From: <john.hufnagel@exeloncorp.com>
To: <dja1@nrc.gov>, <gvc@nrc.gov>
Date: 12/05/2005 3:12:25 PM
Subject: Final three AMP Basis Documents of Batch 3

Donnie and Greg,

Attached please find the remaining three AMP program basis documents that indicated we would provide by today, 12/5/05. These supplement the six documents sent on Friday 12/2, and complete the transmittal of the nine Batch 3 documents.

The documents attached, in Word format, are: PBD-AMP-B.1.16 (Overhead...Handling Systems), PBD-AMP-B.1.28 (ASME Section XI, Subsection IWF) and PBD-AMP-B.1.21 (Above Ground Tanks).

In addition, the response to AMP Audit question 147 has been updated to reflect the transmittal of the Batch 3 Program Basis Documents, and is attached below.

Please call with any questions.

- John.

<<PBD-AMP-B.1.16 Overhead cranes Rev 0.doc>> <<PBD 1.28 IWF Rev 0.doc>> <<PBD B.1.21 Above ground tanks Rev 0.doc>> <<12-05-05 Update to AMP-147 Q&A.pdf>>

CC: <fred.polaski@exeloncorp.com>

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Subject: Final three AMP Basis Documents of Batch 3
Creation Date: 12/05/2005 3:11:18 PM
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MESSAGE	1692	05 December, 2005 3:11:18 PM
TEXT.htm	2666	
PBD-AMP-B.1.16 Overhead cranes Rev 0.doc	143872	
PBD 1.28 IWF Rev 0.doc	171520	
PBD B.1.21 Above ground tanks Rev 0.doc	145408	
12-05-05 Update to AMP-147 Q&A.pdf	573183	
Mime.822	1422940	

Options
Expiration Date: None
Priority: Standard
Reply Requested: No
Return Notification: None

Concealed Subject: No
Security: Standard

Audit Question No.	Source:	Info Only	Status	Discipline	Date Received
AMP-147	AMP Audit	☐	Open		10/7/2005

NRC Representative:	Took Issue:	Assigned to:	Potential Submittal on Docket	Document Reference
Tran, Linh		Corsi, Lou	☐	All

Topic:

AMP Generic Question

Question

Please provide the basis document of the ten program elements review for the following aging management programs:

B.1.1 ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD
B.1.2 Water Chemistry
B.1.3 Reactor Head Closure Studs
B.1.4 BWR Vessel ID Attachment Welds
B.1.5 BWR Feedwater Nozzle
B.1.6 BWR Control Rod Drive Return Line Nozzle
B.1.7 BWR Stress Corrosion Cracking
B.1.8 BWR Penetrations
B.1.10 Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)
B.1.11 Flow-Accelerated Corrosion
B.1.13 Open-Cycle Cooling Water System
B.1.14 Closed-Cycle Cooling Water System
B.1.15 Boraflex Rack Management Program
B.1.16 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
B.1.17 Compressed Air Monitoring
B.1.18 BWR Reactor Water Cleanup System
B.1.19 Fire Protection
B.1.20 Fire Water System
B.1.21 Aboveground Outdoor Tanks
B.1.22Fuel Oil Chemistry
B.1.24 One-Time Inspection
B.1.25Selective Leaching of Materials
B.1.26 Buried Piping Inspection
B.1.27 ASME Section XI, Subsection IWE
B.1.28 ASME Section XI, Subsection IWF
B.1.29 10 CFR Part 50, Appendix J
B.1.30 Masonry Wall Program
B.1.31 Structures Monitoring Program
B.1.32 RG 1.27, Inspection of Water-Control Structures Associated with Nuclear Power Plants
B.1.33 Protective Coating Monitoring and Maintenance Program
B.1.34 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
B.1.35 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits
B.1.36 Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
B.3.1 Metal Fatigue of Reactor Coolant Pressure Boundary
B.3.2 Environmental Qualification (EQ) Progr

Final Response

This request will be responded to in several steps. That is, batches of aging management program basis documents (PBDs) will be provided over a period of time such that when a set of these PBDs is ready for NRC review, that set will be transmitted. This way, the NRC Audit team can continue their reviews while the Oyster Creek team continues to generate the upgraded PBDs. These transmittals are being made an an ongoing activity as part of the AMP Audit.

11/17/05 Update

The initial (two) PBDs provided to the NRC were the Flow Accelerated Corrosion (FAC) and the Reactor Water Cleanup (RWCU) PBDs. These were e-mailed to NRC Project Manager Donnie Ashley, with a copy to Audit Team lead Greg Cranston, on 11/17/05. They were provided in two formats. PDF versions of the documents were provided, which included copies of the signatures of the preparer, reviewer, program owner (site) and Approver (Project Technical Lead). In addition, as requested by the NRC, Word versions were provided to facilitate the Audit review and report writing process.
- J.G. Hufnagel

11/28/05 Update

Today, 11/28/05, electronic copies (in Word format) of the following approved AMP Basis Documents (PBDs) were provided via e-mail to the NRC Project Manager and NRC AMP/AMR Audit team lead: B.1.02 (Water Chemistry), B.1.22 (Fuel Oil Chemistry), B.1.08 (BWR Penetrations), B.1.19 (Fire Protection), B.1.31 (Structures Monitoring), B.1.01 (ASME Section XI IWB, IWC, IWD), B.1.17 (Compressed Air) and B.1.25 (Selective Leaching). They were sent to NRC in Word format for ease of review and also for ease of docketing the information. Exelon/AmerGen approval signatures on these documents may be reviewed on site (e.g., during the Audits) at the Staff's request.

12/5/05 Update

On Friday, 12/2/05, electronic copies (in Word format) of the following six AMP PBDs were provided to the NRC Project Manager and NRC AMP/AMR Audit team lead: B.1.34 (E-1), B.1.15 (Boraflex), B.1.35 (E-2), B.1.20 (Fire Water System), B.1.24 (One Time Inspections) and B.1.29 (Appendix J). These were six of the nine batch 3 PBDs to be delivered to NRC by 12/5/05.

Today, 12/05/05, electronic copies (in Word format) of the following approved AMP Basis Documents (PBDs) were provided via e-mail to the NRC Project Manager and NRC AMP/AMR Audit team lead: B.1.28 (ASME XI, IWF), B.1.16 (Overhead Cranes), and B.1.21 (Above ground tanks). This completed transmittal of Batch 3 of the AMP PBDs, which were to be transmitted by today. They were sent to NRC in Word format for ease of review and also for ease of docketing the information. Exelon/AmerGen approval signatures on these documents may be reviewed on site (e.g., during the Audits) at the Staff's request.

Followup Actions Required

Scope/Screen Change ☐ LR Drawing Change ☐ Commitment Chang ☐ None ☐

AMR Change ☐ Program Basis Document Chang ☐ Docketed Response ☐

IR#: LRCR #:

Prepared By:	Reviewed By:	Approved By:	NRC Acceptance Date:
Hufnagel, John			
Prepared Date:	**Reviewed Date:**	**Approved Date:**	

NRC Response Report

PROGRAM BASIS DOCUMENT

PBD-AMP-B.1.16

Revision 0

INSPECTION OF OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELING) HANDLING SYSTEMS

GALL PROGRAM XI.M23 - INSPECTION OF OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELING) HANDLING SYSTEMS

Prepared By: _____

Reviewed By: _____

Program Owner Review: _____

Technical Lead Approval: _____

Revision History:

Revision	*Prepared by:*	*Reviewed by:*	*Program Owner:*	*Approved by:*
0	*Joe Ely*	*George Beck*	*Jannette Gonzalez*	*Don Warfel*
Date				

Summary of Revisions:

Rev. Number	Reason for the Revision(s)
0	Initial Issue

TABLE OF CONTENTS

1.0 PURPOSE AND METHODOLOGY

1.1 Purpose

The purpose of this Program Basis Document is to document and evaluate those activities of the Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program that are credited for managing the effects of general corrosion on the crane and trolley structural components, and the effects of wear on the rails in the rail system, as part of Oyster Creek License Renewal to meet the requirements of the License Renewal Rule 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

This includes the following:

- The identification of the scope of the program;
- The evaluation of program elements against NUREG-1801;
- The review of Operating Experience to demonstrate program effectiveness;
- The identification of required program enhancements;
- The identification of Oyster Creek documents required implementing the program.

1.2 Methodology

The nuclear power plant License Renewal Rule 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," describes the License Renewal process and provides requirements for the contents of License Renewal Applications. 10 CFR Part 54.21(a)(3) states:

"For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the Current Licensing Basis (CLB) for the period of extended operation."

