16.2 AGING MANAGEMENT PROGRAMS AND ACTIVITIES

This section presents summary descriptions of the AMPs and associated activities credited for managing the effects of plausible ARDMs of applicable SSCs. Aging Management Basis Documents are contained in FCMS (search AMBD% for current documents).

The majority of AMPs credit existing plant programs, procedures and associated activities. A number of AMPs credit existing plant programs, procedures and associated activities that have been modified prior to entering the Period of Extended Operation (PEO) for managing specific plausible ARDMs. A few AMPs credit new programs, procedures and associated activities established prior to entering the PEO, to manage plausible ARDMs where existing plant programs, procedures and associated activities did not exist.

Common to all AMPs is the use of the corrective action process to identify and resolve discovered degraded/non-conforming conditions and the use of operating experience to identify and assess internal and external operating experience related to potential aging issues for applicability to Calvert Cliffs.

Table 16-1 presents the AMPs and the associated SSCs. Table 16-1 is arranged to align with the applicable LRA section number.

Table 16-1 contains the following 7 columns:

1. Line Item Number
2. Applicable LRA Section
3. Applicable SSC
4. Portion(s) of the SSC subject to a particular aging mechanism,
5. Aging mechanism(s) that is plausible for the SSC
6. Credited AMP
7. Reference to the applicable AMP Summary Description and, as applicable, attributes specific to the associated SSC line item

Calvert Cliffs Renewed Licenses for Units 1 and 2 (Condition 2.G) stipulated that the Updated Final Safety Analysis Report (UFSAR) be updated to include:

- Any future actions (i.e., regulatory commitments) listed in NUREG-1705; Appendix E (Reference 1).
- Section 16.2 and Table 16-1 document completion of these 'future actions' ('regulatory commitments') prior to entering each Unit's PEO.

16.2.1 ADDITIONAL BASELINE WALKDOWNS AGING MANAGEMENT PROGRAM

This is a new AMP consisting of a one-time inspection of components in the 'Component Supports' commodity group that were not subject to inspection under the Inservice Inspection (ISI) or the Seismic Verification Project. Fourteen systems within the scope of license renewal contain piping supports not subject to American Society of Mechanical Engineers (ASME) Section XI inspections or one-time inspection performed as part of the Seismic Verification Project walkdowns.

For these component supports (i.e., not inspected or partially inspected by the Seismic Verification Project walkdowns or subject to inspections under the ISI Program, and environmental or other differences prevented extrapolation of results to cover these component supports) additional one-time baseline walkdowns were performed. The

additional baseline walkdown scope included inspection (visual examinations), on a sampling basis, for aging effects (i.e., corrosion and loose bolts).

The sampling approach was comparable to the approach required by ASME Class 3 systems. These walkdowns documented the condition of the piping support type, not including piping frames outside Containment. If an aging effect was found during this one-time inspection, additional sampling one-time inspections for piping hangers outside Containment. In addition, the inspection scope for that system was expanded to pipe frames outside Containment.

The systems included in the additional baseline walkdown program were as follows:

Condensate	Liquid Waste
Condensate Storage	Nitrogen and Hydrogen
Compressed Air	Nuclear Steam Supply Sampling
Demineralized Water	Plant Drains
Diesel Fuel Oil (DFO)	Plant Heating
Extraction Steam	Plant Water
Fire Protection (FP)	Well and Pretreated Water

This AMP has been completed and does not continue into either Unit's PEO.

Based on the results of the walkdowns associated with this AMP, aging management of applicable component supports within the applicable systems have been implemented via the Structure and System Walkdown AMP (Section 16.2.29).

16.2.2 AGE-RELATED DEGRADATION INSPECTION (ARDI) AGING MANAGEMENT PROGRAM

This is a new AMP consisting of inspections, on a sampling basis, of mechanical systems, consistent with Nuclear Regulatory Commission (NRC) GALL (Reference 2) AMPs XI.M32 and XI.M35, based on groups of components comprised of the same material/environment combination, regardless of the system or unit where they are installed. All of the components in each of these material/environment combination groups are subject to the same plausible aging effects requiring management.

This is a discovery AMP that is typically credited in combination with a mitigation program. This AMP is typically paired with the Chemistry Program. The Water Chemistry AMP (Section 16.2.12) is utilized to mitigate corrosion in water filled piping systems. The DFO Chemistry AMP (Section 16.2.16) provides a similar mitigation function for DFO filled piping systems. For each identified controlled chemical environment, ARDI sampling inspections were used to validate that the Water and Fuel Oil Chemistry AMPs have mitigated plausible aging effects requiring mitigation (AERMs) from occurring.

There are a few systems included in the ARDI AMP that do not have a controlled chemical environment. For these systems, and associated material/environment combination groups, site operating experience had been that no AERMs have been occurring. The ARDI AMP is utilized to validate the plant's operating history of the non-presence of AERMs in these systems for the applicable material/environment combination groups. This is consistent with Reference 3, Section XI.M32.

This AMP was initially based on Reference 4, which based sampling methodology on statistical methods that provided a 90% probability that 90% of the components in a material/environment combination group would not exhibit the applicable potential AERMs. For the number of components that the methodology algorithms indicated were required to be inspected out of the total population of components within a material/environment

combination group, as long as no AERMs were discovered for the components inspected, then the 90%/90% confidence criteria was satisfied and no further inspections of any kind were required during the PEO.

