:

Plant Specific Notes:

3 Gray Cast Iron SSCs with surfaces exposed to Ventilation Atmosphere (Internal) or Plant Indoor Air (Internal) are subject to wetting due to condensation and thus are subject to loss of material due to selective leaching.

3.4.2.1.1 Turbine Steam Supply System

Materials

The materials of construction for the turbine steam supply system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

Aging Management Programs

The following aging management programs manage the aging effects for the turbine steam supply system component types:

- *Selective Leaching of Materials (B2.1.17)*

3.4.2.1.2 Auxiliary Steam System

Materials

The materials of construction for the auxiliary steam system component types are:

- ~~Cast Iron~~

3.4.2.1.4 Condensate System

Materials

The materials of construction for the condensate system component types are:

- ~~Cast Iron~~
- *Cast Iron (Gray Cast Iron)*

Aging Management Programs

The following aging management programs manage the aging effects for the condensate system component types:

- *Selective Leaching of Materials (B2.1.17)*

Table 3.4.2-1 Steam and Power Conversion System – Summary of Aging Management Evaluation – Turbine Steam Supply System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	B
Valve	*LBS*	*Cast Iron (Gray Cast Iron)*	*Secondary Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VIII.A-8*	*3.4.1.36*	*A*
Valve	LBS	Cast Iron *(Gray Cast Iron)*	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-8	3.4.1.04	A

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger (Aux Steam Drain Rec Vent Cond)	LBS, SIA, SS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Closed Cycle Cooling Water System (B2.1.10)~~	VIII.G-5	3.4.1.24	~~B~~*E, 8*
Heat Exchanger (Aux Steam Drain Rec Vent Cond)	*LBS, SIA, SS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.B1-11*	*3.4.1.04*	*E, 8*
~~Heat Exchanger (Aux Steam Drain Rec Vent Cond)~~	~~LBS, SIA, SS~~	~~Carbon Steel~~	~~Steam (Int)~~	~~Loss of material~~	~~*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VIII.B1-8~~	~~3.4.1.37~~	~~E, 68~~
Piping	*LBS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.B1-11*	*3.4.1.04*	*E, 8*

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger (Aux Steam Drain Rec Vent Cond)	LBS, SIA, SS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*~~Closed Cycle Cooling Water System (B2.1.10)~~	VIII.G-5	3.4.1.24	~~B~~*E, 8*
Heat Exchanger (Aux Steam Drain Rec Vent Cond)	*LBS, SIA, SS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.B1-11*	*3.4.1.04*	*E, 8*
~~Heat Exchanger (Aux Steam Drain Rec Vent Cond)~~	~~LBS, SIA, SS~~	~~Carbon Steel~~	~~Steam (Int)~~	~~Loss of material~~	~~*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)~~	~~VIII.B1-8~~	~~3.4.1.37~~	~~E, 68~~
Piping	*LBS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.B1-11*	*3.4.1.04*	*E, 8*

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	*LBS*	*Stainless Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.B1-4*	*3.4.1.16*	*E, 8*
Pump	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	B
Pump	*LBS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VIII.G-24*	*3.4.1.36*	*A*
Pump	LBS	Cast Iron *(Gray Cast Iron)*	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VIII.G-36	3.4.1.08	E
Strainer	LBS	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	B
Strainer	LBS	Cast Iron *(Gray Cast Iron)*	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-8	3.4.1.37	E, 6
Strainer	LBS	Cast Iron *(Gray Cast Iron)*	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.B1-9	3.4.1.29	B
Strainer	*LBS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.B1-11*	*3.4.1.04*	*E, 8*

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer	*LBS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.B1-11*	*3.4.1.04*	*E, 8*
Tank	*LBS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.G-41*	*3.4.1.06*	*E, 8*
Trap	*LBS*	*Carbon Steel*	*Steam (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.B1-8*	*3.4.1.37*	*E, 8*
Valve	*LBS*	*Carbon Steel*	*Secondary Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.B1-11*	*3.4.1.04*	*E, 8*
~~Valve~~	~~LBS~~	~~Cast Iron~~	~~Plant Indoor Air (Ext)~~	~~Loss of material~~	~~External Surfaces Monitoring Program (B2.1.20)~~	~~VIII.H-7~~	~~3.4.1.28~~	~~B~~
~~Valve~~	~~LBS~~	~~Cast Iron~~	~~Raw Water (Int)~~	~~Loss of material~~	~~Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)~~	~~VIII.G-36~~	~~3.4.1.08~~	~~E~~
Valve	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	*VIII.H-7*~~None~~	*3.4.1.28*~~None~~	*B*~~G~~

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	*LBS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VIII.G-24*	*3.4.1.36*	*A*
Valve	*LBS*	*Cast Iron (Gray Cast Iron)*	*Raw Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.G-36*	*3.4.1.08*	*E*
Valve	*LBS*	*Cast Iron (Gray Cast Iron)*	*Secondary Water (Int)*	*Loss of material*	*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)*	*VIII.B1-11*	*3.4.1.04*	*A*
Valve	*LBS*	*Copper Alloy (> 15% Zinc)*	*Raw Water (Int)*	*Loss of material*	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)*	*VIII.A-4*	*3.4.1.32*	*E, 5*
Valve	*LBS*	*Copper Alloy (Aluminum > 8%)*	*Raw Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VIII.A-6*	*3.4.1.35*	*A*

Notes for Table 3.4.2-2:

Plant Specific Notes:

8 *Components are associated with the boric acid evaporator subsystem which is abandoned-in-place. Thus, aging of the components will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program.*

Table 3.4.2-4 Steam and Power Conversion System – Summary of Aging Management Evaluation – Condensate System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS, PB	Cast Iron *(Gray Cast Iron)*	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	B
Valve	*LBS, PB*	*Cast Iron (Gray Cast Iron)*	*Secondary Water (Int)*	*Loss of material*	*Selective Leaching of Materials (B2.1.17)*	*VIII.E-23*	*3.4.1.36*	*A*
Valve	LBS, PB	Cast Iron *(Gray Cast Iron)*	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-34	3.4.1.04	A
Valve	PB	Cast Iron *(Gray Cast Iron)*	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.E-35	3.4.1.29	B
Valve	LBS	Cast Iron *(Gray Cast Iron)*	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.A-16	3.4.1.02	A
Valve	*PB*	*Ductile Iron*	*Plant Indoor Air (Ext)*	*Loss of material*	*External Surfaces Monitoring Program (B2.1.20)*	*VIII.H-7*	*3.4.1.28*	*B*
Valve	*PB*	*Ductile Iron*	*Secondary Water (Int)*	*Loss of material*	*Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)*	*VIII.E-34*	*3.4.1.04*	*A*

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Containment Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Hatch	*SH, SS*	*Stainless Steel*	*Plant Indoor Air (Structural) (Ext)*	*None*	*None*	*VII.J-15*	*3.3.1.94*	*C*
Structural Steel	*MB,* SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A4-5	3.5.1.25	A

4.2.1 Neutron Fluence Values

Summary Description

Loss of fracture toughness is an aging effect caused by the neutron embrittlement aging mechanism that results from prolonged exposure to neutron radiation. This process results in increased tensile strength and hardness of the material with reduced toughness. The rate of neutron exposure is defined as neutron flux, and the cumulative degree of exposure over time is defined as neutron fluence. As neutron embrittlement progresses, the toughness/temperature curve shifts down (lower fracture toughness as indicated by Charpy upper-shelf energy or C_V USE), and the curve shifts to the right (brittle/ductile transition temperature increases). Neutron fluence projections are made in order to estimate the effect on these reactor vessel material properties (Section 4.2.2 and Section 4.2.3), and to determine if additional reactor vessel materials will be exposed to fluence greater than 1×10^{17} n/cm^2 (E>1.0 MeV) as a result of license renewal (extended beltline).

Analysis

Unit 1

The last capsule withdrawn and tested from Unit 1 was Capsule V at the end-of-cycle (EOC) 11. At that point, Unit 1 had operated for 14.27 EFPY. This capsule had a lead factor of 2.26 resulting in an exposure equivalent to 32.25 EFPY of operation. The results were documented in WCAP-15958 [Reference 2].