The NRC and the industry identified 10 program elements that are useful in describing an aging management program and then demonstrating its effectiveness. These program elements are described in Appendix A.1, Section A.1.2.3 of the Standard Review Plan. NUREG-1801 uses these program elements in Section XI to describe acceptable aging management programs.

This Program Basis Document also provides a comparison of the credited Oyster Creek program with the elements of the corresponding NUREG-1801 Chapter XI program XI.M23. Project Level Instruction PLI-8 "Program Basis Documents" prescribes the methodology for evaluating Aging Management Programs. An evaluation of Oyster Creek's aging management program criteria or activities to those of the NUREG-1801 program elements is performed and a conclusion is reached concerning consistency for each individual program element. A demonstration of overall program effectiveness is made after all program elements are evaluated. Required program enhancements are documented. An overall determination is made as to consistency with the program description in NUREG-1801.

2.0 PROGRAM DESCRIPTION

2.1 Program Description

NUREG-1801:

Most commercial nuclear facilities have between 50 and 100 cranes. Many are industrial grade cranes, which meet the requirements of 29 CFR Volume XVII, Part 1910, and Section 1910.179. Most are not within the scope of 10 CFR Part 54.4, and therefore are not required to be part of the integrated plant assessment (IPA).

Normally, fewer than 10 cranes fall within the scope of 10 CFR Part 54.4.

The program demonstrates that testing and monitoring programs have been implemented and have ensured that the structures, systems, and components of these cranes are capable of sustaining their rated loads. This is their intended function during the period of extended operation. It is noted that many of the systems and components of these cranes perform an intended function with moving parts or with a change in configuration, or subject to replacement based on qualified life. In these instances, these types of crane systems and components are not within the scope of this aging management program (AMP). This program is primarily concerned with structural components that make up the bridge and trolley. NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," provides specific guidance on the control of overhead heavy load cranes.

Oyster Creek:

The Oyster Creek Overhead Heavy Load and Light Load Handling Systems inspection activities are implemented through plant procedures that are based on ASME/ANSI and OSHA requirements. The activities consist of periodic inspections and preventive maintenance that are relied upon to manage loss of material for load bearing passive components of cranes and hoists within the scope of 10 CFR Part 54.4. The activities rely on visual examinations, nondestructive examinations, and functional testing to ensure that cranes and hoists are capable of sustaining their rated loads, thus ensuring their intended function is maintained during the period of extended operation. The visual examination activities are listed in Section 3.4. The functional tests and nondestructive examinations are performed on active components of the crane to ensure proper functionality and are not credited for managing aging of passive components of cranes and hoists.

The program relies on procurement controls and installation practices, defined in plant procedures **(Reference: SM-AA-300, paragraph 4.4.1.3; 2400-GMM-3900.52, paragraph 3.1.3)** to ensure that only approved lubricants and proper torque are applied consistent with NUREG-1801 bolting integrity program.

The current scope of the activities includes cranes and hoists that are required to comply with the Maintenance Rule requirements provided in 10 CFR Part 50.65, Nuclear Regulatory Commission Regulatory Guide (RG) 1.160, and provisions of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." The scope of the activities will be increased to include additional hoists in scope of 10 CFR Part 54.4(a)(2), and require that structural members and rails be inspected for loss of material due to corrosion and wear respectively. The enhancements will be implemented prior to entering the extended period of operation.

2.2 Overall NUREG-1801 Consistency

The Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program is an existing program that is consistent with NUREG-1801 aging management program XI.M23, with enhancement.

2.3 Summary of Exceptions to NUREG-1801

None. The existing Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program is found to be adequate to support the extended period of operation with no exceptions. *The following exception, previously submitted in the License Renewal Application, is no longer an exception based on the reconciliation of this aging management program from draft January 2005 NUREG-1801, Rev. 1 to the approved September 2005 NUREG-1801, Rev. 1:*

Exceptions to NUREG-1801

NUREG-1801 indicates that the number and magnitude of lifts made by the crane are reviewed. The Oyster Creek program does not require tracking of the number and magnitude of lifts. Administrative controls are implemented to ensure that only allowable loads are handled. As discussed in the Crane Load Cycle Limit time-limited aging analysis (TLAA), the projected number of load cycles for 60 years for the reactor building crane is 2800 cycles. The projected number of load cycles for 60 years for the turbine building and heater bay cranes are 2000 and 600 cycles respectively. The reactor building crane, the turbine building and the heater bay cranes were designed for 20,000 to 100,000 load cycles. Thus tracking the number of lifts, or load cycles, is not required because the projected number of crane load cycles for 60 years is significantly lower than the design value.

2.4 Summary of Enhancements to NUREG-1801

The existing Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program is found to be adequate to support the extended period of operation with the following enhancements:

- The program will include visual inspection of structural members for loss of material due to general corrosion.
- The program will include visual inspection of the rails for loss of material due to wear.
- The scope will include additional hoists identified as potential Seismic II/I concerns in accordance with 10 CFR Part 54.4(a)(2).

3.0 EVALUATIONS AND TECHNICAL BASIS

Note

This section is organized by quoting the relevant NUREG-1801 Chapter XI program element (September 2005 version) followed by the related Oyster Creek program attributes and a conclusion of the comparison. Where applicable, the NUREG-1801 program element was separated into logical sub-elements and addressed accordingly.

Implementing procedure references are included in **( )** for information purposes. This information from the source procedure has been either directly extracted from the procedure or summarized for inclusion into this PBD.

3.1 Scope of Program

NUREG-1801:

The program manages the effects of general corrosion on the crane and trolley structural components for those cranes that are within the scope of 10 CFR Part 54.4, and the effects of wear on the rails in the rail system.

Oyster Creek:

The scope of the Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program activities include cranes that are within the scope of 10 CFR Part 54.4. These include the reactor building crane, turbine building crane, turbine building heater bay crane, recirculation pumps monorail, spent fuel pool jib cranes, refueling platform, equipment handling monorail (RB El. 95'), and the torus bay monorail. The program will be enhanced to include the vacuum breaker service jib cranes/hoists, which were identified as potential Seismic II/I concerns in accordance with 10 CFR Part 54.4(a)(2). The activities will require monitoring of structural components that make up the bridge, the trolley, bolting, lifting devices, and the rail system of each crane and hoist **(Reference: see Table 5.1 for procedures)**.

The Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program manages the aging effect of loss of material due to general corrosion on the crane and trolley structural components, and loss of material due to wear on the rails in the rail system, for the systems, components, and environments listed in Table 5.2. The implementing documents for this aging management program are listed in Table 5.1 and are described throughout the individual program element discussions.

Exceptions to NUREG-1801, Element 1:

None.

Enhancements to NUREG-1801, Element 1:

The program will include visual inspection of structural members for loss of material due to general corrosion, and visual inspection of the rails for loss of material due to wear. The scope will include the vacuum breaker service jib cranes/hoists, which were identified as potential Seismic II/I concerns in accordance with 10 CFR Part 54.4(a)(2).

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 1, Scope of Program, with enhancement.

3.2 Preventive Actions

NUREG-1801:

No preventive actions are identified. The crane program is an inspection program.

Oyster Creek:

This program specifies no preventive actions. The program is a condition-monitoring program that utilizes inspections to identify aging effects prior to loss of intended function.

Exceptions to NUREG-1801, Element 2:

None.

Enhancements to NUREG-1801, Element 2:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 2, Preventive Actions.

3.3 Parameters Monitored or Inspected

NUREG-1801:

The program evaluates the effectiveness of the maintenance monitoring program and the effects of past and future usage on the structural reliability of cranes.

Oyster Creek:

The program activities verify structural integrity of crane and hoist elements required to maintain their intended function and comply with ASME/ANSI and OSHA requirements. The activities consist of visual inspections for conditions such as missing items, corroded and loose bolts (loss of preload), cracked or misaligned rail, and cracked welds. The activities will be enhanced to specifically include visual inspection of structural members for loss of material due to general corrosion, and visual inspection of the rails for loss of material due to wear **(Reference: see Table 5.1 for procedures)**.

Exceptions to NUREG-1801, Element 3:

None.

Enhancements to NUREG-1801, Element 3:

The program will include visual inspection of structural members for loss of material due to general corrosion, and visual inspection of the rails for loss of material due to wear.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 3, Parameters Monitored or Inspected, with enhancement.

3.4 Detection of Aging Effects

NUREG-1801:

Crane rails and structural components are visually inspected on a routine basis for degradation.