The systems that are included in this AMP are as follows:

Auxiliary Building Heating, Ventilation, and Air Conditioning (HVAC)	Liquid Waste
Auxiliary Feedwater (AFW)	Main Steam
Chemical Addition	Nitrogen and Hydrogen
Chemical and Volume Control (CVCS)	Nuclear Steam Supply Sampling
Component Cooling	Plant Drains
Compressed Air	Plant Heating
Condensate	Plant Water
Condensate Storage	Primary Containment HVAC
Containment Heating and Ventilation	Radwaste HVAC
Containment Spray	Radiation Monitoring
Control Room HVAC	Reactor Coolant
Demineralized Water	Safety Injection (SI)
Emergency Diesel Generator (EDG)	Saltwater (SW)
EDG Building HVAC	Service Water (SRW)
Feedwater	Spent Fuel Pool Cooling (SFPC)
FP	Waste Gas

Reference 2, Section XI.M32, established a standardized sampling approach to the performance of one-time inspections. This sampling approach provides for the inspection of 20% of the total number of components in each material/environment combination group, not to exceed a maximum of 25 inspections for each group. Calvert Cliffs adopted this sampling approach.

Small bore piping inspections were also completed under this AMP consistent with the one time inspection of ASME Code Class 1 Small Bore Piping guidance provided in Reference 3, Section XI.M35.

This AMP has been completed and does not continue into either Unit's PEO. Based on the results of the ARDI inspections associated with this AMP, aging management of applicable components not meeting ARDI criteria, has been implemented via the Preventive Maintenance (PM) AMP (Section 16.2.23).

16.2.3 ALLOY 600 AGING MANAGEMENT PROGRAM

This AMP credits existing plant program (i.e., Alloy 600 Program). The Alloy 600 Program was developed after several instances of plant-specific and industry issues, relative to the primary water stress corrosion cracking (PWSCC) of Alloy 600 components, were identified.

This AMP is consistent with Section XI.M11B of Reference 2 with the enhancement that this AMP includes the Reactor Coolant System (RCS) nozzle thermal sleeves and other non-pressure boundary components. In addition, welds and base metals are implicitly included.

Much of the Alloy 600 material (including all of the pressurizer heater sleeves) at the time the units' licenses were renewed, has been replaced with Alloy 690 and the Reactor Pressure Vessel (RPV) Head replacements eliminated Alloy 600 that was of concern in

the previous design. This AMP includes all Nickel-Chromium (Ni-Cr) based alloys in the primary systems.

Specifically, this AMP inspects RCS nozzles during refueling outages for indications of leakage through the performance of the Boric Acid Corrosion Inspection (BACI) AMP (Section 16.2.7). The Alloy 600 Program also contains provisions for augmented inspections based on 10 CFR 50.55a.

16.2.4 ASME SECTION XI, SUBSECTIONS IWB, IWC, AND IWD AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., ASME Section XI). The ASME Section XI, Subsections IWB, IWC and IWD programs consist of periodic volumetric, surface, and/or visual examinations and leakage tests of all Class 1, 2, and 3 pressure-retaining components for evidence of degradation. As permitted by License Amendments 332/310 dated 02/28/2020, to implement 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors", the station may voluntarily comply with the requirements of 10 CFR 50.69 as an alternative to compliance with 10 CFR 50.55a ASME Section XI Inservice Inspection requirements for ASME Class 2 and Class 3 components that have a Risk-Informed Safety Classification (RISC) RISC-3 or RISC-4. Surface and visual examinations of integral attachments are also performed. The ASME Section XI program is implemented through the ISI Program per the requirements of 10 CFR 50.55a. As such, the program is consistent with the ASME Section XI, Subsections IWB, IWC, and IWD program guidance in Reference 2, Section XI.M1.

16.2.5 ASME SECTION XI, SUBSECTIONS IWE AND IWL AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., ASME Section XI). The ASME Section XI, Subsection IWE program consists of periodic visual, surface, and volumetric inspection of steel containment shells and their attachments, containment steel liners and their attachments, and containment air locks, hatches, and pressure retaining bolting for evidence of degradation. The ASME Section XI, Subsection IWL program consists of periodic visual inspection of concrete surfaces for reinforced and pre-stressed concrete containments, and periodic visual inspection and sample tendon testing of unbounded post-tensioning systems for pre-stressed concrete containments, for evidence of degradation, assessment of damage, and corrective actions. Measured tendon lift-off forces are compared to predicted tendon forces calculated in accordance with Reference 5. The ASME Section XI program is implemented through the ISI Program per the provisions and requirements of 10 CFR 50.55a. As such, the program is consistent with the ASME Section XI, Subsections IWE and IWL program guidance in Reference 2, Sections XI.S1 and XI.S2, respectively.

This AMP utilizes the Surveillance Testing AMP (Section 16.2.30) and PM AMP (Section 16.2.23) to facilitate the periodic tests and inspections.

16.2.6 ASME SECTION XI, SUBSECTION IWF AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., ASME Section XI). The ASME Section XI, Subsection IWF program consists of periodic visual examinations of supports, associated with Class 1, 2, 3, and Metal Containment piping and components, for evidence of degradation. The ASME Section XI program is implemented through the ISI Program per the requirements of 10 CFR 50.55a. As such, the program is consistent with the ASME Section XI, Subsection IWF program guidance in Reference 2, Section XI.S3. As permitted by License Amendments 332/310 dated 02/28/2020, to implement 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors", the station may voluntarily comply with the requirements of 10

CFR 50.69 as an alternative to compliance with 10 CFR 50.55a ASME Section XI Inservice Inspection requirements for ASME Class 2 and Class 3 components that have a Risk-Informed Safety Classification (RISC) RISC-3 or RISC-4.