This exposure is less than that expected at EOLE. In PG&E Letter DCL-08-021, PG&E requested a change to the withdrawal date of Unit 1 Capsule B from 20.7 EFPY to 21.9 EFPY in order to capture enough fluence data for EOLE. The change was approved by the NRC in a Safety Evaluation dated September 24, 2008, *Diablo Canyon Nuclear Power Plant, Unit No. 1 – Approval of Proposed Reactor Vessel Material Surveillance Capsule Withdrawal Schedule (TAC No. MD8371)* [Reference 2].

During the scheduled Unit 1 Sixteenth Refueling Outage (1R16), refueling personnel were not able to remove the Capsule B access plug on the reactor core barrel flange. In PG&E Letter DCL-10-141, dated October 25, 2010, PG&E requested a change to the withdrawal date of Unit 1 Capsule B from 21.9 EFPY to 23.2 EFPY. The change was approved by the NRC in a Safety Evaluation dated October 29, 2010, *Diablo Canyon Nuclear Power Plant, Unit No. 1 – Approval of Proposed Reactor Vessel Material Surveillance Program Withdrawal Schedule (TAC No. ME4924)* [Reference 38].

Unit 2

The last remaining capsule withdrawn and tested from Unit 2 was Capsule V at EOC 9. At that point, Unit 2 had operated for 11.49 EFPY. This capsule had a lead factor of 4.58 resulting in an exposure equivalent to 52.62 EFPY of operation. This exposure is comparable to the predicted EOLE exposure of 54 EFPY, i.e., within the 20 percent limit specified as the acceptance criteria in Regulatory Guide 1.190. The results were documented in WCAP-15423 [Reference 3].

Both Units

Based on the *guidance specified in Regulatory Guide 1.190, a neutron fluence assessment of the beltline and extended beltline regions was performed* ~~results of the Capsule V analyses provided~~ by Westinghouse in WCAP-~~15958~~ *17299-NP* [Reference ~~2~~*40*], for Unit*s* 1 *and 2, through EOLE.* ~~Cycles 1-11 and WCAP-15782 [Reference 17], for Unit 2 Cycles 1-10, t~~ *T*he peak calculated fast neutron fluence values at the *pressure vessel clad/base metal interface* ~~inner surface of the DCPP reactor vessels~~ are shown in Table 4.2-1 and Table 4.2-2 *for Units 1 and 2, respectively*. These fluence data tabulations include fuel cycle specific *power distributions* ~~exposures~~ through the end of Cycle ~~11~~ *16 for Units 1 and 2,* ~~(Unit 1) and Cycle 10 (Unit 2)~~ as well as fluence projections at several intervals out to 54 EFPY.
~~The fluence values were projected using ENDF-B/VI cross sections, and the Capsule V analyses meet the requirements of Regulatory Guide 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence*.~~

The calculations account for a Unit 1 core power uprate from 3338 MWt to 3411 MWt at the onset of Cycle 11. Fluence projections beyond the end of Cycle 1~~1~~*6* on Unit*s* 1 and ~~Cycle 10 on Unit~~ 2 are based on the assumption that the spatial core power distributions are defined by the average of ~~Unit 1~~ Cycles ~~5-11~~*13-15 for Units 1 and 2.* ~~and Unit 2 Cycles 5-10. Power distributions for Cycles 1-4 on both Units are not included since they are not representative of the very low leakage core loading patterns now being used.~~

For license renewal, Westinghouse performed additional calculations to define which materials in the DCPP pressure vessels, other than beltline materials, are projected to exceed the threshold neutron fluence of $1x10^{17}$ n/cm^2 at 54 EFPY (extended beltline materials). The results of these calculations are documented in *WCAP-17299-NP [Reference 40], for Units 1 and 2, through EOLE.* ~~LTR-REA-09-90, *Neutron Fluence Evaluation for the Diablo Canyon Units 1 and 2 Reactor Pressure Vessel Extended Beltline Materials* [Reference 37].~~ *For both units, although the nozzle shell course and the associated nozzle shell to intermediate shell weld are projected to exceed the $1x10^{17}$ n/cm^2 threshold, the nozzles themselves as well as the nozzle to nozzle shell welds remain below the $1x10^{17}$ n/cm^2 threshold through 54 EFPY. Likewise, the lower shell to lower head weld remains below $1x10^{17}$ n/cm^2 through 54 EFPY for both units.* ~~The extended beltline material for both Units includes the upper shell plates, associated longitudinal welds, and the upper shell to intermediate shell circumferential weld.~~

Table 4.2-3 shows the EOLE fluence values for all beltline and extended beltline materials for both Units 1 and 2.

As discussed in Section B2.1.15, both units currently use ex-vessel monitoring dosimetry.

Disposition: Revision, 10 CFR 54.21(c)(1)(ii); and Aging Management, 10 CFR 54.21(c)(1)(iii)

Revision

The fluence projections were revised to quantify expected fluence at the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Aging Management

Neutron fluence will be monitored and its effects managed for the period of extended operation by the DCPP Reactor Vessel Surveillance program, which is summarized in Section B2.1.15. The validity of these parameters and the analyses that depend upon them will therefore be managed to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.2-1 Unit 1 Maximum Calculated Fluence (E>1.0 MeV)

Cycle	Cumulative Irradiation Time (EFPY)	Neutron Fluence (E>1.0 MeV) [n/cm^2]			
		0°	15°	30°	45°
~~11~~*16*	~~14.27~~*21.77*	~~2.19~~ *3.22* E+18	~~3.52~~ *5.08* E+18	~~4.39~~ *6.31* E+18	~~6.07~~ *8.63* E+18
~~Projection~~	~~16.00~~	~~2.44 E+18~~	~~3.91 E+18~~	~~4.86 E+18~~	~~6.68 E+18~~
~~Projection~~	~~24.00~~	~~3.59 E+18~~	~~5.81 E+18~~	~~7.12 E+18~~	~~9.62 E+18~~
Projection	32.00	~~4.75~~ *4.63* E+18	~~7.71~~ *7.26* E+18	~~9.39~~ *9.05* E+18	~~1.26~~ *1.23* E+19
~~Projection~~	~~40.00~~	~~5.91 E+18~~	~~9.61 E+18~~	~~1.17 E+19~~	~~1.55 E+19~~
Projection	48.00	~~7.07~~ *6.85* E+18	~~1.15~~ *1.07* E+19	~~1.39~~ *1.33* E+19	~~1.84~~ *1.80* E+19
Projection	54.00	~~7.94~~ *7.68* E+18	~~1.29~~ *1.19* E+19	~~1.56~~ *1.49* E+19	~~2.06~~ *2.02* E+19

Table 4.2-2 Unit 2 Maximum Calculated Fluence (E>1.0 MeV)

Cycle	Cumulative Irradiation Time (EFPY)	Neutron Fluence (E>1.0 MeV) [n/cm^2]			
		0°	15°	30°	45°
~~10~~*16*	~~12.88~~*21.85*	~~3.26~~ *5.24* E+18	~~4.93~~ *7.91* E+18	~~4.92~~ *7.98* E+18	~~5.79~~ *9.42* E+18
~~Projection~~	~~16.00~~	~~4.01 E+18~~	~~6.04 E+18~~	~~6.03 E+18~~	~~7.11 E+18~~
~~Projection~~	~~24.00~~	~~5.93 E+18~~	~~8.89 E+18~~	~~8.90 E+18~~	~~1.05 E+19~~
Projection	32.00	~~7.86~~ *7.51* E+18	~~1.18~~ *1.13* E+19	~~1.18~~ *1.14* E+19	~~1.39~~ *1.34* E+19
~~Projection~~	~~40.00~~	~~9.79 E+18~~	~~1.46 E+19~~	~~1.46 E+19~~	~~1.73 E+19~~
Projection	48.00	~~1.17~~ *1.11* E+19	~~1.75~~ *1.67* E+19	~~1.75~~ *1.69* E+19	~~2.06~~ *1.96* E+19
Projection	54.00	~~1.32~~ *1.24* E+19	~~1.96~~ *1.87* E+19	~~1.96~~ *1.89* E+19	~~2.32~~ *2.19* E+19

Table 4.2-3 Units 1 and 2 Calculated Fluence (E>1.0 MeV) Values at EOLE (54 EFPY)