Oyster Creek:

Station procedures require periodic inspection of cranes and hoists for degradation that could lead to loss of an intended function. Cranes and hoists accessible during normal plant operation are inspected on an annual basis. Cranes and hoists that are accessible only during a refueling outage are inspected every 2 years, consistent with the outage frequency **(PM00583M, PM01145M, PM00170M, PM00167M, PM00174M, PM00199M, PM01166M, PM88203M, PM88808M, PM88809M, PM88810M, PM88811M, PM88812M)**. The program will be enhanced to require visual inspection of the vacuum breaker service jib cranes/hoists on an annual basis **(New PM for Comp ID 888-19, New PM for Comp ID 888-20, New PM for Comp ID 888-21, New PM for Comp ID 888-22, New PM for Comp ID 888-23, New PM for Comp ID 888-24, New PM for Comp ID 888-25, New PM for Comp ID 888-26, New PM for Comp ID 888-27, New PM for Comp ID 888-28)**.

Exceptions to NUREG-1801, Element 4:

None.

Enhancements to NUREG-1801, Element 4:

The program will be enhanced to require visual inspection of the vacuum breaker service jib cranes/hoists on an annual basis **(New PM for Comp ID 888-19, New PM for Comp ID 888-20, New PM for Comp ID 888-21, New PM for Comp ID 888-22, New PM for Comp ID 888-23, New PM for Comp ID 888-24, New PM for Comp ID 888-25, New PM for Comp ID 888-26, New PM for Comp ID 888-27, New PM for Comp ID 888-28).**

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 4, Detection of Aging Effects.

3.5 Monitoring and Trending

NUREG-1801:

Monitoring and trending are not required as part of the crane inspection program.

Oyster Creek:

Monitoring and trending are not specified as part of the Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program.

Exceptions to NUREG-1801, Element 5:

None.

Enhancements to NUREG-1801, Element 5:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 5, Monitoring and Trending.

3.6 Acceptance Criteria

NUREG-1801:

a) *Any significant visual indication of loss of material due to corrosion or wear is evaluated according to applicable industry standards and good industry practice.*

b) The crane may also have been designed to a specific Service Class as defined in the Crane Manufacturers Association of America, Inc. (CMAA) Specification #70 (or later revisions), or CMAA Specification #74 (or later revisions). The specification that was applicable at the time the crane was manufactured is used.

Oyster Creek:

a) Any visual indications of loss of material due to corrosion or wear are evaluated, and resolution proposed, by a qualified crane inspector or structural steel inspector according to applicable industry standards and good industry practice. The activities will be enhanced to specifically include visual inspection of structural members for loss of material due to general corrosion, and visual inspection of the rails for loss of material due to wear **(Reference: see Table 5.1 for procedures)**.

b) Acceptance criteria for the reactor building crane are based on specifications EOCI-61, ASME/ANSI B30.2, and Crane Manufacturers Association of America, Inc. (CMAA) Specification #70 for class D cranes. Acceptance criteria for other cranes and hoists are based on vendor manuals, industry standards, OSHA, and ASME/ANSI B30.2 requirements **(Reference: see Table 5.1 for procedures)**.

Exceptions to NUREG-1801, Element 6:

None.

Enhancements to NUREG-1801, Element 6:

The program will include visual inspection of structural members for loss of material due to general corrosion, and visual inspection of the rails for loss of material due to wear.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 6, Acceptance Criteria.

3.7 Corrective Actions

NUREG-1801:

Site corrective actions program, quality assurance (QA) procedures, site review and approval process, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions, confirmation process, and administrative controls.

Oyster Creek:

Evaluations are performed for test or inspection results that do not satisfy established criteria and an Issue Report (IR) is initiated to document the concern in accordance with the 10 CFR Part 50, Appendix B Corrective Action Program. The corrective action process ensures that conditions adverse to quality are promptly corrected. If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence.

Exceptions to NUREG-1801, Element 7:

None.

Enhancements to NUREG-1801, Element 7:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 7, Corrective Actions.

3.8 Confirmation Process

NUREG-1801:

See Item 7, above.

Oyster Creek:

See Item 3.7, above.

Exceptions to NUREG-1801, Element 8:

None.

Enhancements to NUREG-1801, Element 8:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 8, Confirmation Process.

3.9 Administrative Controls

NUREG-1801:

See Item 7, above.

Oyster Creek:

See Item 3.7, above.

Exceptions to NUREG-1801, Element 9:

None.

Enhancements to NUREG-1801, Element 9

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 9, Administrative Controls.

3.10 Operating Experience

NUREG-1801:

There has been no history of corrosion-related degradation that has impaired cranes. Likewise, because cranes have not been operated beyond their design lifetime, there have been no significant fatigue-related structural failures.

Oyster Creek:

Review of industry operating experience has confirmed no history of corrosion-related degradation that has impaired cranes. A

review of plant operating experience at Oyster Creek also shows no history of corrosion-related degradation that has impaired cranes. In all cases, the existing Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program has identified only event-driven (not age related) conditions, discussed further below, such as a bent support angle and overstressed bolts identified during the recent crane inspection. The experience at Oyster Creek with the Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program shows that the program is effective in managing general corrosion on structural components, and wear on the rails, for the cranes and trolleys.

Operating experience, both internal and external, is used in two ways at Oyster Creek to enhance plant programs, prevent repeat events, and prevent events that have occurred at other plants from occurring at Oyster Creek. The first way in which operating experience is used is through the Oyster Creek Operating Experience process. The Operating Experience process screens, evaluates, and acts on operating experience documents and information to prevent or mitigate the consequences of similar events. The second way is through the process for managing programs. This process requires the review of program related operating experience by the program owner.

Both of these processes review operating experience from both external and internal (also referred to as in-house) sources. External operating experience may include such things as INPO documents (e.g., SOERs, SERs, SENs, etc.), NRC documents (e.g., GLs, LERs, INs, etc.), General Electric documents (e.g., RCSILs, SILs, TILs, etc.), and other documents (e.g., 10 CFR Part 21 Reports, NERs, etc.). Internal operating experience may include such things as event investigations, trending reports, and lessons learned from in-house events as captured in program notebooks, self-assessments, and in the 10 CFR Part 50, Appendix B corrective action process.

Demonstration that the effects of aging are effectively managed is achieved through objective evidence that shows that general corrosion on structural components, and wear on the rails, is being adequately managed for the cranes and trolleys. The following examples of operating experience provides objective evidence that the Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program is

effective in assuring that intended function(s) will be maintained consistent with the CLB for the period of extended operation:

> A review of the site operating and maintenance experience found no history of corrosion-related degradation that adversely impacts the intended function of any crane or hoist. Minor degradations, that are not aged related, such as a bent support angle for the main walkway handrail of the reactor building crane, and overstressed bolts on the same walkway were identified during the recent crane inspection. The angle and the bolts were replaced. Additional examples of event driven conditions and degradation of active components, not related to aging, are documented in Action Requests (A/R) 00347115, 00370648, and 00370911, and Corrective Action Program (CAP) items 02003-0660, 02004-0601, 02004-0586, 02000-1446 and 02004-2877. These examples provide objective evidence that crane degradation will be detected, and adequate corrective actions taken, during crane inspections and prior to the loss of intended function.

The operating experience of the Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program did not show any adverse trend in performance. Problems identified would not cause significant impact to the safe operation of the plants, and adequate corrective actions were taken to prevent recurrence. There is sufficient confidence that the implementation of Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program will effectively detect susceptible locations of general corrosion on the crane and trolley structural components, and wear on the rails in the rail system. Appropriate guidance for reevaluation, repair or replacement is provided for such indications. Periodic self-assessments of the Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program will identify the areas that need improvement to maintain the quality performance of the program.

3.11 Conclusion

The Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program is credited for managing the effects of general corrosion on the crane and trolley structural components, and the effects of wear on the rails in the rail system, for the systems, components, and environments listed in Table 5.2. The Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program's elements have been evaluated against NUREG-1801 in Section 3.0. Program exceptions have been identified in Section 2.3. Program enhancements have been identified in Section 2.4. The implementing documents for this aging management program are listed in Table 5.1. The relevant operating experience has been reviewed and a demonstration of program effectiveness is provided in Section 3.10.

Based on the above, the continued implementation of the Oyster Creek Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program provides reasonable assurance that general corrosion on the crane and trolley structural components, and wear on the rails in the rail system, will be adequately managed so that the intended functions of components within the scope of license renewal will be maintained during the period of extended operation.