16.2.7 BORIC ACID CORROSION INSPECTION (BACI) PROGRAM

This AMP credits an existing plant program (i.e., Boric Acid Corrosion Control). The Boric Acid Corrosion Control Program consists of discovery and management of general corrosion/oxidation and corrosion due to boric acid exposure, for those systems containing boric acid, by performing visual inspections. The scope of the Boric Acid Corrosion Control program is as follows: (a) identifies locations to be examined, (b) provides examination requirements and procedures for the detection of leaks, and (c) provides the responsibilities for initiating engineering evaluations and the necessary corrective actions.

During each refueling outage, designated personnel perform walkdown inspections to identify and quantify any leakage found at specific locations inside Containment and in the Auxiliary Building. A second inspection of these components is performed prior to plant start-up (at normal operating pressure and temperature) if leakage was identified previously and corrective action taken. If either leakage or corrosion is discovered, the condition is entered into the corrective action process to document and resolve the deficiency. Corrective actions address the removal of boric acid residue and inspection of the affected components for general corrosion.

The Boric Acid Corrosion Control Program scope includes RCS components in accordance with Reference 6, as well as non-RCS mechanical, electrical, and structural components susceptible to boric acid corrosion which are potentially exposed to borated water leaks.

The Boric Acid Corrosion Control Program has been modified to include examinations during refueling outages of: (1) the reactor vessel cooling shroud anchorage to the reactor vessel head for evidence of boric acid leakage, (2) all reactor vessel cooling shroud structural support members for general corrosion/oxidation and (3) piping supports associated with the Spent Fuel Pool (SFP) demineralizer and filter.

An engineering review for stress corrosion cracking (SCC) at the Refueling Water Tank (RWT) penetrations determined that the RWT penetrations will leak before break. This engineering review confirmed that detection of minor leakage by PM based periodic visual inspections performed will adequately manage the RWT penetration and associated welds prior to a challenge to the structural integrity under design basis conditions.

This AMP utilizes the PM AMP (Section 16.2.23) to facilitate periodic BACIs and periodic RWT penetration/weld inspections.

16.2.8 BURIED PIPING INSPECTION AGING MANAGEMENT PROGRAM

This is a new AMP for buried pipe in the AFW and DFO Systems. This AMP provides assurance that the effects of plausible ARDMs are effectively managed in the PEO so that this buried piping remains capable of maintaining the system's pressure boundary function under all applicable current licensing basis loading conditions.

This AMP considers variations in environmental conditions (including cathodic protection) to select representative samples of buried piping (external surfaces) for inspection to ensure that the piping wrapping/coating and cathodic protection are adequately protecting the pipe from the external environment. Evidence of the effects of crevice corrosion, galvanic corrosion, general corrosion, Microbiologically-Induced Corrosion (MIC) or pitting will initiate corrective actions in accordance with the Corrective Action Program.

This AMP utilizes the PM AMP (Section 16.2.23) to facilitate the piping inspections.

16.2.9 CABLE AGING MANAGEMENT PROGRAM

This is a new AMP initially developed to address a number of cables that were identified, during the integrated plant assessment, as candidates for replacement before the end of the Units' PEOs. Calvert Cliffs has since defined a cable condition monitoring AMP that provides the necessary inspection, testing, analysis and acceptance criteria to ensure that plausible ARDMs associated with in-scope cables are adequately managed in the PEO. Prior to entering the PEO, this AMP was updated to be consistent with Reference 2, Sections XI.E1, XI.E2, and XI.E3. To address Reference 7, this AMP includes environmentally qualified cables.

In-scope low and medium voltage cables and connections (non-environmentally qualified and environmentally qualified) in accessible areas exposed to adverse localized environments caused by heat, radiation, or moisture are inspected on a periodic basis. Visual inspections for cable and connector jacket surface anomalies such as embrittlement, discoloration, cracking, and surface containment are performed at least once every 10 years. (Table 16-1, Items 258 thru 261, and 266)

In-scope low current, high voltage instrumentation circuit cables and connections are assessed, via review/evaluation of periodic instrument calibration results/findings, to identify potential cable and connection insulation material degradation that could have an impact on proper circuit operation. When an instrument is found to be significantly out of calibration, additional evaluation is performed on the circuit, including the cable and connections, as required. The review of periodic instrument calibration results is performed at ten year intervals. This periodic review/evaluation activity, combined with the performance of visual inspections of the cable in accessible areas exposed to adverse localized environments, is sufficient to manage potential ARDMs. (Table 16-1; Item 263)

In-scope, inaccessible or underground power cables (greater than or equal to 400 volts) exposed to adverse localized environments caused by moisture (e.g., wetting or submergence) are tested on a periodic (i.e., at least every 6 years) basis. The specific type of testing utilized is capable of detecting reduced insulation resistance of the cable's insulation system due to wetting or submergence. In addition, periodic (i.e., annually) visual inspection of applicable manholes and underground cable duct banks are performed to ensure cables are not wetted or submerged, cable support structures are intact and the dewatering/drainage systems are operating properly. (Table 16-1; Item 262)

In-scope 4 kV Bus insulating boots and certain ITE motor control center internal wiring insulation/ jacketing are periodically (at least once every ten years) inspected for surface anomalies such as embrittlement, discoloration, cracking, and surface contamination. (Table 16-1; Items 264 and 265)

This AMP utilizes the PM AMP (Section 16.2.23) and Surveillance Testing AMP (Section 16.2.30) to facilitate cable tests and inspections.