Unit 1		**Unit 2**	
Material	**Fluence [n/cm^2]**	**Material**	**Fluence [n/cm^2]**
Upper Shell Plate[(a)]		Upper Shell Plate[(a)]	
B4105-1	~~2.86~~*3.41* E+17	B5453-1	~~5.20~~*6.77* E+17
B4105-2	~~2.86~~*3.41* E+17	B5453-3	~~5.20~~*6.77* E+17
B4105-3	~~2.86~~*3.41* E+17	B5011-1R	~~5.20~~*6.77* E+17
Intermediate Shell Plate		Intermediate Shell Plate	
B4106-1	~~2.06~~*2.02* E+19	B5454-1	~~2.32~~*2.25* E+19
B4106-2	~~2.06~~*2.02* E+19	B5454-2	~~2.32~~*2.25* E+19
B4106-3	~~2.06~~*2.02* E+19	B5454-3	~~2.32~~*2.25* E+19
Lower Shell Plate		Lower Shell Plate	
B4107-1	~~2.04~~*2.01* E+19	B5455-1	~~2.30~~*2.22* E+19
B4107-2	~~2.04~~*2.01* E+19	B5455-2	~~2.30~~*2.22* E+19
B4107-3	~~2.04~~*2.01* E+19	B5455-3	~~2.30~~*2.22* E+19
Upper Shell Long. Welds[(a)]		Upper Shell Long. Welds[(a)]	
1-442 A	~~2.16~~*2.45* E+17	1-201 A	~~5.10~~*6.33* E+17
1-442 B	~~1.27~~*1.49* E+17	1-201 B	~~4.82~~*6.29* E+17
1-442 C	~~2.57~~*3.06* E+17	1-201 C	~~3.93~~*5.14* E+17
Upper Shell to Intermed. Shell Weld[(a)]		Upper Shell to Intermed. Shell Weld[(a)]	
8-442	~~2.86~~*3.41* E+17	8-201	~~5.20~~*6.77* E+17
Intermed. Shell Long. Welds		Intermed. Shell Long. Welds	
2-442 A	~~1.56~~*1.49* E+19	2-201 A	~~1.32~~*1.24* E+19
2-442 B	~~1.56~~*1.49* E+19	2-201 B	~~1.59~~*1.53* E+19
2-442 C	~~7.95~~*7.68* E+18	2-201 C	~~1.35~~*1.30* E+19
Intermed. Shell to Lower Shell Weld		Intermed. Shell to Lower Shell Weld	
9-442	~~2.04~~*2.01* E+19	9-201	~~2.30~~*2.22* E+19

Table 4.2-3 Units 1 and 2 Calculated Fluence (E>1.0 MeV) Values at EOLE (54 EFPY)

Unit 1		**Unit 2**	
Material	**Fluence [n/cm^2]**	**Material**	**Fluence [n/cm^2]**
Lower Shell Long. Welds		Lower Shell Long. Welds	
3-442 A	~~1.28~~*1.19* E+19	3-201 A	~~1.33~~*1.28* E+19
3-442 B	~~1.28~~*1.19* E+19	3-201 B	~~1.31~~*1.23* E+19
3-442 C	~~2.04~~*2.01* E+19	3-201 C	~~1.57~~*1.51* E+19

4.2.2 Pressurized Thermal Shock

Summary Description

10 CFR 50.61(b)(1) provides requirements for protection against pressurized thermal shock (PTS) events for pressurized water reactors. Licensees are required to perform an updated assessment of the projected values of reference temperature whenever a significant change occurs in projected values of the adjusted reference temperature for pressurized thermal shock (RT_{PTS}), or upon request for a change in the expiration date for the operation of the facility.

Irradiation by high energy neutrons raises the value of RT_{NDT} for the reactor vessel. The initial RT_{NDT} is determined through testing of unirradiated 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. Regulatory Guide 1.99 defines the calculation methods for ΔRT_{NDT} (and end-of-life C_V USE). RT_{PTS} is defined as the RT_{NDT} value evaluated at the end of life fluence at the clad/base metal interface for each of the vessel beltline materials. 10 CFR 50.61(c) provides two methods for determining RT_{PTS}. These methods are also described as Positions 1 and 2 in Regulatory Guide 1.99. Position 1 applies for material that *does not* have credible surveillance data available and Position 2 is used for material that *does* have two or more credible surveillance data sets available. The criteria for credible data are also provided in Regulatory Guide 1.99. The adjusted reference temperatures are calculated for both Positions 1 and 2 by following the guidance in Regulatory Guide 1.99 (Sections 1.1 and 2.1, respectively), using the copper and nickel content of DCPP reactor vessel materials, and the EOLE fluence projections. 10 CFR 50.61(b)(2) establishes screening criteria for RT_{PTS} as 270°F for plates, forgings, and axial welds and 300°F for circumferential welds. If the RT_{PTS} does not exceed the PTS screening criteria, then only the reactor pressure vessel is relied on to demonstrate compliance with 10 CFR 50.61, the PTS rule.

Analysis

PG&E's original response to the issuance of the PTS rule, 10 CFR 50.61, indicated that the projected RT_{PTS} for both units do not exceed the PTS screening criteria, 270°F, and 300°F, based on 32 EFPY.

Since Cycle 1, several actions taken by PG&E have resulted in changes to input parameters used to calculate RT_{PTS}. Fluence projections for both units were reduced following Cycle 1 as a result of fuel management changes to lower-leakage core designs. Also, copper and nickel content for the Unit 1 beltline longitudinal welds have been updated to reflect chemical analyses performed for the evaluation of surveillance capsules. 10 CFR 50.61 was revised in June 1991, which changed the method used to calculate RT_{PTS}.

The most recent coupon examination results for both units show that the increase in RT_{NDT} in plate and weld materials are bounded by that predicted by Regulatory Guide 1.99 Revision 2 for Units 1 and 2. The results demonstrate that the DCPP reactor vessel material ages consistent with Regulatory Guide 1.99 predictions, and provide a conservative means to satisfy the requirement of 10 CFR 50.61; thus providing assurance of the reactor vessel integrity.

Unit 1

The data from the most recently withdrawn surveillance capsule, Capsule V, were not deemed credible [Reference 2, Appendix D]. Using Regulatory Guide 1.99 ~~Position 1.1 methods~~, RT_{PTS} values were generated for beltline and extended beltline region materials of the Unit 1 reactor vessel for EOLE fluence values. The RT_{PTS} values for the Unit 1 materials are provided in Table 4.2-4. The projected RT_{PTS} values for EOLE ~~did not~~ meet the 10 CFR 50.61 screening criteria in all cases. The calculation [Reference ~~14~~*39*] indicates the limiting weld material for Unit 1 is lower shell longitudinal (axial) weld 3-442C with a projected EOLE RT_{PTS} value of 2~~80.4~~*43*°F*, using Position 2.1*. ~~Lower shell longitudinal weld 3-442C will satisfy the PTS screening criteria until approximately 43 EFPY. All other materials meet the 10 CFR 50.61 screening criteria.~~ The limiting plate material on Unit 1 is the lower shell plate B4107-1 with a projected EOLE RT_{PTS} value of 156~~.2~~°F*, using Position 1.1 [Reference 39]*.

~~The Unit 1 reactor vessel fluence will continue to be monitored in accordance with 10 CFR 50.61 as part of the DCPP Reactor Vessel Surveillance program (B2.1.15) to ensure that the reactor vessel material does not violate the PTS criteria.~~

~~In 2009, the NRC approved the Final Rule 10 CFR 50.61a, *Alternate Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events* [Reference 15]. The revised rule amended its regulations to provide updated fracture toughness requirements based on updated analysis methods for protection against PTS events for PWR pressure vessels. It is anticipated that DCPP Unit 1 will meet these revised requirements through EOLE.~~

~~PG&E will implement the revised PTS (10 CFR 50.61a) rule at least three years prior to exceeding the PTS screening criterion of 10 CFR 50.61. In the event that the provisions of 10 CFR 50.61a cannot be met, PG&E will implement alternate options, such as flux reduction, as provided in 10 CFR 50.61.~~

The extended beltline materials were also evaluated. The results (Table 4.2-4) confirm the materials will not become limiting.

Unit 2

The data from the most recently withdrawn surveillance capsule, Capsule V, was deemed credible [Reference 3, Appendix D]. RT_{PTS} values were generated for beltline and extended beltline region materials of the Unit 2 reactor vessel for fluence values at EOLE. The RT_{PTS} values for the Unit 2 materials are provided in Table 4.2-5. The projected RT_{PTS} values for EOLE meet the 10 CFR 50.61 screening criteria. The calculation [Reference ~~14~~*39*] indicates that the limiting weld material for Unit 2 is intermediate shell longitudinal (axial) weld 2-201B with a projected EOLE RT_{PTS} value of ~~244.2~~*207*°F using Regulatory Guide 1.99 Position ~~1~~2.1. The limiting plate material on Unit 2 is the intermediate shell plate B5454-2 with a projected EOLE RT_{PTS} value of 22~~3.~~2°F.