4.0 REFERENCES

4.1 Generic to Aging Management Programs

4.1.1 10 CFR Part 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants*

4.1.2 10 CFR Part 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants*

4.1.3 NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,* Revision 1, dated September 2005

4.1.4 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report,* Revision 1, dated September 2005

4.2 Industry Standards

4.2.1 Crane Manufactures Association of America, Inc., CMAA Specification No. 70, *Specifications for Electric Overhead Traveling Cranes*, 1970

4.2.2 Electric Overhead Crane Institute, Inc., EOCI Specification No. 61, *Specifications for Electric Overhead Traveling Cranes*, 1961

4.2.3 NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants*, U.S. Nuclear Regulatory Commission, 1980

4.3 Oyster Creek Program References

4.3.1 MA-AA-716-021 Revision 1, "Rigging and Lifting Program"

4.3.2 MA-AA-716-022 Revision 0, "Control of Heavy Loads Program"

4.3.3 Oyster Creek Procedure #131 Revision 2, "Oyster Creek Load Lift Management Procedure"

4.3.4 2400-SMM-3891.01 Revision 4, "Inspection of Refueling Lifting Fixtures and Rigging Equipment"

4.3.5 2400-SMM-3252.02 Revision 3, "Refueling Platform Mechanical Preventive Maintenance Prior to Refueling Outage"

5.0 TABLES

5.1 Aging Management Program Implementing Documents

Procedure Number	Procedure Title	Commitment No.	Status
SM-AA-300	Procurement Engineering Support Activities	330592.16.01	ACC/ASG
2400-GMM-3900.52	Inspection and Torquing of Bolted Connections	330592.16.02	ACC/ASG
2400-SMM-3252.02	Refueling Platform Mechanical Preventive Maintenance Prior to Refueling Outage	330592.16.03	ACC/ASG
PM00583M	Refueling Platform Mechanical Preventive Maintenance Prior to Refueling Outage	330592.16.04	ACC/ASG
PM01145M	Recirc Pump Monorail Hoist	330592.16.05	ACC/ASG
PM00170M	Turbine 150 Ton/40 Crane	330592.16.06	ACC/ASG
PM00167M	Turbine Building Roof/Heater Bay 25 Ton	330592.16.07	ACC/ASG
PM00174M	RB 95-3 Monorail W/Chain Hoist	330592.16.08	ACC/ASG
PM00967M	RX Fuel Handling Equipment 1/2 Ton Jib Crane	330592.16.10	ACC/ASG
PM01166M	Torus Monorail -Inspection	330592.16.11	ACC/ASG
PM88203M	Reactor Building 105 Ton/10 Ton Crane	330592.16.12	ACC/ASG
New PM for Comp ID 888-19	Jib Crane/Hoist – Service Vacuum Breaker V-26-0014	330592.16.13	ACC/ASG

5.1 Aging Management Program Implementing Documents

Procedure Number	Procedure Title	Commitment No.	Status
New PM for Comp ID 888-20	Jib Crane/Hoist – Service Vacuum Breaker V-26-0012	330592.16.14	ACC/ASG
New PM for Comp ID 888-21	Jib Crane/Hoist – Service Vacuum Breaker V-26-0010	330592.16.15	ACC/ASG
New PM for Comp ID 888-22	Jib Crane/Hoist – Service Vacuum Breaker V-26-0009	330592.16.16	ACC/ASG
New PM for Comp ID 888-23	Jib Crane/Hoist – Service Vacuum Breaker V-26-0008	330592.16.17	ACC/ASG
New PM for Comp ID 888-24	Jib Crane/Hoist – Service Vacuum Breaker V-26-0007	330592.16.18	ACC/ASG
New PM for Comp ID 888-25	Jib Crane/Hoist – Service Vacuum Breaker V-26-0006	330592.16.19	ACC/ASG
New PM for Comp ID 888-26	Jib Crane/Hoist – Service Vacuum Breaker V-26-0005	330592.16.20	ACC/ASG
New PM for Comp ID 888-27	Jib Crane/Hoist – Service Vacuum Breaker V-26-0004	330592.16.21	ACC/ASG
New PM for Comp ID 888-28	Jib Crane/Hoist – Service Vacuum Breaker V-26-0003	330592.16.22	ACC/ASG
PM00199M	RX Fuel Handling Equipment ½ Ton Jib Crane	330592.16.28	ACC/ASG

5.2 Aging Management Review Results

SSC Name	Structure and/or Component	Material	Environment	Aging Effect
Cranes and Hoists	Crane (Bridge; Trolley; Girders)	Carbon and low alloy steel	Outdoor Air	Loss of Material
Cranes and Hoists	Crane (Bridge; Trolley; Girders)	Carbon and low alloy steel	Indoor Air	Loss of Material
Cranes and Hoists	Hoists (Jib Crane Columns, Beams, Plates, Anchorage)	Carbon and low alloy steel	Indoor Air	Loss of Material
Cranes and Hoists	Hoists (Monorail Beams; Lifting Devices, Plates)	Carbon and low alloy steel	Indoor Air	Loss of Material
Cranes and Hoists	Rail System (Rail, Rail Clips, Rail Fasteners)	Carbon and low alloy steel	Outdoor Air	Loss of Material
Cranes and Hoists	Rail System (Rail, Rail Clips, Rail Fasteners)	Carbon and low alloy steel	Indoor Air	Loss of Material
Cranes and Hoists	Rail System (Rail, Rail Clips, Rail Fasteners)	Carbon and low alloy steel	Indoor Air	Loss of Material
Cranes and Hoists	Structural Bolts	Carbon and low alloy steel	Outdoor Air	Loss of Material
Cranes and Hoists	Structural Bolts	Carbon and low alloy steel	Indoor Air	Loss of Material
Cranes and Hoists	Structural Bolts	Carbon and low alloy steel	Outdoor Air	Loss Of Preload
Cranes and Hoists	Structural Bolts	Carbon and low alloy steel	Indoor Air	Loss Of Preload
Fuel Storage and Handling Equipment	Refueling platform	Carbon and low alloy steel	Indoor Air (External)	Loss of Material
Fuel Storage and Handling Equipment	Structural Bolts	Carbon and low alloy steel	Indoor Air	Loss of Material
Fuel Storage and Handling Equipment	Structural Bolts	Carbon and low alloy steel	Indoor Air	Loss Of Preload

6.0 ATTACHMENTS

6.1 LRA Appendix A

6.2 LRA Appendix B

PROGRAM BASIS DOCUMENT

PBD-AMP-B.1.28

Revision 0

ASME SECTION XI, SUBSECTION IWF

GALL PROGRAM XI.S3 - ASME SECTION XI, SUBSECTION IWF

Prepared By: _____

Reviewed By: _____

Program Owner Review: _____

Technical Lead Approval: _____

Revision History:

Revision	*Prepared by:*	*Reviewed by:*	*Program Owner:*	*Approved by:*
0	*Louis J. Corsi*	*Ahmed Ouaou*	*Greg Harttraft*	*Don Warfel*
Date				

Summary of Revisions:

Rev. Number	Reason for the Revision(s)
0	Initial Issue

TABLE OF CONTENTS

1.0 PURPOSE AND METHODOLOGY

1.1 Purpose

The purpose of this Program Basis Document is to document and evaluate those activities of the Oyster Creek ASME Section XI, Subsection IWF aging management program that are credited for managing loss of mechanical function, loss of material and loss of bolting function (which includes loss of material and loss of preload by inspecting for missing, detached, or loosened bolts) as part of Oyster Creek License Renewal to meet the requirements of the License Renewal Rule 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

This includes the following:

- The identification of the scope of the program;
- The evaluation of program elements against NUREG-1801;
- The review of Operating Experience to demonstrate program effectiveness;
- The identification of required program enhancements; and
- The identification of Oyster Creek documents required to implement the program.

1.2 Methodology

The nuclear power plant License Renewal Rule 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," describes the License Renewal process and provides requirements for the contents of License Renewal Applications. 10 CFR 54.21(a)(3) states:

"For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the Current Licensing Basis (CLB) for the period of extended operation."

The NRC and the industry identified 10 program elements that are useful in describing an aging management program and then demonstrating its effectiveness. These program elements are described in Appendix A.1, Section A.1.2.3 of the Standard Review Plan. NUREG-1801 uses these program elements in Section XI to describe acceptable aging management programs.

This Program Basis Document also provides a comparison of the credited Oyster Creek program with the elements of the corresponding NUREG-1801 Chapter XI program XI.S3 ASME Section XI, Subsection IWF. Project Level Instruction PLI-8 "Program Basis Documents" prescribes the methodology for evaluating Aging Management Programs. An evaluation of Oyster Creek's aging management program criteria or activities to those of the NUREG-1801 program elements is performed and a conclusion is reached concerning consistency for each individual program element. A demonstration of overall program effectiveness is made after all program elements are evaluated. Required program enhancements are documented. An overall determination is made as to consistency with the program description in NUREG-1801.