16.2.10 CAST AUSTENITIC STAINLESS STEEL (CASS) AGING MANAGEMENT PROGRAM

This is a new AMP developed to manage the effects of thermal embrittlement of CASS components in the RCS, SI System, and Reactor Vessel Internals (RVI) with design

temperatures >250°C (482°F) by identifying those components that may be susceptible to this ARDM. This AMP was developed to: (1) screen components; (2) review operating experience; (3) utilize either volumetric examination or EVT-1 visual examination; and (4) follow industry programs to evaluate thermal embrittlement and adjust the program accordingly. The CASS RVI components included within scope of this program are inspected in accordance with the RVI AMP (Section 16.2.26).

Susceptibility of individual components to thermal embrittlement was determined based on the delta ferrite content of the component, the casting method (static or centrifugal) and the molybdenum content. Delta ferrite content was determined using Hull's equation. For components that failed the screening and were deemed susceptible to thermal aging embrittlement, the preferred alternative is either a volumetric examination or an EVT-1 visual examination. A second alternative is to replace the component. The second alternative will be used if a component cannot be qualified for the license renewal term by either a volumetric examination or an EVT-1 examination or, if it is more cost effective to replace rather than perform either a volumetric examination or an EVT-1 examination. Replacement of the component will make the ARDM non-plausible for the respective component. The corrective actions taken as part of this program will ensure that the CASS components remain capable of performing their pressure boundary function under all applicable current licensing basis conditions.

This AMP is implemented through the CASS Program Plan and is consistent with Reference 2, Section XI.M12.

16.2.11 CAULKING AND SEALANTS INSPECTION AGING MANAGEMENT PROGRAM

This is a new AMP initiated to provide requirements and guidance for the identification, inspection frequencies and acceptance criteria for non-fire barrier caulking and sealants used in the applicable in-scope plant structures (Turbine Building, Intake Structure, Auxiliary Building, and Safety-Related [SR]/Station Blackout [SBO] Diesel Buildings) to ensure that their condition is maintained at a level that ensures that they will perform their intended functions. This new AMP consists of baseline inspections, completed prior to entering the PEO, to determine the material condition of the caulking and sealants along with periodic inspection activities during the PEO.

This AMP utilizes the PM AMP (Section 16.2.23) and the Surveillance Testing AMP (Section 16.2.30) to facilitate the periodic inspections.

16.2.12 CHEMISTRY (WATER) AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., Plant Chemistry). The Plant Chemistry Program serves to minimize impurity ingress to plant systems; reduce corrosion product generation, transport, and deposition; reduce collective radiation exposure through chemistry; improve integrity and availability of plant systems; and extend component and plant life. The Plant Chemistry Program is implemented through a series of procedures that provide for monitoring, maintaining, and/or controlling fluid chemistry in various plant systems.

Certain activities directed by these procedures are credited with mitigation of plausible aging effects by performing periodic measurement and evaluation of water chemistry parameters in process and supporting fluid systems. For certain fluid systems, activities include treatment with additives to aid in the prevention and control of corrosion mechanisms. Other portions of these procedures are credited with discovery of certain aging effects through measurement and evaluation of additional chemistry parameters in supporting systems. When the value of a measured parameter approaches or goes beyond predetermined warning limits, appropriate corrective actions are initiated as prescribed by the applicable procedure.

This AMP is credited for chemistry control, and thus mitigation aging management, in the following systems:

AFW	Main Steam
CVCS	Nitrogen and Hydrogen
Component Cooling	Nuclear Steam Supply Sampling
Containment Heating & Ventilation	RCS
Containment Spray	SI
SRW	EDG
SFPC	Feedwater
Steam Generator (SG) Blowdown	Chemical Addition

16.2.13 COMPREHENSIVE REACTOR VESSEL SURVEILLANCE AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., Comprehensive Reactor Vessel Surveillance Program). The Comprehensive Reactor Vessel Surveillance Program (CRVSP) implements the requirements of 10 CFR Part 50, Appendix H and provides the necessary data to monitor the embrittlement of the reactor vessels. A detailed discussion of the CRVSP is presented in Section 4.1.5.2.

Calvert Cliffs has five surveillance capsules for each unit to provide sufficient RPV material property changes and fluence information as suggested in Reference 8 to meet the requirements of 10 CFR Part 50, Appendix H, through the original license period. Each Unit also has one standby surveillance capsule to meet future needs (e.g., life extension, radical fuel management changes) as required. The regulations already require embrittlement and loss of upper shelf energy projections be updated to account for any significant changes in the projected values of RT_{PTS} or change in the expiration date for operation of the facility.

The CRVSP also provides for evaluation and incorporation of other research results, such as applicable coupon surveillance data obtained from other power plants.

Calvert Cliffs will continue to make periodic adjustments of neutron embrittlement and loss of upper shelf energy predictions, as needed, to account for any new information on the RPV beltline materials.