The extended beltline materials were also evaluated. The results (Table 4.2-5) confirm the materials will not become limiting.

Disposition: Revision, 10 CFR 54.21(c)(1)(ii)~~; and Aging Management, 10 CFR 54.21(c)(1)(iii)~~

Unit 1 – ~~Aging Management~~Revision

The RT_{PTS} was projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). RT_{PTS} remains within acceptable values for the period of extended operation. ~~The Unit 1 reactor vessel fluence will continue to be monitored as part of the DCPP Reactor Vessel Surveillance program (B2.1.15) and its effects will be adequately managed to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).~~

Unit 2 - Revision

The RT_{PTS} was projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). RT_{PTS} remains within acceptable values for the period of extended operation.

Table 4.2-4 DCPP Unit 1 Vessel RT_{PTS} at 54 EFPY[(i)]

Material Description			~~Source~~ R.G 1.99, Rev.2 Position	Chemical Composition		Chemistry Factors °F	Initial RT_{NDT} °F	EOLE Fluence 10^{19} n/cm² E>1.0 MeV	Fluence Factor	Δ~~RT_{PTS}~~ RT_{NDT} °F	Margin °F	RT_{PTS} °F	Screening Criteria °F	Extended Beltline Region
Location	Heat No.	Type		Cu Wt%	Ni Wt%									
Upper Shell Plate B4105-1	C2624	A 533B	1.1~~Ref -14~~	0.120	0.56	82.2	28	~~0.0286~~0.0341	~~0.2136~~0.2365	~~17.6~~19.4	~~38.3~~39.2	~~83.8~~87	≤270	Yes
Upper Shell Plate B4105-2	C2624-2	A 533B	1.1~~Ref -14~~	0.120	0.57	82.4	9	~~0.0286~~0.0341	~~0.2136~~0.2365	~~17.6~~19.5	~~38.3~~39.2	~~64.9~~68	≤270	Yes
Upper Shell Plate B4105-3	C2608-2B	A 533B	1.1~~Ref -14~~	0.140	0.56	98.2	14	~~0.0286~~0.0341	~~0.2136~~0.2365	~~21.0~~23.2	~~39.9~~41.2	~~74.9~~78	≤270	Yes
Intermediate Shell Plate B4106-1	C2884-1	A 533B	1.1~~Ref -14~~	0.125	0.53	85.3	-10	~~2.06~~2.02	~~1.1968~~1.1917	~~102.1~~101.7	34	126~~.1~~	≤270	No
Intermediate Shell Plate B4106-2	C2854-2	A 533B	1.1~~Ref -14~~	0.12	0.50	81	-3	~~2.06~~2.02	~~1.1968~~1.1917	~~96.9~~96.5	34	~~127.9~~128	≤270	No
Intermediate Shell Plate B4106-3	C2793-1	A 533B	1.1~~Ref -14~~	0.086	0.476	55.2	30	~~2.06~~2.02	~~1.1968~~1.1917	~~66.1~~65.8	48.1	144~~.1~~	≤270	No
→Using non-credible surveillance data	*C2793-1*	*A 533B*	*2.1*	*0.086*	*0.476*	*37.4*	*30*	*2.02*	*1.1917*	*44.6*	*48.1*	*123*	*≤270*	*No*
Lower Shell Plate B4107-1	C3121-1	A 533B	1.1~~Ref -14~~	0.13	0.56	89.8	15	~~2.04~~2.01	~~1.1943~~1.1904	~~107.2~~106.9	34	156~~.2~~	≤270	No
Lower Shell Plate B4107-2	C3131-2	A 533B	1.1~~Ref -14~~	0.12	0.56	82.2	20	~~2.04~~2.01	~~1.1943~~1.1904	~~98.2~~97.9	34	152~~.2~~	≤270	No
Lower Shell Plate B4107-3	C3131-1	A 533B	1.1~~Ref -14~~	0.12	0.52	81.4	-22	~~2.04~~2.01	~~1.1943~~1.1904	~~97.2~~96.9	34	109~~.2~~	≤270	No
Upper Shell Long. Weld 1-442 A	27204 / 12008	Linde 1092	1.1~~Ref -14~~	0.190	0.970	215.7	-20	~~0.0216~~0.0245	~~0.1804~~0.1948	~~38.9~~42	~~38.9~~42.0	~~57.8~~64	≤270	Yes
Upper Shell Long. Weld 1-442 B	27204 / 12008	Linde 1092	1.1~~Ref -14~~	0.190	0.970	215.7	-20	~~0.0127~~0.0149	~~0.1287~~0.1428	~~27.8~~30.8	~~27.8~~30.8	~~35.5~~42	≤270	Yes
Upper Shell Long. Weld 1-442 C	27204 / 12008	Linde 1092	1.1~~Ref -14~~	0.190	0.970	215.7	-20	~~0.0257~~0.0306	~~0.2004~~0.2222	~~43.2~~47.9	~~43.2~~47.9	~~66.5~~76	≤270	Yes
Upper Shell to Intermediate Shell Circumferential Weld 8-442	13253	Linde 1092	1.1~~Ref -14~~	0.25	0.730	197.5	-56	~~0.0286~~0.0341	~~0.2136~~0.2365	~~42.2~~46.7	~~54.2~~57.8	~~40.4~~48	≤300	Yes

Table 4.2-4 DCPP Unit 1 Vessel RT_{PTS} at 54 EFPY[(i)]

Material Description			~~Source~~ R.G 1.99, Rev.2 Position	Chemical Composition		Chemistry Factors °F	Initial RT_{NDT} °F	EOLE Fluence 10^{19} n/cm² E>1.0 MeV	Fluence Factor	Δ~~RT_{PTS}~~ RT_{NDT} °F	Margin °F	RT_{PTS} °F	Screening Criteria °F	Extended Beltline Region
Location	Heat No.	Type		Cu Wt%	Ni Wt%									
Intermediate Shell Long. Welds 2-442A, B	27204	Linde 1092	*1.1*~~Ref.14~~	0.203	1.018	226.8	-56	~~1.56~~*1.49*	~~1.1229~~*1.1104*	~~254.7~~*251.8*	65.5	~~264.2~~*261*	≤270	No
→Using credible surveillance data	*27204*	*Linde 1092*	*2.1*	*0.203*	*1.018*	*214.1*	*-56*	*1.49*	*1.1104*	*237.7*	*44.0*	*226*	*≤270*	*No*
Intermediate Shell Long. Weld 2-442C	27204	Linde 1092	*1.1*~~Ref.14~~	0.203	1.018	226.8	-56	~~0.795~~*0.768*	~~0.9356~~*0.9259*	~~212.2~~*210.0*	65.5	~~221.7~~*220*	≤270	No
→Using credible surveillance data	*27204*	*Linde 1092*	*2.1*	*0.203*	*1.018*	*214.1*	*-56*	*0.768*	*0.9259*	*198.2*	*44.0*	*186*	*≤270*	*No*
Lower Shell Long. Welds 3-442A, B	27204	Linde 1092	*1.1*~~Ref.14~~	0.203	1.018	226.8	-56	~~1.28~~*1.19*	~~1.0687~~*1.0485*	~~242.4~~*237.8*	65.5	~~251.9~~*247*	≤270	No
→Using credible surveillance data	*27204*	*Linde 1092*	*2.1*	*0.203*	*1.018*	*214.1*	*-56*	*1.19*	*1.0485*	*224.5*	*44.0*	*213*	*≤270*	*No*
Lower Shell Long. Weld 3-442C	27204	Linde 1092	*1.1*~~Ref.14~~	0.203	1.018	226.8	-56	~~2.04~~*2.01*	~~1.1943~~*1.1904*	~~270.9~~*270.0*	65.5	~~280.4~~*280*	≤270	No
→Using credible surveillance data	*27204*	*Linde 1092*	*2.1*	*0.203*	*1.018*	*214.1*	*-56*	*2.01*	*1.1904*	*254.9*	*44.0*	*243*	*≤270*	*No*
Intermediate to Lower Shell Circumferential Weld 9-442	21935	Linde 1092	*1.1*~~Ref.14~~	0.183	0.704	172.2	-56	~~2.04~~*2.01*	~~1.1943~~*1.1904*	~~205.7~~*205.0*	65.5	215~~.2~~	≤300	No