2.0 PROGRAM DESCRIPTION

2.1 Program Description

NUREG-1801:

a) 10 CFR 50.55a imposes the inservice inspection (ISI) requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, for Class 1, 2, 3, and MC piping and components and their associated supports. Inservice inspection of supports for ASME piping and components is addressed in Section XI, Subsection IWF. This evaluation covers the 2001 edition[1] including the 2002 and 2003 Addenda, as approved in 10 CFR 50.55a. ASME Code Section XI, Subsection IWF constitutes an existing mandated program applicable to managing aging of ASME Class 1, 2, 3, and MC supports for license renewal.

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1 An applicant may rely on a different version of the ASME Code, but should justify such use. An applicant may wish to refer to the SOC for an update of 10 CFR § 50.55a to justify use of a more recent edition of the Code.

b) The IWF scope of inspection for supports is based on sampling of the total support population. The sample size varies depending on the ASME Class.

1. *The largest sample size is specified for the most critical supports (ASME Class 1). The sample size decreases for the less critical supports (ASME Class 2 and 3).*

2. *Discovery of support deficiencies during regularly scheduled inspections triggers an increase of the inspection scope, in order to ensure that the full extent of deficiencies is identified. The primary inspection method employed is visual examination.*

3. *Degradation that potentially compromises support function or load capacity is identified for evaluation.*

4. *IWF specifies acceptance criteria and corrective actions. Supports requiring corrective actions are re-examined during the next inspection period.*

Oyster Creek:

a) The ASME Section XI, Subsection IWF aging management program (AMP) is part of the overall Inservice Inspection (ISI) program for the Oyster Creek stations developed to satisfy the requirements of 10CFR50.55a. This AMP provides for visual examination of ASME Class 1,2, & 3 Class MC component supports. The overall ISI program was developed in accordance with ASME Section XI, 1995 Edition with 1996 Addenda. **(Reference: ER-AA-330-003, paragraph 1, ER-AA-330 Attachment 1)**

The ASME Section XI, Subsection IWF program is implemented through procedures. Instructions are provided for visual examination of Class 1, 2, 3 and MC supports in accordance with the requirements of ASME Section XI, Subsection IWF.

b) The OC ISI program plan is based on sampling of the total support population. The size varies depending on the ASME Class. Implementing Procedures provide the administrative controls for the conduct of activities that are necessary to fulfill the requirements of the American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, Section XI, as mandated by Title 10, Code of Federal Regulations, Part 50 (10CFR50), Article 55a, "Code and Standards" for the ISI of systems and components that are classified as ASME Code Class 1, 2, 3 and MC **(Reference: ER-AA-330, ER-AA-330-003, OC-1)**.

1. The sample size is specified in OC ISI Program Plan and agrees with the requirements of decreasing sample size for the less critical supports. **(Reference: OC-1 Section 5 Tables)**

2. Discovery of support deficiencies during regularly scheduled inspections initiates an increase of the inspection scope. When the acceptance criteria are exceeded then additional and successive exams will be conducted. **(Reference: ER-AA-330-003 paragraph 4.8)** The primary inspection method is the performance of visual examinations, VT-3 for Inservice Inspection (ISI) or Repair/Replacement of component supports. **(Reference: ER-AA-335-016, paragraph 1)**

3. Examination for degradation (to determine the general mechanical and structural condition of component supports such as the presence of loose parts, debris, or abnormal corrosion products, wear, erosion, corrosion, and the loss of integrity at bolted or welded connections) that potentially compromises support function or load capacity is identified through a VT-3 visual examination. Degradation is then documented for evaluation on the VT-3 Examination Report for Component Supports/Attachments. **(Reference: ER-AA-335-016 paragraphs 4.2.4 and 4.11)**

4. Implementing procedure specifies the acceptance criteria and necessary corrective actions. When the acceptance criteria are exceeded then additional and successive exams will be conducted. **(Reference: ER-AA-330-003 paragraph 4.8)**

Program enhancement is required to include the inspections of additional Class 2, 3 and MC supports and underwater MC supports by visual examination for loss of material due to corrosion and loss of mechanical function.

2.2 Overall NUREG-1801 Consistency

The Oyster Creek ASME Section XI, Subsection IWF is an existing program that is consistent with NUREG-1801 aging management program XI.S3 ASME Section XI, Subsection IWF with exceptions and enhancements as described in 2.3 and 2.4 below.

2.3 Summary of Exceptions to NUREG-1801

NUREG-1801 evaluation covers the 2001 edition including the 2002 and 2003 Addenda, as approved in 10 CFR 50.55a. The current Oyster Creek ISI Program Plan for the fourth ten-year inspection interval effective from October 15, 2002 through October 14, 2012, approved per 10CFR50.55a, is based on the 1995 ASME Section XI B&PV Code, including 1996 addenda. The next 120-month inspection interval for Oyster Creek will incorporate the requirements specified in the version of the ASME Code incorporated into 10 CFR 50.55a twelve months before the start of the inspection interval.

2.4 Summary of Enhancements to NUREG-1801

Enhancement activities, which are in addition to the existing Oyster Creek ASME Section XI, Subsection IWF program, consist of including additional MC supports inside the Torus, Torus Support – Base Plate and Saddle, Inner Support Column & Outer Support Column) and inspection of underwater MC supports for loss of material due to corrosion and loss of mechanical function (Torus Internal – Downcomer Brace Support (underwater), Vent Header Ring Header Support (above water), Vent System Inner Support Column (above and below water) and Vent System Outer Support Column (above and below water)).

Enhancements will be implemented prior to entering the period of extended operation.

3.0 EVALUATIONS AND TECHNICAL BASIS

Note

This section is organized by quoting the relevant NUREG-1801 Chapter XI program element (September 2005 version) followed by the related Oyster Creek program attributes and a conclusion of the comparison. Where applicable, the NUREG-1801 program element was separated into logical sub-elements and addressed accordingly.

Implementing procedure references are included in () for information purposes. This information from the source procedure has been either directly extracted from the procedure or summarized for inclusion into this PBD.

3.1 Scope of Program

NUREG-1801:

a) *For Class 1 piping and component supports, Subsection IWF (1989 edition) refers to Subsection IWB for the inspection scope and schedule. According to Table IWB-2500-1, only 25% of nonexempt supports are subject to examination. Supports exempt from examination are the supports for piping systems that are exempt from examination, according to pipe diameter or service. The same supports are inspected in each 10-year inspection interval.*

b) *For Class 2, 3, and MC piping and component supports, Subsection IWF (1989 edition) refers to Subsections IWC, IWD, and IWE for the inspection scope and schedule. According to Table IWC-2500-1, 7.5% of nonexempt supports are subject to examination for Class 2 systems. The same supports are inspected in each 10-year inspection interval.*

c) *No specific numerical percentages are identified in Subsections IWD and IWE for Class 3 and Class MC, respectively.*

Starting with the 1990 addenda, the scope of Subsection IWF was revised. The required percentages of each type of nonexempt support subject to examination were incorporated into Table IWF-2500-1. The revised percentages are 25% of Class 1 nonexempt piping supports, 15% of Class 2 nonexempt piping supports, 10% of Class 3 nonexempt piping supports, and 100% of supports other than piping supports (Class 1, 2, 3, and MC). For pipe supports, the total sample consists of supports from each system (such as main steam, feedwater, residual heat removal), where the individual sample sizes are proportional to the total number of nonexempt supports of each type and function within each system. For multiple components other than piping, within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined. To the extent practical, the same supports selected for examination during the first inspection interval are examined during each successive inspection interval.

Oyster Creek:

a) The OC ISI program plan details the requirements for the examination and inspection of component supports specified in ASME Section XI Subsections IWF at Oyster Creek Generating Station based on the requirements of the 1995 ASME Section XI B&PV Code, including 1996 addenda and approved per 10CFR50.55a. Class 1 component examinations are identified in Table 5.2-1 of the OC ISI program plan and include a visual examination of at least 25% of the class 1 piping supports by the end of the 10 year interval. **(Reference: OC-1, Section 3, Subsection 5.0)** The complete inspection scope shall be repeated during each successive inspection interval, to the extent practical. **(Reference OC-1, Section 3, paragraph 2.3.1)**

b) The OC ISI program plan details the requirements for the examination and inspection of Class 2, 3, and MC piping and component supports, Subsection IWF at Oyster Creek Generating Station based on the requirements of the 1995 ASME Section XI B&PV Code, including 1996 addenda and approved per 10CFR50.55a. According to Table 5.2-3, 15% of Class 2 nonexempt supports are subject to visual examination by the end of the 10 year interval. **(Reference: OC-1 Section 3 Subsection 5.0)** The complete inspection scope shall be repeated during each successive inspection interval, to the extent practical. **(Reference OC-1, Section 3, paragraph 2.3.1)**

c) Starting with the 1990 addenda, the scope of Subsection IWF was revised. The Oyster Creek ISI program plan requires inspection of 10% of Class 3 nonexempt piping supports, and 100% of supports other than piping supports (Class 1, 2, 3, and MC). For pipe supports, the total sample consists of supports from each system (such as Main Steam, Feedwater, Isolation Condenser, Liquid Poison, etc.), where the individual sample sizes are proportional to the total number of nonexempt supports of each type and function within each system. For multiple components other than piping, within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined. **(Reference: OC-1 Section 3 Sub-Section 5.0)**

The Oyster Creek ASME Section XI Inservice Inspection, Subsection IWF aging management program manages the aging effect of loss of material and loss of mechanical function for component supports listed in Table 5.2. The implementing documents for this aging management program are listed in Table 5.1 and are described throughout the individual program element discussions. The commitment numbers under which these implementing documents are being revised are contained within the listings in Table 5.1.