In addition, Calvert Cliffs addressed the following items in the CRVSP:

1. The capsule withdrawal schedule was revised to provide data at neutron fluences equal to or greater than the projected peak neutron fluence at the end of the PEO.
2. One capsule containing dosimeters will be removed during the final 5 years of the PEO.

16.2.14 CONTAINMENT LOCAL LEAKAGE RATE TESTING AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., Containment Local Leak Rate Testing). Containment Local Leak Rate Testing is performed as part of an overall Calvert Cliffs Containment Leakage Rate Testing Program. A discussion of the Containment Leakage Rate Testing Program is presented in Section 5.5.2.1.

The Containment Leakage Rate Testing Program implements the leakage testing of the Containment, as required by 10 CFR 50.54(o) and 10 CFR Part 50, Appendix J and the Technical Specifications. The Containment Leakage Rate Testing Program requires a quantitative assessment of the containment integrity on a periodic basis. As permitted by

License Amendments 332/310 dated 02/28/2020, to implement 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors", the station may voluntarily comply with the requirements of 10 CFR 50.69 as an alternative to compliance with 10 CFR 50 Appendix J requirements for penetrations and valves that have a Risk-Informed Safety Classification (RISC) RISC-3 or RISC-4, and meet the criteria of 10 CFR 50.69(b)(1)(x).

This AMP is credited for discovery and management of radiation and thermal related degradation for non-metallic portions of both EQ and Non-EQ electrical penetrations. Any significant degradation of the penetration elastomer seals would be detected and repaired as required to maintain integrity.

This AMP utilizes the PM AMP (Section 16.2.23) and Surveillance Testing AMP (Section 16.2.30) to facilitate the credited surveillance testing activities.

16.2.15 DESIGN CHANGE AND MODIFICATION IMPLEMENTATION AGING MANAGEMENT PROGRAM

This AMP credits an existing plant process (i.e., Design Change/ Modification Process). Implementation of the following modifications eliminated the plausible ARDMs and aging management activities that would have been required for the applicable plant components during the PEO:

1. Control Room air handling unit supports were replaced. The new supports eliminate the use of elastomers, thereby eliminating elastomer degradation for the Control Room HVAC air handler supports as a plausible ARDM in the Component Supports commodity group.
2. Certain CVCS heat trace, installed on the borated water piping, was replaced with a different type of heat trace. This modification removed the corrosive adhesive associated with the original heat tracing, thus eliminating SCC of the external surfaces of the applicable stainless steel components as a plausible ARDM in the CVCS.

This AMP has been completed and does not continue into either Unit's PEO.

16.2.16 DIESEL FUEL OIL (TANKS AND CHEMISTRY) AGING MANAGEMENT PROGRAM

This AMP credits existing and new plant programs and activities. This AMP manages the effects of plausible ARDMs of the DFO System components and various DFO storage tanks.

This AMP utilizes the PM AMP (see Section 16.2.23) and the Surveillance Testing AMP (Section 16.2.30) to facilitate the various inspections and tests.

16.2.17 ENVIRONMENTAL QUALIFICATION (EQ) AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., EQ Program). The EQ Program manages the environmental qualification of electrical equipment important to safety as required by 10 CFR 50.49. The EQ Program is credited for managing the effects of plausible ARDMs of organic subcomponents for environmentally qualified components within the scope of license renewal. The EQ Program provides for management of aging

effects by performing periodic PM and replacement activities. A discussion of the EQ Program is presented in Section 7.12.

The EQ Program will continue to be administered in accordance with the requirements of 10 CFR 50.49, and References 9 and 10. The EQ Program includes requirements for determining the components in-scope per 10 CFR 50.49 and options for management of the plausible thermal and radiative aging effects associated with these components. The EQ Program contains the provisions necessary to ensure that EQ components will remain qualified to perform their required 10 CFR 50.49 function(s) under applicable design bases conditions should a design basis event occur at the end of extended plant life. The EQ Program is consistent with Reference 2, Section X.E1. As permitted by License Amendments 332/310 dated 02/28/2020, to implement 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors", the station may voluntarily comply with the requirements of 10 CFR 50.69. For EQ components in a system which have been categorized per 10 CFR 50.69 and have a Risk-Informed Safety Classification (RISC) RISC-3 or RISC-4, alternative treatment per 10 CFR 50.69 is applied in lieu of special treatment required per 10 CFR 50.49. However, Low Safety Significant (LSS) RISC-3 components remain capable of performing, with reasonable confidence, their safety functions under design basis conditions.

This AMP utilizes the PM AMP (Section 16.2.23) to facilitate the various inspections, refurbishments and replacements.

16.2.18 FLOW ACCELERATED CORROSION (FAC) AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., Flow Accelerated Corrosion Program). The FAC Program was established to provide early detection and prevention of pipe wall thinning caused by accelerated corrosion, cavitation or erosion that could lead to ruptures in high energy piping.

All piping within the scope of the FAC program is evaluated and categorized to determine inspection points where thickness measurements will be taken. Inspection points are determined through evaluations of site-specific data, failures at other plants and modeling of piping systems by CHECWORKS software developed by Electric Power Research Institute. An ultrasonic non-destructive examination is used to determine the wall thickness at a number of grid locations for each inspection point. This data is used with a predictive model to determine additional inspection points, to adjust an inspection point's priority and to extrapolate the time until the minimum wall thickness will be reached on the inspected component. This information is maintained in the FAC Program database and further inspections or replacements are scheduled to ensure no components reach their minimum thickness value while in-service.