Notes:

(i) Reference 39, WCAP-17315-NP

Table 4.2-5 DCPP Unit 2 Vessel RT_{PTS} at 54 EFPY[i]

Material Description			R.G 1.99, Rev.2 Position ~~Source~~	Chemical Composition		Chemistry Factors °F	Initial RT_{NDT} °F	Fluence 10^{19} n/cm² E >1.0MeV	Fluence Factor	Δ~~RT_{PTS}~~ RT_{NDT} °F	Margin °F	RT_{PTS} °F	Screening Criteria °F	Extended Beltline Region
Location	Heat No.	Type		Cu Wt%	Ni Wt%									
Upper Shell Plate B5453-1	C5162-1	A 533B	1.1~~Ref. 14~~	0.110	0.600	74	28	~~0.0520~~0.0677	~~0.2990~~0.3434	~~22.1~~25.4	~~22.1~~25.4	~~72.2~~79	≤270	Yes
Upper Shell Plate B5453-3	C5162-2	A 533B	1.1~~Ref. 14~~	0.110	0.600	74	5	~~0.0520~~0.0677	~~0.2990~~0.3434	~~22.1~~25.4	~~40.6~~42.4	~~67.7~~73	≤270	Yes
Upper Shell Plate B5011-1R	C4377-1	A 533B	1.1~~Ref. 14~~	0.110	0.650	74.8	0	~~0.0520~~0.0677	~~0.2990~~0.3434	~~22.4~~25.7	~~40.7~~42.6	~~63.1~~68	≤270	Yes
Intermediate Shell Plate B5454-1	C5161-1	A 533B	1.1~~Ref. 14~~	0.140	0.650	~~98.6~~101.3	52	~~2.32~~2.25	~~1.2274~~1.2196	~~121.0~~123.5	~~17~~34	~~190.0~~210	≤270	No
→Using credible surveillance data	C5161-1	A 533B	2.1	0.140	0.650	105.7	52	2.25	1.2196	128.9	17	198	≤270	No
Intermediate Shell Plate B5454-2	C5168-2	A 533B	1.1~~Ref. 14~~	0.14	0.59	99.6	67	~~2.32~~2.25	~~1.2274~~1.2196	~~122.2~~121.5	34	~~223.2~~222	≤270	No
Intermediate Shell Plate B5454-3	C5161-2	A 533B	1.1~~Ref. 14~~	0.15	0.62	110.5	33	~~2.32~~2.25	~~1.2274~~1.2196	~~135.6~~134.8	34	202~~.6~~	≤270	No
Lower Shell Plate B5455-1	C5175-1	A 533B	1.1~~Ref. 14~~	0.14	0.56	98.2	-15	~~2.30~~2.22	~~1.2252~~1.2161	~~120.3~~119.4	34	~~139.3~~138	≤270	No
Lower Shell Plate B5455-2	C5175-2	A 533B	1.1~~Ref. 14~~	0.14	0.56	98.2	0	~~2.30~~2.22	~~1.2252~~1.2161	~~120.3~~119.4	34	~~154.3~~153	≤270	No
Lower Shell Plate B5455-3	C5176-1	A 533B	1.1~~Ref. 14~~	0.1	0.62	65.2	15	~~2.30~~2.22	~~1.2252~~1.2161	~~79.8~~79.3	34	128~~.9~~	≤270	No
Upper Shell Long. Weld 1-201 A	21935 / 12008	Linde 1092	1.1~~Ref. 14~~	0.220	0.870	211.2	-50	~~0.0510~~0.0633	~~0.2959~~0.3317	~~62.5~~70.1	56.0	~~68.5~~76	≤270	Yes
→Using credible surveillance data	21935 / 12008	Linde 1092	2.1	0.220	0.870	204.6	-50	0.0633	0.3317	67.9	28	46	≤270	Yes
Upper Shell Long. Weld 1-201 B	21935 / 12008	Linde 1092	1.1~~Ref. 14~~	0.220	0.870	211.2	-50	~~0.0482~~0.0629	~~0.2870~~0.3306	~~60.6~~69.8	56.0	~~66.6~~76	≤270	Yes

Table 4.2-5 DCPP Unit 2 Vessel RT_{PTS} at 54 EFPY[(i)]

Material Description			R.G 1.99, Rev.2 Position ~~Source~~	Chemical Composition		Chemistry Factors °F	Initial RT_{NDT} °F	Fluence 10^{19} n/cm² E >1.0MeV	Fluence Factor	Δ~~RT_{PTS}~~ RT_{NDT} °F	Margin °F	RT_{PTS} °F	Screening Criteria °F	Extended Beltline Region
Location	Heat No.	Type		Cu Wt%	Ni Wt%									
→Using credible surveillance data	21935 / 12008	Linde 1092	2.1	0.220	0.870	204.6	-50	0.0629	0.3306	67.6	28	46	≤270	Yes
Upper Shell Long. Weld 1-201 C	21935 / 12008	Linde 1092	1.1~~Ref. 14~~	0.220	0.870	211.2	-50	~~0.0393~~0.0514	~~0.2564~~0.2971	~~54.1~~62.7	~~54.1~~56	~~58.3~~69	≤270	Yes
→Using credible surveillance data	21935 / 12008	Linde 1092	2.1	0.220	0.870	204.6	-50	0.0514	0.2971	60.8	28	39	≤270	Yes
Upper Shell to Intermediate Shell Circumferential Weld 8-201	21935	Linde 1092	1.1~~Ref. 14~~	0.183	0.704	172.2	-56	~~0.0520~~0.0677	~~0.2990~~0.3434	~~51.5~~59.1	~~61.7~~65.5	~~57.2~~69	≤300	Yes
Intermediate Shell Long. Weld 2-201A	21935 / 12008	Linde 1092	1.1~~Ref. 14~~	0.22	0.87	211.2	-50	~~1.32~~1.24	~~1.0772~~1.0599	~~227.5~~223.9	56	~~233.5~~230	≤270	No
→Using credible surveillance data	21935 / 12008	Linde 1092	2.1	0.22	0.87	204.6	-50	1.24	1.0599	216.9	28	195	≤270	No
Intermediate Shell Long. Weld 2-201B	21935 / 12008	Linde 1092	1.1~~Ref. 14~~	0.22	0.87	211.2	-50	~~1.59~~1.53	~~1.1281~~1.1176	~~238.2~~236.0	56	~~244.2~~242	≤270	No
→Using credible surveillance data	21935 / 12008	Linde 1092	2.1	0.22	0.87	204.6	-50	1.53	1.1176	228.7	28	207	≤270	No
Intermediate Shell Long. Weld 2-201C	21935 / 12008	Linde 1092	1.1~~Ref. 14~~	0.22	0.87	211.2	-50	~~1.35~~1.30	~~1.0834~~1.0730	~~228.8~~226.6	56	~~234.8~~233	≤270	No
→Using credible surveillance data	21935 / 12008	Linde 1092	2.1	0.22	0.87	204.6	-50	1.30	1.0730	219.5	28	198	≤270	No
Lower Shell Long. Weld 3-201A	33A277	Linde 124	1.1~~Ref. 14~~	0.258	0.165	126.3	-56	~~1.33~~1.28	~~1.0793~~1.0687	~~136.3~~135.0	65.5	~~145.8~~144	≤270	No
→Using credible surveillance data	33A277	Linde 124	2.1	0.258	0.165	115.9	-56	1.28	1.0687	123.9	44.0	112	≤270	No

Table 4.2-5 DCPP Unit 2 Vessel RT_{PTS} at 54 EFPY[(i)]