Exceptions to NUREG-1801, Element 1:

None.

Enhancements to NUREG-1801, Element 1:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 1, Scope of Program.

3.2 Preventive Actions

NUREG-1801:

No preventive actions are specified; Subsection IWF is an inspection program.

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Oyster Creek:

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The component support portion of the ISI program consists of condition monitoring activities that detect degradation of components before loss of intended function. No preventive attributes are associated with these activities.

Exceptions to NUREG-1801, Element 2:

None.

Enhancements to NUREG-1801, Element 2:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 2, Preventive Actions.

3.3 Parameters Monitored or Inspected

NUREG-1801:

IWF specifies visual examination (VT-3) of supports. The parameters monitored or inspected include corrosion; deformation; misalignment; improper clearances; improper spring settings; damage to close tolerance machined or sliding surfaces; and missing, detached, or loosened support items. The visual inspection would be expected to identify relatively large cracks.

Table IWF-2500-1 (1989 edition) specifies examination of the following:

(F1.10) Mechanical connections to pressure-retaining components and building structure;

(F1.20) Weld connections to building structure;

(F1.30) Weld and mechanical connections at intermediate joints in multi-connected integral and nonintegral supports;

(F1.40) Clearances of guides and stops, alignment of supports, and assembly of support items;

(F1.50) Spring supports and constant load supports;

(F1.60) Sliding surfaces;

(F1.70) Hot or cold position of spring supports and constant load supports.

(Starting with the 1990 addenda, these items are listed in paragraph IWF-2500.).

Oyster Creek:

Identification of the specific components scheduled for examination is contained in the Oyster Creek's fourth ten-year schedule, a separate document from the ISI program plan. The parameters monitored or inspected include corrosion; deformation; misalignment; improper clearances; improper spring settings; damage to close tolerance machined or sliding surfaces; and missing, detached, or loosened support items. The visual inspection is expected to identify relatively large cracks. The Oyster Creek Generating Station ISI program plan provides the Inservice Inspection Summary Table, which includes the examination categories and descriptions as identified in ASME Section XI, Tables IWF-2500-1. **(Reference: OC-1 Section 1 Table 7.0 AND ER-AA-335-016 paragraph 4.10)**

Exceptions to NUREG-1801, Element 3:

None.

Enhancements to NUREG-1801, Element 3:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 3, Parameters Monitored or Inspected.

3.4 Detection of Aging Effects

NUREG-1801:

a) *VT-3 visual examination is specified in Table IWF-2500-1. The complete inspection scope is repeated every 10-year inspection interval.*

b) *The qualified VT-3 inspector uses judgment in assessing general corrosion; observed degradation is documented if loss of structural capacity is suspected.*

Oyster Creek:

a) The Oyster Creek Component Support ISI program plan provide for the examination and documentation of components and piping supports in accordance with Table IWF-2500-1. The component supports are periodically inspected by visual VT-3 examination, from a representative sampling. **(Reference: OC-1 paragraph 1.0 Section 3 and ER-AA-335-016 paragraph 4.10.2)** The complete inspection scope shall be repeated during each successive inspection interval, to the extent practical. **(Reference OC-1, Section 3, paragraph 2.3.1)**

b) Personnel performing VT-3 Examinations shall be a minimum Level II qualified and certified in accordance with corporate procedure for Qualification and Certification of Nondestructive (NDE) Personnel or in accordance with an approved vendor qualification and certification procedure. **(Reference: ER-AA-335-016 paragraph 3.3.1)** Observed degradation is documented by the qualified inspector on the "VT-3 Examination Report for Component Supports/Attachments", if loss of structural capacity is suspected. **(Reference: ER-AA-335-016 paragraph 4.9.1 and Attachment 1)**

Exceptions to NUREG-1801, Element 4:

None.

Enhancements to NUREG-1801, Element 4:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 4, Detection of Aging Effects.

3.5 Monitoring and Trending

NUREG-1801:

a) There is no requirement to monitor or report progressive, time-dependent degradation.

b) Unacceptable conditions, according to IWF-3400, are noted for correction or further evaluation.

Oyster Creek:

a) OC has no requirement to monitor or report progressive, time-dependent degradation.

b) In accordance with IWF-3400, if a recordable indication for a support exceeds acceptance standards it shall be considered a rejectable indication and shall be rectified through corrective actions and reexamined during the next inspection period. When the reexamination of the support does not result in additional corrective measures, examination of the component support may revert back to the original examination schedule. **(Reference: ER-AA-335-016, paragraph 4.12 and ER-AA-330-003 paragraph 4.8.1.3)**

Exceptions to NUREG-1801, Element 5:

None.

Enhancements to NUREG-1801, Element 5:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 5, Monitoring and Trending.

3.6 Acceptance Criteria

NUREG-1801:

The acceptance standards for visual examination are specified in IWF-3400. In IWF-3410(b)(5), "roughness or general corrosion which does not reduce the load bearing capacity of the support" is given as an example of a "non-relevant condition," which requires no further action. IWF-3410(a) identifies the following conditions as unacceptable:

a) deformations or structural degradations of fasteners, springs, clamps, or other support items;

b) missing, detached, or loosened support items;

c) arc strikes, weld spatter, paint, scoring, roughness, or general corrosion on close tolerance machined or sliding surfaces;

d) improper hot or cold positions of spring supports and constant load supports;

e) misalignment of supports;

f) improper clearances of guides and stops.

Identification of unacceptable conditions triggers an expansion of the inspection scope, in accordance with IWF-2430, and reexamination of the supports requiring corrective actions during the next inspection period, in accordance with IWF-2420(b)

Oyster Creek:

The component support conditions, which are unacceptable for continued service are provided in implementing procedures and replicate those delineated in IWF-3410 (a) and listed below:

a) deformations or structural degradations of fasteners, springs, clamps, or other support items;

b) missing, detached, or loosened support items;

c) arc strikes, weld spatter, paint, scoring, roughness, or general corrosion on close tolerance machined or sliding surfaces;

d) improper hot or cold positions (snubbers and spring supports);

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e) misalignment of supports;

f) improper clearance of guides and stops.

The ISI program provides for initiation of a Condition Report if a recordable indication exceeds the acceptance standards. **(Reference:** ER-AA-335-016 paragraph 4.10 and **ER-AA-330-003 Attachment 1 Item 3.9.1)**

The ISI program procedures mandate that any recordable indications identified during examination be resolved either by repair, replacement, adjustment, or evaluation prior to declaring the component support acceptable for continued service. **(Reference: ER-AA-330-003 paragraph 4.8.1)**

When component supports must be subjected to corrective measures, the supports immediately adjacent to those for which corrective measures are required shall be examined. Also, the examination scope shall be extended to include additional component supports within the system, equal in number and of the same type as those scheduled for examination during the current inspection period. **(Reference: ER-AA-330-003 paragraph 4.8.1)**

Identification of unacceptable conditions triggers an expansion of the inspection scope, consistent with IWF-2430, and reexamination of the supports requiring corrective actions during the next inspection period, consistent with IWF-2420(b). **(Reference: ER-AA-330-003, paragraph 4.8.1)**

Exceptions to NUREG-1801, Element 6:

None.

Enhancements to NUREG-1801, Element 6:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 6, Acceptance Criteria.