The FAC Program is credited for aging management in the following systems:

Extraction Steam	Main Feedwater
Main Steam	SG Blowdown

16.2.19 FATIGUE MONITORING AGING MANAGEMENT PROGRAM

This AMP credits an existing program (i.e., Fatigue Monitoring). The Fatigue Monitoring Program (FMP) records and tracks the number of thermal and pressure test transients. Cycle counting is performed as part of this program. The data for thermal transients is collected, recorded and analyzed using SR software (FatiguePro). This software is used to analyze data that represents real transients and to predict the number of transients for 40 and 60 years of plant operation based on historical records.

The FMP tracks low-cycle fatigue usage using three methods: 1) cycle counting, 2) cycle-based fatigue analysis, and 3) stress-based fatigue analysis. In accordance with ASME Code Section III, the fatigue life of a component is based on a calculated cumulative usage factor of less than or equal to one.

Twenty-seven sentinel locations have been selected for monitoring for low-cycle fatigue usage. These locations represent the bounding locations for critical thermal and pressure transients and operating cycles.

The FMP assesses the effect of the environment using statistical correlations developed in Reference 11 for stainless steels, Reference 12 for carbon and low alloy steels and Reference 13 for nickel-based alloys. The modified FMP uses these statistical correlations to calculate an effective environmental factor to account for the reduction in fatigue life due to the reactor water environment. This factor was applied to fatigue loads where the specified threshold criteria for strain rate and temperature have been exceeded.

The FMP provides fatigue monitoring for the following systems:

CVCS	Reactor Coolant
Control Element Drive Mechanism (CEDM)	RPV
Feedwater	RVI
Nuclear Steam Supply Sampling	SI

16.2.20 FIRE BARRIER PENETRATION SEAL INSPECTION AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., Surveillance Testing), in addition to Operations Department's Performance Evaluations (PEs) for managing the plausible ARDMs associated with penetration fire barriers located in the Turbine Building, Intake Structure, Auxiliary Building and SR/SBO Diesel Buildings. These existing surveillances and PEs provide instructions for visual inspection of fire barrier penetration seals in fire areas boundaries that protect safe shutdown and other areas. The scope of these surveillances and PEs is to visually inspect the following types of fire barrier and penetration seals:

Electrical Conduit and cable tray penetration seals
HVAC duct penetration seals (ducts without dampers)
Mechanical pipe penetration seals
Expansion joint penetration seals

Under these existing surveillances and PEs the penetration seals are inspected for damage, cracking, voids and proper installation, providing for separate failure criteria and repair criteria. A discussion of the FP Program is presented in Section 9.9.

This AMP utilizes the PM AMP (Section 16.2.23) and Surveillance Testing AMP (Section 16.2.30) to facilitate the associated Surveillance Test Procedure (STPs) and PE periodic inspections.

16.2.21 FIRE PROTECTION AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., FP) and procedures (i.e., Conduct of Operations). A discussion of the FP Program is presented in Section 9.9.

The FP Program is credited for managing the aging of specific components within the scope of license renewal. Various performance and/or condition monitoring activities implemented by this program provide for discovery of aging effects on pressure-retaining components

(e.g., piping, spool-pieces, and valves), by performing periodic inspections and functional testing.

The FP Program is the integrated effort involving components, procedures and personnel used to carry out activities of the FP Program and fire prevention. The FP Program contains maintenance, periodic functional testing, and inspection criteria to provide reasonable assurance that various Non-Safety-Related (NSR) systems are capable of performing their FP intended functions. Any abnormal condition would be detected and investigated to ensure that it does not have the ability to impact safety or adversely affect operation of the system. Any such condition would be repaired prior to impacting the passive FP intended function of the system. Fire protection equipment and systems are inspected and tested upon initial installation and periodically thereafter.

The inspection and testing is conducted following the guidance of applicable National FP Association Codes and Standards as well as recommendations and requirements of the insurance carrier and the NRC. Plant procedures mandate test frequencies and testing process. Applicability, compensatory actions, testing requirements and testing frequencies for those FP systems that protect equipment needed to achieve safe and stable plant conditions following a fire are contained in the Technical Requirements Manual. The Technical Requirements Manual also identifies compensatory actions to be taken when equipment is identified as degraded/non-conforming.

The FP AMP credits 'conduct of operations' procedures for managing plausible aging mechanisms on NSR portions of various systems required for safe and stable conditions. The demands on most NSR systems and components during normal operation are the same as, or greater than, the demands placed on them during mitigation of fires. Therefore, satisfactory performance of periodic functional tests can be used to demonstrate that aging is adequately managed for the passive FP functions of NSR components. A system that is in continuous operation during normal operation can be characterized as undergoing a continuous FP function test if the system parameters (pressure, temperature, flow, etc.) encountered during performance of FP intended functions are bounded by the normal operating parameters of the system.

The performance and conditioning activities conducted in accordance with Conduct of Operations ensure detection of abnormal conditions. The Conduct of Operations requires that operators be accountable for their immediate areas of responsibility. This includes performing general inspections and checking conditions of areas and equipment. Operators assess degraded equipment conditions to ensure personnel and affected equipment safety while completing corrective actions. Where the above type of demonstration is successful, performance and condition monitoring activities during normal plant operation are credited for identifying the effects of system aging. Specific AMPs are not necessary and no further evaluation is required.