Material Description			R.G 1.99, Rev.2 Position ~~Source~~	Chemical Composition		Chemistry Factors °F	Initial RT_{NDT} °F	Fluence 10^{19} n/cm² E >1.0MeV	Fluence Factor	Δ~~RT_{PTS}~~ RT_{NDT} °F	Margin °F	RT_{PTS} °F	Screening Criteria °F	Extended Beltline Region
Location	Heat No.	Type		Cu Wt%	Ni Wt%									
Lower Shell Long. Weld 3-201B	33A277	Linde 124	1.1~~Ref. 14~~	0.258	0.165	126.3	-56	~~1.31~~1.23	~~1.0751~~1.0577	~~135.8~~133.6	65.5	~~145.3~~143	≤270	No
→Using credible surveillance data	33A277	Linde 124	2.1	0.258	0.165	115.9	-56	1.23	1.0577	122.6	44.0	111	≤270	No
Lower Shell Long. Weld 3-201C	33A277	Linde 124	1.1~~Ref. 14~~	0.258	0.165	126.3	-56	~~1.57~~1.51	~~1.1246~~1.1141	~~142.0~~140.7	65.5	~~151.6~~150	≤270	No
→Using credible surveillance data	33A277	Linde 124	2.1	0.258	0.165	115.9	-56	1.51	1.1141	129.1	44.0	117	≤270	No
Intermediate to Lower Shell Circumferential Weld 9-201	10120	Linde 0091	1.1~~Ref. 14~~	0.046	0.082	34	-56	~~2.30~~2.22	~~1.2252~~1.2161	~~41.7~~41.3	~~53.8~~53.5	39~~.4~~	≤300	No

Notes:

(i) Reference 39, WCAP-17315-NP

4.2.3 Charpy Upper-Shelf Energy

Summary Description

Per Regulatory Guide 1.99, *Radiation Embrittlement of Reactor Vessel Materials*, the Charpy upper-shelf energy (C_V USE) is assumed to decrease as a function of fluence and copper content. Figure 2 of the guide determines this magnitude of decrease when surveillance data is not used (Position 1.2). In addition, if surveillance data is to be used (Position 2.2), the decrease in upper shelf energy may be obtained by plotting the plant surveillance data on Figure 2 of the guide and fitting the data with a line drawn parallel to the existing lines as the upper bound of all the data. This line can then be used in preference to the existing line. The C_V USE can be predicted using the corresponding 1/4T fluence projection, the copper content of the beltline materials, and the results of the capsules tested to date using Figure 2 of the guide.

10 CFR 50, Appendix G requires that the reactor vessel beltline materials must have a C_V USE of no less than 75 ft-lb initially, and must maintain C_V USE throughout the life of the vessel of no less than 50 ft-lb unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation, that lower values of C_V USE will provide margins of safety against fracture equivalent to those required by ASME Section XI, Appendix G (10 CFR 50, Appendix G, Section IV.A.1.a).

Analysis

The most recent coupon examination results for both units show that the decline in C_V USE in plate and weld materials are bounded by that originally predicted by Regulatory Guide 1.99, Revision 2. Thus the results demonstrate that the DCPP reactor vessel material ages consistently with Regulatory Guide 1.99 predictions and provides a conservative means to satisfy the requirements of 10 CFR 50, Appendix G. This provides assurance of the reactor vessel integrity.

Unit 1

In accordance with Regulatory Guide 1.99, the C_V USE data from Unit 1 surveillance Capsule V were determined not to be credible and were, therefore, not included in the EOLE C_V USE projections.

The C_V USE values were projected to 54 EFPY of operation using Regulatory Guide 1.99 Position 1.2. The EOLE C_V USE values for the Unit 1 beltline and extended beltline materials are provided in Table 4.2-6. The limiting value was ~~58.5~~*58.2* ft-lbf for lower shell longitudinal weld 3-442C.

The extended beltline materials were also evaluated to confirm they will not decrease below the 10 CFR 50, Appendix G criterion of 50 ft-lbf.

Unit 2

In accordance with Regulatory Guide 1.99, the C_V USE data from Unit 2 surveillance Capsule V were deemed credible for intermediate shell plate B5454-1.

The C_V USE values were projected to 54 EFPY of operation using Regulatory Guide 1.99 Position 1.2. The EOLE C_V USE values for the Unit 2 beltline and extended beltline materials are provided in Table 4.2-7. The limiting value was 53.7 ft-lbf for lower shell longitudinal weld 3-201C.

The extended beltline materials were also evaluated to confirm they will not decrease below the 10 CFR 50, Appendix G criterion of 50 ft-lbf.

Disposition: Revision, 10 CFR 54.21(c)(1)(ii)

The C_V USE values were re-evaluated with projections to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). The re-evaluations demonstrated that the C_V USE in the limiting material of each unit will remain above the 10 CFR 50 Appendix G acceptance criterion of 50 ft-lbf for the period of extended operation.

Table 4.2-6 DCPP Unit 1 Reactor Vessel Material C_V USE at EOLE[i]

Material Description			Cu wt%	Unirradiated C_V USE ft-lbf	EOL ¼T Fluence 10^{19} n/cm^2 (E>1 MeV)	% Drop in C_V USE	Projected C_V USE ft-lbf	EOL C_V USE Acceptance Criterion ft-lbf
Reactor Vessel Beltline Region Location	**Heat Number**	**Type**						
Intermediate Shell Plate B4106-1	C2884-1	A 533B	0.125	116	1.204	~~22~~23	~~90.0~~89.3	≥50
Intermediate Shell Plate B4106-2	C2854-2	A 533B	0.12	114	1.204	22	~~89.0~~88.9	≥50
Intermediate Shell Plate B4106-3	C2793-1	A 533B	0.086	77	1.204	~~18~~20	~~62.8~~61.6	≥50
→Using surveillance data	C2793-1	A 533B	0.086	77	1.204	7.2[ii]	71.5	≥50
Lower Shell Plate B4107-1	C3121-1	A 533B	0.13	110	1.198	23	~~84.8~~84.7	≥50
Lower Shell Plate B4107-2	C3131-2	A 533B	0.12	103	1.198	22	~~80.5~~80.3	≥50
Lower Shell Plate B4107-3	C3131-1	A 533B	0.12	116	1.198	22	~~90.6~~90.5	≥50
Intermediate Shell Long. Welds 2-442A, B	27204	Linde 1092	0.203	91	~~0.908~~0.888	34	~~60.5~~60.1	≥50
→Using surveillance data	27204	Linde 1092	0.203	91	0.888	33[ii]	61.0	≥50
Intermediate Shell Long. Weld 2-442C	27204	Linde 1092	0.203	91	~~0.463~~0.458	29	~~64.9~~64.6	≥50
→Using surveillance data	27204	Linde 1092	0.203	91	0.458	28.5[ii]	65.1	≥50
Lower Shell Long. Welds 3-442A, B	27204	Linde 1092	0.203	91	~~0.745~~0.709	32	~~61.8~~61.9	≥50
→Using surveillance data	27204	Linde 1092	0.203	91	0.709	31[ii]	62.8	≥50
Lower Shell Long. Weld 3-442C	27204	Linde 1092	0.203	91	1.198	36	~~58.5~~58.2	≥50
→Using surveillance data	27204	Linde 1092	0.203	91	1.198	35[ii]	59.2	≥50

Table 4.2-6 DCPP Unit 1 Reactor Vessel Material C_V USE at EOLE[i]

Material Description			Cu wt%	Unirradiated C_V USE ft-lbf	EOL ¼T Fluence 10^{19} n/cm² (E>1 MeV)	% Drop in C_V USE	Projected C_V USE ft-lbf	EOL C_V USE Acceptance Criterion ft-lbf
Reactor Vessel Beltline Region Location	**Heat Number**	**Type**						
Intermediate Shell to Lower Shell Circumferential Weld 9-442	21935	Linde 1092	0.183	109	1.198	34	~~72.4~~*71.9*	≥50
Upper Shell Plate B4105-1	C2624	A 533B	0.120	80	~~0.017~~*0.020*	8.6	~~73.6~~*73.1*	≥50
Upper Shell Plate B4105-2	C2624-2	A 533B	0.120	74	~~0.017~~*0.020*	8.6	~~68.1~~*67.6*	≥50
Upper Shell Plate B4105-3	C2608-2B	A 533B	0.140	81	~~0.017~~*0.020*	9.4	~~73.9~~*73.4*	≥50
Upper Shell Long. Weld 1-442A	27204/12008	Linde 1092	0.190	86	~~0.013~~*0.015*	~~12~~*14*	~~75.7~~*74.0*	≥50
Upper Shell Long. Weld 1-442B	27204/12008	Linde 1092	0.190	86	~~0.007~~*0.009*	~~11~~*14*	~~76.9~~*74.0*	≥50
Upper Shell Long. Weld 1-442C	27204/12008	Linde 1092	0.190	86	~~0.015~~*0.018*	~~13~~*14*	~~75.2~~*74.0*	≥50
Upper Shell to Intermediate Shell Weld 8-442	13253	Linde 1092	0.250	111	~~0.017~~*0.020*	~~15~~*17*	~~94.1~~*92.1*	≥50

Notes:

(i) Per the guidance of 10 CFR 50.61 and Position 1.2 unless otherwise noted.
(ii) Percentage USE decrease is based on Position 2.2 of Regulatory Guide 1.99, Revision 2.