3.7 Corrective Actions

NUREG-1801:

a) *In accordance with IWF-3122, supports containing unacceptable conditions are evaluated or tested, or corrected before returning to service. Corrective actions are delineated in IWF-3122.2. IWF-3122.3 provides an alternative for evaluation or testing, to substantiate structural integrity and/or functionality.*

b) *As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions.*

Oyster Creek:

a) OC has provided guidance for corrective action (evaluation, test, correct) of any recordable indication that exceeds acceptance standards before returning to service. Corrective actions are made by adjustment and reexamination or repair or replacement consistent with the guidelines of IWF-3122. Evaluation and/or test are used to substantiate the component support integrity before for its intended service. The evaluation is documented consistent with the requirements of IWA-6000. **(Reference: ER-AA-330-003 paragraph 4.8).**

b) Evaluations are performed for test or inspection results that do not satisfy established criteria and a condition report is initiated to document the concern in accordance with the 10CFR Part 50, Appendix B Corrective Action Program. The corrective action program ensures that the conditions adverse to quality are promptly corrected. If the deficiency is assessed to be significantly adverse to quality, the cause of the problem is determined and an action plan is developed to preclude repetition. **(Reference: ER-AA-330-003, paragraph 4.8.1)**

Exceptions to NUREG-1801, Element 7:

None.

Enhancements to NUREG-1801, Element 7:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 7, Corrective Actions.

3.8 Confirmation Process

NUREG-1801:

As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process.

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Oyster Creek:

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Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B.

Exceptions to NUREG-1801, Element 8:

None.

Enhancements to NUREG-1801, Element 8:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 8, Confirmation Process.

3.9 Administrative Controls

NUREG-1801:

As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the administrative controls.

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Oyster Creek:

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See Item 8, above.

Exceptions to NUREG-1801, Element 9:

None.

Enhancements to NUREG-1801, Element 9

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 9, Administrative Controls.

3.10 Operating Experience

NUREG-1801:

To date, IWF sampling inspections have been effective in managing aging effects for ASME Class 1, 2, 3, and MC supports. There is reasonable assurance that the Subsection IWF inspection program will be effective through the period of extended operation.

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Oyster Creek:

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The OC ISI program invokes the requirements of the ASME Section XI Code. Because the ASME Code is a consensus document that has been widely used over a long period, it has been shown to be generally effective in managing aging effects in Class 1, 2, and 3 components and their integral attachments in light-water cooled power plants. The Operating Experience (OE) of the ISI program did not show any adverse trend of its performance. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence. There is sufficient confidence that the Component Support ISI program as described in the Oyster Creek ISI program plan will effectively monitor the condition of the component supports within LR boundaries that are subject to an indoor air, containment atmosphere or treated water environment, so that their design function will be maintained during the extended license period. Appropriate guidance for reevaluation, repair or replacement is provided for any indication of degradation detected by the OC ISI program. Periodic self-assessments of the ISI program are performed to identify the areas that need improvement to maintain the quality performance of the program.

Operating experience, both internal and external, is used in two ways at Oyster Creek to enhance plant programs, prevent repeat events, and prevent events that have occurred at other plants from occurring at Oyster Creek. The first way in which operating experience is used is through the Oyster Creek Operating Experience process. The Operating Experience process screens, evaluates, and acts on operating experience documents and information to prevent or mitigate the consequences of similar events. The second way is through the process for managing programs. This process requires the review of program related operating experience by the program owner.

Both of these processes review operating experience from both external and internal (also referred to as in-house) sources. External operating experience may include such things as INPO documents (e.g., SOERs, SERs, SENs, etc.), NRC documents (e.g., GLs, LERs, INs, etc.), General Electric documents (e.g., RCSILs, SILs, TILs, etc.), and other documents (e.g., 10CFR Part 21 Reports, NERs, etc.). Internal operating experience may include such things as event investigations, trending reports, and lessons learned from in-house events as captured in program notebooks, self-assessments, and in the 10 CFR Part 50, Appendix B corrective action process.

Demonstration that the effects of aging are effectively managed is achieved through objective evidence that shows that managing loss of material and loss of mechanical function is being adequately managed in component supports. The following examples of operating experience provide objective evidence that the ISI program is effective in assuring that intended functions will be maintained consistent with the CLB for the period of extended operation:

An example of a recent inspection, which detected degradation and the corrective actions taken, is as follows:

Challenges were identified in the submitted to the NRC on 2/16/2005 of the NIS-1 Owner's Data Report for Inservice Inspections for the first period of the Fourth Inservice Inspection interval. This report covered examinations conducted between October 28, 2002 and November 22, 2004. The report for examinations was performed in accordance with the ASME Code.

From the initial sample size of 40 rod hangers, 2.5% were found to be unacceptable. Scope expansion was required due to unacceptable as-found conditions on rod hangers. The systems involved were: Isolation Condenser, Core Spray System, Standby Liquid Control Shutdown Cooling, Reactor Water Clean Up, Reactor Recirc, Control Rod Drive, Containment Spray, Feedwater and Reactor Building Closed Cooling Water System piping supports, ASME Code Class 1 & 2. Rod hangers were the initial problems. The second scope expansion of rod hangers found zero failures. No Items were returned to service based solely on evaluation. All were restored/reworked to their intended design configuration.

Another challenge that was corrected was a loss of preload (without loss of mechanical function) for 3 spring cans. The load settings were found outside the tolerance. **(Reference CAP's 02004-3311 and -3341 along with A2078197)** The spring cans with the load settings out of spec did not affect the sample expansion. A "root cause" failure evaluation was documented in AR A2078197 Eval 23. Reinspections have been scheduled as part of ISI program for the next outage.

A focused-area self-assessment at Oyster Creek indicated that Code Cases and Relief Requests were not easily found in the program documents and the listings were incomplete. The ISI Program plan was updated to include a summary of all Relief Requests in effect in Section 4 of the ISI plan and to include a listing of all Code Cases invoked in the plan. This example provides objective evidence that program deficiencies are identified and entered into the corrective action process and that the program is updated as necessary to ensure that it remains effective for condition monitoring of piping and components within the scope of license renewal. (CAP O2004-1736)

A focused-area self-assessment at Oyster Creek indicated that although a Relief Request for examination of a reactor pressure vessel support skirt weld had been granted, no provision to augment the ASME Code-required surface examination with a volumetric (UT) examination of the restricted area was addressed. A new exam record was added to the ISI database to reflect the required UT examination. This example provides objective evidence that program deficiencies are identified and entered into the corrective action process and that the program is updated as necessary to ensure that it remains effective for condition monitoring of piping and components within the scope of license renewal. (CAP O2004-1736)

The results of the program evaluation indicate that the Oyster Creek ISI program did not show any adverse trend in performance. Problems identified would not cause significant impact to the safe operation of the plant, and corrective actions have been taken when acceptance criteria have not been met. In addition, periodic self-assessments are performed to identify the areas that need improvement to maintain the quality performance of the program. Therefore, it is concluded that the Oyster Creek ASME Section XI, Subsection IWF program is effective in managing the effects of aging.

3.11 Conclusion

The Oyster Creek ASME Section XI, Subsection IWF aging management program is credited for managing loss of material due to due to general, pitting and crevice corrosion and loss of mechanical function due to corrosion, distortion, dirt, overload, etc. for the systems, components, and environments listed in Table 5.2. The Oyster Creek ASME Section XI, Subsection IWF program's elements have been evaluated against NUREG-1801 in Section 3.0. Program exceptions have been identified in Section 2.3. Program enhancements have been identified in Section 2.4. The implementing documents and commitment numbers for this aging management program are listed in Table 5.1. The relevant operating experience has been reviewed and a demonstration of program effectiveness is provided in Section 3.10.

Based on the above, the continued implementation of the Oyster Creek ASME Section XI, Subsection IWF aging management program provides reasonable assurance that loss of material due to due to general, pitting and crevice corrosion and loss of mechanical function due to corrosion, distortion, dirt, overload, etc. will be adequately managed so that the intended functions of components within the scope of license renewal will be maintained during the period of extended operation

4.0 REFERENCES

4.1 Generic to Aging Management Programs

4.1.1 10 CFR 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants*

4.1.2 10 CFR 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants*

4.1.3 NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, Revision 1, dated September 2005*

4.1.4 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 1 dated September 2005

4.2 Industry Standards

4.2.1 ASME Section XI, Subsection IWF, 1995 Edition with 1996 Addenda.

4.3 Oyster Creek Program References

4.3.1 CAP No. 02004-3341

4.3.2 CAP No. 02004-3311

4.3.3 NRC Information Request Forms AMP-084, -085, -086, -087 and –142.

4.3.4 Focused Area Self-Assessment (FASA) Report on Oyster Creek ISI Program April 26-29, 2004

4.3.5 Ltr. To NRC dated 2/16/2005 Oyster Creek Generating Station Refueling Outage 20 (1R20) Inservice Inspection (ISI) Summary Report