This AMP utilizes the PM AMP (Section 16.2.23) and Surveillance Test AMP (Section 16.2.30) to facilitate the associated STPs.

16.2.22 LOAD HANDLING AND FUEL HANDLING EQUIPMENT AGING MANAGEMENT PROGRAM

This AMP credits existing Calvert Cliffs load handling procedures in addition to PEs and Operating Instructions (OIs). These load handling procedures, PEs and OIs establish the requirements and assigns responsibilities for activities involving load handling. These procedures, etc. are credited for managing the aging of certain devices in the Fuel Handling Equipment (FHE) and Heavy Load Handling Cranes (HLHC) commodity group. A discussion of control of heavy loads is presented in Section 5.7.

Certain steps of the load handling procedures, etc. provide for discovery of plausible ARDMs by performing periodic visual inspection and non-destructive examination. These activities provide reasonable assurance that aging of FHE and HLHC will be managed during the PEO.

The FHE and HLHC components addressed by this AMP are as follows:

- Auxiliary Building Cask Handling Crane
- Containment Building Jib Cranes
- Intake Structure Semi-Gantry Crane
- Polar Cranes
- Reactor Vessel Head Lift Rigs
- Refueling Machine Auxiliary Hoists
- Spent Fuel Handling Machine (SFHM)
- Containment Purge Exhaust Monorail Hoists
- Fuel Upending Machines
- New Fuel Elevator
- Reactor Refueling Machines
- Reactor Vessel Head Cooling Shroud/ Structural Support Members
- Spent Fuel Inspection Elevator
- Transfer Machine Jib Crane

This AMP utilizes the PM AMP (Section 16.2.23) to facilitate FHE and HLHC component inspections and examinations.

16.2.23 PREVENTIVE MAINTENANCE (PM) AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (i.e., PM Program). The Calvert Cliffs PM Program maintains plant structures, systems and components (SSCs) in a reliable condition for normal operation and emergency use, to minimize equipment failure and extend equipment and plant life. The PM Program covers PM activities for all nuclear power plant SSCs within the scope of license renewal. The PM tasks maintain plant SSCs through regular maintenance and inspection of SSCs for signs of damage and/or degradation.

Preventive maintenance encompasses a variety of maintenance actions taken to extend equipment life and maintain equipment within design operating conditions. These include periodic maintenance actions (accomplished on a routine basis) and certain other activities that may be initiated in response to predictive or periodic maintenance results, vendor recommendations or experience.

PM tasks are scheduled and implemented in accordance with PM Program procedures. Some PM tasks have been modified to inspect for effects of specific plausible ADRMs.

PM activities are automatically scheduled and implemented in accordance with PM Program procedures.

The following SSCs and commodity groups specifically credit the PM AMP for aging management:

- AFW System
- Component Cooling and SRW Systems
- Electrical Commodities (Groups 1-7)
- HVAC Systems
- FWS
- Salt Water Cooling System
- Intake Structure
- BACI
- Cables
- RPV/CEDM
- Main Steam System
- SFPC System
- Piping Encapsulations
- EDGs
- Instrument Air (IA) and SW Air Systems
- ASME Section XI; Subsections IWE and IWL
- Buried Piping Inspection
- Caulking and Sealants Inspection

Containment Leakage Rate Testing	DFO (Tanks and Chemistry)
Environmental Qualification	Fire Barrier Penetration Seal Inspection
FP	Load Handling and FHE
Protective Coating	RCS
SFP (Liner/ Neutron Absorbing Material)	Structure and System Walkdown

16.2.24 PROTECTIVE COATINGS AGING MANAGEMENT PROGRAM

This AMP credits an existing plant procedure. The protective coatings procedure was established to control Service Level 1 protective coatings activities, performed inside Containment, to ensure they comply with References 14 and 15. Service Level I coatings are those where failure of the coating could adversely affect the operation of mechanical fluid systems required for post-accident operation. The procedure provides for discovery of corrosion or of conditions that would allow corrosion to occur, such as degraded coatings by performing periodic visual inspections on all readily accessible containment surfaces.

The procedure requires that the responsible engineer perform a walkdown of the inside of Containment to verify the condition of Service Level 1 coatings. The responsible engineer develops a list of all areas inside Containment exhibiting deterioration. Repair areas are evaluated to ensure timely corrective action is taken.

This AMP provides reasonable assurance that aging of steel components inside Containment will be managed during the PEO. This AMP utilizes the PM AMP (Section 16.2.23) to facilitate Containment protective coating inspections and repairs.

16.2.25 REACTOR COOLANT AGING MANAGEMENT PROGRAM

This AMP is credits existing plant activities. This AMP specifically manages aging of the following components:

1. Reactor Vessel Head O-ring leak-off line utilizing the PM AMP (Section 16.2.23).
2. Reactor Coolant Pump (RCP) seal water heat exchanger tubes utilizing OIs.

16.2.26 REACTOR VESSEL INTERNALS (RVI) AGING MANAGEMENT PROGRAM

This is a new AMP developed and implemented to manage the aging effects applicable to RVI components following the recommendations of Reference 2, Section XI.M16A and Reference 16. The RVI AMP provides for inspection, acceptance criteria and corrective actions. Under the guidance of Reference 17, Calvert Cliffs incorporated the recommendations for additional inspections and evaluations provide by industry guidelines. These additional industry evaluations and recommendations are documented in Reference 16.