Table 4.2-7 DCPP Unit 2 Reactor Vessel Material C_V USE at EOLE[i]

Material Description			Cu wt%	Unirradiated C_V USE ft-lbf	EOL ¼T Fluence 10^{19} n/cm^2 (E>1 MeV)	% Drop in C_V USE	Projected C_V USE ft-lbf	EOL C_V USE Acceptance Criterion ft-lbf
Reactor Vessel Beltline Region Location	**Heat Number**	**Type**						
Intermediate Shell Plate B5454-1	C5161-1	A 533B	0.14	91	~~1.35~~1.341	25	~~68.5~~68.3	≥50
→Using surveillance data	*C5161-1*	*A 533B*	*0.14*	*91*	*1.341*	*22*[ii]	*71.0*	*≥50*
Intermediate Shell Plate B5454-2	C5168-2	A 533B	0.14	99	~~1.35~~1.341	25	~~74.6~~74.3	≥50
Intermediate Shell Plate B5454-3	C5161-2	A 533B	0.15	90	~~1.35~~1.341	26	~~66.8~~66.6	≥50
Lower Shell Plate B5455-1	C5175-1	A 533B	0.14	112	~~1.34~~1.323	25	~~84.4~~84.0	≥50
Lower Shell Plate B5455-2	C5175-2	A 533B	0.14	122	~~1.34~~1.323	25	~~92.0~~91.5	≥50
Lower Shell Plate B5455-3	C5176-1	A 533B	0.1	100	~~1.34~~1.323	~~20~~21	~~79.6~~79.0	≥50
Intermediate Shell Long. Weld 2-201A	21935/12008	Linde 1092	0.22	118	~~0.768~~0.739	~~38~~34	~~73.6~~77.9	≥50
→Using surveillance data	*21935/12008*	*Linde 1092*	*0.22*	*118*	*0.739*	*37.5*[ii]	*73.8*	*≥50*
Intermediate Shell Long. Weld 2-201B	21935/12008	Linde 1092	0.22	118	~~0.925~~0.912	~~39~~36	~~71.6~~75.5	≥50
→Using surveillance data	*21935/12008*	*Linde 1092*	*0.22*	*118*	*0.912*	*39.5*[ii]	*71.4*	*≥50*
Intermediate Shell Long. Weld 2-201C	21935/12008	Linde 1092	0.22	118	~~0.785~~0.775	~~38~~35	~~73.3~~76.7	≥50
→Using surveillance data	*21935/12008*	*Linde 1092*	*0.22*	*118*	*0.775*	*38*[ii]	*73.2*	*≥50*
Lower Shell Long. Weld 3-201A	33A277	Linde 124	0.258	88	~~0.774~~0.763	38	~~55.0~~54.6	≥50
Lower Shell Long. Weld 3-201B	33A277	Linde 124	0.258	88	~~0.762~~0.733	~~37~~38	~~55.1~~54.6	≥50
Lower Shell Long. Weld 3-201C	33A277	Linde 124	0.258	88	~~0.913~~0.900	39	53.7	≥50
Intermediate Shell to Lower Shell Circumferential Weld 9-201	10120	Linde 0091	0.046	125	~~1.34~~1.323	~~20~~21	~~100.1~~98.8	≥50

Table 4.2-7 DCPP Unit 2 Reactor Vessel Material C_V USE at EOLE[(i)]

Material Description			Cu wt%	Unirradiated C_V USE ft-lbf	EOL ¼T Fluence 10^{19} n/cm² (E>1 MeV)	% Drop in C_V USE	Projected C_V USE ft-lbf	EOL C_V USE Acceptance Criterion ft-lbf
Reactor Vessel Beltline Region Location	Heat Number	Type						
Upper Shell Plate B5453-1	C5162-1	A 533B	0.110	82	~~0.030~~*0.040*	9.*4*	~~74.8~~*74.3*	≥50
Upper Shell Plate B5453-3	C5162-2	A 533B	0.110	86.5	~~0.030~~*0.040*	9.*4*	~~78.9~~*78.4*	≥50
Upper Shell Plate B5011-1R	C4377-1	A 533B	0.110	72	~~0.030~~*0.040*	9.*4*	~~65.7~~*65.2*	≥50
Upper Shell Long. Weld 1-201A	21935/12008	Linde 1092	0.220	118	~~0.030~~*0.038*	18	~~96.9~~*96.8*	≥50
→Using surveillance data	*21935/12008*	*Linde 1092*	*0.220*	*118*	*0.038*	*20*[(ii)]	*94.4*	*≥50*
Upper Shell Long. Weld 1-201B	21935/12008	Linde 1092	0.220	118	~~0.028~~*0.037*	18	~~97.2~~*96.8*	≥50
→Using surveillance data	*21935/12008*	*Linde 1092*	*0.220*	*118*	*0.037*	*20*[(ii)]	*94.4*	*≥50*
Upper Shell Long. Weld 1-201C	21935/12008	Linde 1092	0.220	118	~~0.023~~*0.031*	17	~~98.1~~*97.9*	≥50
→Using surveillance data	*21935/12008*	*Linde 1092*	*0.220*	*118*	*0.031*	*19*[(ii)]	*95.6*	*≥50*
Upper Shell to Intermediate Shell Weld 8-201	21935	Linde 1092	0.183	109	~~0.030~~*0.040*	~~14~~*16*	~~93.3~~*91.6*	≥50

Notes:

(i) Per the guidance of 10 CFR 50.61 and Position 1.2 unless otherwise noted.
(ii) Percentage USE decrease is based on Position 2.2 of Regulatory Guide 1.99, Revision 2.

4.9 REFERENCES

39. *Westinghouse Report WCAP-17315-NP. Diablo Canyon Units 1 and 2 Pressurized Thermal Shock and Upper-Shelf Energy Evaluations. Rev. 0. July 2011. Westinghouse Non-Proprietary Class 3.*

40. *Westinghouse Report WCAP-17299-NP. Fast Neutron Fluence Update for Diablo Canyon Unit 1 and Unit 2 Pressure Vessels. Rev. 0. February 2011. Westinghouse Non-Proprietary Class 3.*

A1.15 Reactor Vessel Surveillance

The Reactor Vessel Surveillance program manages loss of fracture toughness due to neutron embrittlement in reactor materials exposed to neutron fluence exceeding $1.0E^{17}$ n/cm2 (E>1.0 MeV). The program is consistent with ASTM E 185-70 and ASTM E 185-73 for Units 1 and 2, respectively. Capsules are periodically removed during the course of plant operating life. Neutron embrittlement is evaluated through surveillance capsule testing and evaluation, ex-vessel neutron fluence calculations, and monitoring of reactor vessel neutron fluence. The testing program and reporting conform to requirements of 10 CFR 50 Appendix H, *Reactor Vessel Material Surveillance Program Requirements*. Data resulting from the program is used to:

- Determine pressure-temperature limits, minimum temperature requirements, and end-of-life Charpy upper-shelf energy (C_V USE) in accordance with the requirements of 10 CFR 50 Appendix G, *Fracture Toughness Requirements*; and,
- Determine end-of-life RT_{PTS} values in accordance with 10 CFR 50.61, *Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock*.

The Reactor Vessel Surveillance program provides guidance for removal and testing or storage of material specimen capsules. All capsules that have been withdrawn and tested were stored.

For Unit 1, the last capsule is expected to be withdrawn during the ~~current operating term~~ *1R17 refueling outage* after it has accumulated a fluence equivalent to 6~~0~~6 years of operation. The remaining four standby capsules have low lead factors, will remain inside the vessel throughout the vessel lifetime, and will be available for future testing.

There are no capsules remaining in the Unit 2 vessel. All capsules were removed because high lead factors produced exposures comparable to the fluences expected at the end of the period of extended operation.