Calvert Cliffs continues to participate in industry programs through the MRP.

16.2.27 SPENT FUEL POOL (SFP) AGING MANAGEMENT PROGRAM

This AMP credits existing plant activities. This AMP specifically manages aging of the following components:

1. SFP Liner utilizing the PM AMP (Section 16.2.23) and related OIs.
2. SFP (Unit 1) Storage Racks (Neutron Absorbing Material) utilizing the PM Program (Section 16.2.23) and an Engineering Test Procedure (ETP)

Regarding the SFP Liner, the applicable OI and related PM provide for the determination of SFP leakage. This OI provides detailed instructions for leakage monitoring of the SFP

cooling system. During the performance of this OI, the 'telltale' valves are opened, drained and are monitored for 24 hours with catch devices installed at the outlet of each 'telltale' valve.

Regarding the Unit 1 SFP storage racks neutron absorbing material, the ETP and related PMs were initially developed on the basis of vendor recommendations for detecting degradation of neutron-absorbing materials. The ETP is designed to permit samples of the materials used in the Unit 1 SFP storage racks to be periodically removed from the SFP for examination. Through specific positioning of the designated sample packets, both accelerated and long-term exposure to gamma radiation and borated water is provided. Sufficient samples are available so that the principle properties (i.e., sample weight for the Carborundum material) can be determined as a function of exposure on a regularly scheduled basis. Visual condition is assessed on a graded scale and the results of physical property analysis are compared to historical results. The ETP was modified to refine the process for scheduling sample packet removal from the SFP.

16.2.28 STEAM GENERATOR (SG) AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (SG Program) that was applicable to the aging management of the SGs that were installed in the plant at the time the operating licenses were renewed. Those SGs were replaced in 2002 and 2003 for Units 1 and 2, respectively. The materials in the new SGs were upgraded to minimize aging degradation and, consequently, a new AMP was created for the new SGs.

The SG tubes are inspected in accordance with the SG Program. The SG Program prescribes the sample size for tube inspection, inspection process, evaluation and determination of tube status. The SG Program is credited to manage the aging effects of denting, intergranular attack (IGA) and SCC of the SG tubes with eddy current examinations. Tube plugging or sleeving are the prescribed methods for addressing tubes that are identified as susceptible to failure before the next inspection. The SG Program provides for detection of leakage between Primary and Secondary sides of the SG which potentially could be caused by denting, wear, pitting SCC/Intergranular Stress Corrosion Cracking (IGSCC) or IGA.

The SG Program (visual inspections) is also credited to manage the effects of wear, erosion, corrosion of the SG vessel, manway covers, handhole covers and tube supports.

This AMP utilizes the PM AMP (Section 16.2.23) and Surveillance Testing AMP (Section 16.2.30) to facilitate the periodic inspections.

16.2.29 STRUCTURE AND SYSTEM WALKDOWNS AGING MANAGEMENT PROGRAM

This AMP credits an existing plant procedure (Structure and System Walkdown). Structure and System Walkdown activities provide for discovery and mitigation of plausible aging effects through periodic walkdowns. These periodic walkdowns, performed by responsible personnel, assess the condition of applicable structures, systems and components to identify abnormal or degraded conditions. The walkdown procedure provides guidance for the identification of specific types of plausible degradation.

This AMP provides reasonable assurance that aging of the components in the following structures, systems and commodity groups will be managed during both units' PEOs:

Structures:

Containment Structure
Auxiliary Building

Turbine Building Structure
Intake Structure
Emergency Diesel Generator Building Structures
Miscellaneous Tank and Valve Enclosures

Systems:

AFW
Auxiliary Building Heating and Ventilation
Component Cooling
Compressed Air
Condensate
Condensate Storage
Containment Heating and Ventilation
Control Room HVAC
Demineralized Water
DFO
EDG Building Heating and Ventilation
FP
Liquid Waste
Main Steam
Plant Drains
Plant Healing
Radiation Monitoring
SW
Sampling System
SRW
SFP
RWT
Well and Pretreated Water
SI System

Commodity Groups:

Component Supports
Instrument Lines

This AMP utilizes the PM AMP (Section 16.2.23) to facilitate the various System/Structure Walkdown /inspection activities.

16.2.30 SURVEILLANCE TESTING AGING MANAGEMENT PROGRAM

This AMP credits an existing plant program (Surveillance Testing). Surveillance Testing was established to implement certain surveillance requirements specified in the Technical Specifications. A number of the Surveillance Test Procedures (STPs) are credited for managing the aging of certain SSCs within the scope of License Renewal.

The following SSCs and commodity groups specifically credit the Surveillance Testing AMP for aging management:

Containment (Tendons, Liner Plates)
Component Cooling and SRW Systems
Battery Terminals (Electrical Commodities-Group 1)
Fuse Holders (Electrical Commodities-Group 7)

In addition, the following AMPs utilize the Surveillance Testing AMP to facilitate various inspections, refurbishment, replacements and tests for aging management:

ASME Section XI; Subsections IWE and IWL
Cables
Caulking and Sealants Inspection
Containment Leakage Rate Testing
DFO (Tanks and Chemistry)
Fire Barrier Penetration Seal Inspection
FP
SG

This AMP utilizes the PM AMP (Section 16.2.23) to facilitate various surveillance test activities.