DCPP Units 1 and 2 currently use ex-vessel monitoring dosimetry, which consists of four gradient chains with activation foils outside the reactor vessel, which will be used to monitor the neutron fluence environment within the beltline region.

A3.1.2 Pressurized Thermal Shock

The most recent coupon examination results for both units show that the increase in RT_{NDT} in plate and weld materials are bounded by that predicted by Regulatory Guide 1.99, *Radiation Embrittlement of Reactor Vessel Materials*, Revision 2 for Units 1 and 2. The results demonstrate that the DCPP reactor vessel material ages consistently with Regulatory Guide 1.99 predictions, and provides a conservative means to satisfy the requirement of 10 CFR 50.61; thus providing assurance of the reactor vessel integrity.

Unit 1

Using Regulatory Guide 1.99 Position *2.1 and* 1.1 methods, RT_{PTS} values were generated for beltline and extended beltline region materials, the upper shell plates and associated welds, of the Unit 1 reactor vessel for EOLE fluence values. The projected RT_{PTS} values for EOLE ~~did not~~ meet the 10 CFR 50.61 screening criteria for beltline and extended beltline materials. *The Unit 1 RT_{PTS} was projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). RT_{PTS} remains within acceptable values through the period of extended operation.*

~~The Unit 1 reactor vessel fluence will continue to be monitored as part of the DCPP Reactor Vessel Surveillance program, described in Section A1.15 and therefore will be managed to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).~~

Unit 2

The RT_{PTS} values generated for beltline and extended beltline region materials, the upper shell plates and associated welds, of the Unit 2 reactor vessel for fluence values at EOLE meet the 10 CFR 50.61 screening criteria. The Unit 2 RT_{PTS} was projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). RT_{PTS} remains within acceptable values for the period of extended operation.

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
23	~~DCPP will replace the current carbon steel with stainless steel clad CCP 2-2 pump casing in the CVCS with a completely stainless steel pump casing.~~ *Completed*	~~3.3.2.2.14~~	~~Prior to the period of extended operation~~ *Completed*
24	~~PG&E will implement the revised PTS rule (10 CFR 50.61a). In the event that the provisions of 10 CFR 50.61(a) cannot be met, PG&E will implement alternate options, such as flux reduction, as provided in 10 CFR 50.61.~~ *Deleted*	~~4.2.2~~ ~~A3.1.2~~	~~At least 3 years prior to exceeding the PTS screening criterion of 10 CFR 50.61.~~ *Deleted*
31	~~The Unit 2 gap repair work will be completed prior to the period of extended operation.~~ *Completed*	~~B2.1.27~~	~~Prior to the period of extended operation.~~ *Completed*
35	~~DCPP will revise the test procedure acceptance criteria to specifically preclude repositioning a tube more than once without capping or replacing. This will preclude repositioning a tube having chrome plated surfaces from the chrome being moved out of the areas of known wear.~~ *Completed*	~~B2.1.21~~	~~Prior to the period of extended operation.~~ *Completed*
62	~~Implementation for all Unit 2 Diesel Generator Starting Air and Turbocharger Air Compressor upgrades is planned for April, 2011.~~ *Completed*		~~Prior to the period of extended operation~~ *Completed*
71	~~The Intake Structure will be returned to (a)(2) status prior to the period of extended operation. The Intake Structure is currently scheduled to be returned to (a)(2) status by the end of 2011~~ *Completed*	~~B2.1.32~~	~~Prior to the period of extended operation~~ *Completed*

B2.1.15 Reactor Vessel Surveillance

Program Description

The Reactor Vessel Surveillance program manages loss of fracture toughness due to neutron embrittlement in reactor materials exposed to neutron fluence exceeding $1.0E^{17}$ n/cm^2 (E>1.0 MeV). The program is consistent with ASTM E 185-70 and ASTM E 185-73 for Units 1 and 2, respectively. Capsules are periodically removed during the course of plant operating life. Neutron embrittlement is evaluated through surveillance capsule testing and evaluation, ex-vessel neutron fluence calculations, and monitoring of reactor vessel neutron fluence. The testing program and reporting conform to requirements of 10 CFR 50 Appendix H, *Reactor Vessel Material Surveillance Program Requirements*. Data resulting from the program is used to:

- Determine pressure-temperature limits, minimum temperature requirements, and end-of-life Charpy upper-shelf energy (C_V USE) in accordance with the requirements of 10 CFR 50 Appendix G, *Fracture Toughness Requirements*; and,

- Determine end-of-life RT_{PTS} values in accordance with 10 CFR 50.61, *Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock*.

The Reactor Vessel Surveillance program provides guidance for removal and testing or storage of material specimen capsules. All capsules that have been withdrawn and tested were stored.

For Unit 1, the last capsule is expected to be withdrawn during the ~~current operating term~~ *1R17 refueling outage* after it has accumulated a fluence equivalent to 6*6*~~0~~ years of operation. The remaining four standby capsules have low lead factors, will remain inside the vessel throughout the vessel lifetime, and will be available for future testing.

There are no capsules remaining in the Unit 2 vessel. All capsules were removed because high lead factors produced exposures comparable to the fluence expected at the end of the period of extended operation.

DCPP Units 1 and 2 currently use ex-vessel monitoring dosimetry, which consists of four gradient chains with activation foils outside the reactor vessel, which will be used to monitor the neutron fluence environment within the beltline region.

NUREG-1801 Consistency

The Reactor Vessel Surveillance program is an existing program that is consistent with NUREG-1801, Section XI.M31, Reactor Vessel Surveillance.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Reactor Vessel Surveillance program experience at DCPP is evaluated and monitored to maintain an effective program. This is accomplished by promptly identifying and documenting (using the Corrective Action Program) any conditions or events that could compromise the program. In addition, industry operating experience provides input to ensure that the program is maintained. The DCPP operating experience findings for this program identified no unique plant specific operating experience; therefore DCPP operating experience is consistent with NUREG-1801.

The Reactor Vessel Surveillance program has provided materials data and dosimetry for the monitoring of irradiation embrittlement since plant startup. The use of this program has been reviewed and approved by the NRC during the period of current operation. Surveillance capsules have been withdrawn during the period of current operation, and the data from these surveillance capsules have been used to verify and predict the performance of DCPP reactor vessel beltline materials with respect to neutron embrittlement. Calculations have been performed as required to project the reference temperature for pressurized thermal shock (RT_{PTS}) and Charpy upper-shelf energy (C_V USE) values to the end-of-license-extended (EOLE). DCPP pressure-temperature limit curves are valid up to a stated vessel fluence limit, and must be revised prior to operating beyond that limit.

Neutron Fluence

The last capsule withdrawn and tested from Unit 1 was Capsule V at the end-of-cycle (EOC) 11, which yielded an exposure less than that expected at EOLE. Capsule B will be withdrawn at 23.2 EFPY in order to capture enough fluence data for EOLE. The last capsule withdrawn and tested from Unit 2 was Capsule V at EOC 9, which yielded an exposure comparable to that expected at EOLE. The EOLE fluence projections include the use of lower-leakage cores and the Unit 1 power uprate.

Pressurized Thermal Shock

All of the beltline and extended beltline materials in the Diablo Canyon Units 1 and 2 reactor vessels are projected to remain below the PTS screening criteria values of 270˚F, for axially oriented welds and plates / forgings, and 300˚F, for circumferentially oriented welds (per 10 CFR 50.61), through EOL (32 EFPY) and EOLE (54 EFPY). ~~The projected Unit 1 RT_{PTS} values did not meet the 10 CFR 50.61 screening criteria for beltline and extended beltline materials. The Unit 2 RT_{PTS} was projected to the end of~~

~~the period of extended operation. The Unit 1 reactor vessel fluence will continue to be monitored as part of the Reactor Vessel Surveillance program.~~

Charpy Upper-Shelf Energy

The most recent coupon examination results for both units demonstrate that the DCPP reactor vessel material ages consistently with Regulatory Guide 1.99 predictions and provides a conservative means to satisfy the requirements of 10 CFR 50, Appendix G. The C_V USE values were revised with projections to the end of the period of extended operation.

The Reactor Vessel Surveillance program operating experience information provides objective evidence to support the conclusion that the effects of aging will be adequately managed so that the component intended functions will be maintained during the period of extended operation.

Conclusion

Continued implementation of the Reactor Vessel Surveillance program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.