5.0 TABLES

Aging Management Program Implementing Documents

Procedure Number	Procedure Title	Commitment No.	Status
2400-GMM-3900.52	Inspection and Torquing of Bolted Connections	330592.12.05	ACC/ASG
ER-AA-330	Conduct of Inservice Inspection Activities	330592.28.01	ACC/ASG
ER-AA-330-003	Inservice Inspection of Section XI Component Supports	330592.28.02	ACC/ASG
ER-AA-335-016	VT-3 Visual Examination of Component Supports and Attachments	330592.28.03	ACC/ASG
OC-1	Oyster Creek ASME Section XI Program Plan Fourth Ten-Year Inspection Interval	330592.28.04	ACC/ASG

5.1 Aging Management Review Results

SSC Name	Structure and/or Component	Material	Environment	Aging Effect
Component Supports Commodity Group	Supports for ASME Class 1 Piping and Components (constant and variable load spring hangers, guides, stops, sliding surfaces, design clearances)	Carbon and low alloy steel	Containment Atmosphere	Loss of Mechanical Function
Component Supports Commodity Group	Supports for ASME Class 1 Piping and Components (constant and variable load spring hangers, guides, stops, sliding surfaces, design clearances)	Carbon and low alloy steel	Indoor Air	Loss of Mechanical Function
Component Supports Commodity Group	Supports for ASME Class 1 Piping and Components (support members, welds, bolted connections, support anchorage to building structure)	Carbon and low alloy steel	Containment Atmosphere	Loss of Material
Component Supports Commodity Group	Supports for ASME Class 1 Piping and Components (support members, welds, bolted connections, support anchorage to building structure)	Carbon and low alloy steel	Indoor Air	Loss of Material
Component Supports Commodity Group	Supports for ASME Class 2 and 3 Piping and Components (constant and variable load spring hangers, guides, stops, sliding surfaces, design clearances)	Carbon and low alloy steel	Containment Atmosphere	Loss of Mechanical Function
Component Supports Commodity Group	Supports for ASME Class 2 and 3 Piping and Components (constant and variable load spring hangers, guides, stops, sliding surfaces, design clearances)	Carbon and low alloy steel	Indoor Air	Loss of Mechanical Function
Component Supports Commodity Group	Supports for ASME Class 2 and 3 Piping and Components (support members, welds, bolted connections, support anchorage to building structure)	Carbon and low alloy steel	Containment Atmosphere	Loss of Material
Component Supports Commodity Group	Supports for ASME Class 2 and 3 Piping and Components (support members, welds, bolted connections, support anchorage to building structure)	Carbon and low alloy steel	Indoor Air	Loss of Material

SSC Name	Structure and/or Component	Material	Environment	Aging Effect
Component Supports Commodity Group	Supports for ASME Class 2 and 3 Piping and Components (support members, welds, bolted connections, support anchorage to building structure)	Carbon and low alloy steel	Outdoor Air	Loss of Material
Component Supports Commodity Group	Supports for ASME Class 2 and 3 Piping and Components (support members, welds, bolted connections, support anchorage to building structure)	Carbon and low alloy steel	Treated Water < 140F	Loss of Material
Component Supports Commodity Group	Supports for ASME Class 2 and 3 Piping and Components (support members, welds, bolted connections, support anchorage to building structure)	Stainless Steel	Treated Water < 140F	Loss of Material
Component Supports Commodity Group	Supports for ASME Class MC Components (guides, stops, sliding surfaces, design clearances)	Carbon and low alloy steel	Indoor Air	Loss of Material
Component Supports Commodity Group	Supports for ASME Class MC Components (guides, stops, sliding surfaces, design clearances)	Lubrite	Indoor Air	Loss of Mechanical Function
Component Supports Commodity Group	Supports for ASME Class MC Components (support members, welds, bolted connections, support anchorage to building structure)	Carbon and low alloy steel	Containment Atmosphere	Loss of Material
Component Supports Commodity Group	Supports for ASME Class MC Components (support members, welds, bolted connections, support anchorage to building structure)	Carbon and low alloy steel	Indoor Air	Loss of Material
Component Supports Commodity Group	Supports for ASME Class MC Components (support members, welds, bolted connections, support anchorage to building structure)	Carbon and low alloy steel	Treated Water <140F	Loss of Material
Component Supports Commodity Group	Supports for ASME Class MC Components (support members, welds, bolted connections, support anchorage to building structure)	Stainless Steel	Treated Water < 140F	Loss of Material

6.0 ATTACHMENTS

6.1 LRA Appendix A

6.2 LRA Appendix B

PROGRAM BASIS DOCUMENT

PBD-AMP-B.1.21

Revision 0

ABOVEGROUND OUTDOOR TANKS

GALL PROGRAM XI.M29 - ABOVEGROUND STEEL TANKS

Prepared By: _____

Reviewed By: _____

Program Owner Review: _____

Technical Lead Approval: _____

Revision History:

Revision	*Prepared by:*	*Reviewed by:*	*Program Owner:*	*Approved by:*
0	*Charles Micklo*	*Shannon Rafferty*	*Dave Olszewski*	*Fred Polaski*
Date				

Summary of Revisions:

Rev. Number	Reason for the Revision(s)
0	Initial Issue

TABLE OF CONTENTS

1.0 PURPOSE AND METHODOLOGY

1.1 Purpose

The purpose of this Program Basis Document is to document and evaluate those activities of the Oyster Creek Aboveground Outdoor Tanks aging management program that are credited for managing the loss of material due to corrosion as part of Oyster Creek License Renewal to meet the requirements of the License Renewal Rule 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

This includes the following:

- The identification of the scope of the program;
- The evaluation of program elements against NUREG-1801;
- The review of Operating Experience to demonstrate program effectiveness;
- The identification of required program enhancements; and
- The identification of Oyster Creek documents required to implement the program.

1.2 Methodology

The nuclear power plant License Renewal Rule 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," describes the License Renewal process and provides requirements for the contents of License Renewal Applications. 10 CFR 54.21(a)(3) states:

"For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the Current Licensing Basis (CLB) for the period of extended operation."

The NRC and the industry identified 10 program elements that are useful in describing an aging management program and then demonstrating its effectiveness. These program elements are described in Appendix A.1, Section A.1.2.3 of the Standard Review Plan. NUREG-1801 uses these program elements in Section XI to describe acceptable aging management programs.

This Program Basis Document provides a comparison of the credited Oyster Creek program with the elements of the corresponding NUREG-1801 Chapter XI program XI.M29, Aboveground Steel Tanks. Project Level Instruction PLI-8 "Program Basis Documents" prescribes the methodology for evaluating Aging Management Programs. An evaluation of Oyster Creek's aging management program criteria or activities to those of the NUREG-1801 program elements is performed and a conclusion is reached concerning consistency for each individual program element. A demonstration of overall program effectiveness is made after all program elements are evaluated. Required program enhancements are documented. An overall determination is made as to consistency with the program description in NUREG-1801.

2.0 PROGRAM DESCRIPTION

2.1 Program Description

NUREG-1801:

a) *The program includes preventive measures to mitigate corrosion by protecting the external surface of steel tanks with paint or coatings in accordance with standard industry practice. The program also relies on periodic system walkdowns to monitor degradation of the protective paint or coating.*

b) *However, for storage tanks supported on earthen or concrete foundations, corrosion may occur at inaccessible locations, such as the tank bottom. Accordingly, verification of the effectiveness of the program is to be performed to ensure that significant degradation in inaccessible locations is not occurring and the component intended function will be maintained during the extended period of operation. For reasons set forth below, an acceptable verification program consists of thickness measurement of the tank bottom surface.*

Oyster Creek:

a) The Aboveground Outdoor Tanks aging management program is a new program that will provide for management of loss of material aging effects for aboveground outdoor carbon steel and aluminum storage tanks. Program activities provide for the use of paint as a corrosion preventive measure, in accordance with standard industry practice; and for periodic visual inspections to monitor degradation of the paint or sealants and any resulting metal degradation of outdoor carbon steel tanks. The new Oyster Creek Aboveground Outdoor Tank inspection program,

which is based on industry and site specific criteria for inspection parameters and frequency, will be utilized in place of system walkdowns. The program will also include inspections of the unpainted aluminum tank and its caulking at the base. The inspection program is discussed in detail in Section 3.1.

b) Periodic internal UT measurements will be performed on the bottoms of tanks with concrete or earthen foundations. Inspections will also be performed on the tank-foundation interface where caulking or sealants are used. Tanks not supported by earthen or concrete foundations will undergo external visual inspections without the necessity of bottom surface UT measurements.

The Aboveground Outdoor Tanks aging management program is a new program. Tank inspections will be at a frequency of every five years. This program will be implemented prior to the period of extended operation.

2.2 Overall NUREG-1801 Consistency

The Oyster Creek Aboveground Outdoor Tanks is a new program that is consistent with NUREG-1801 aging management program XI.29, Aboveground Steel Tanks, with exceptions described in Section 2.3 below.

2.3 Summary of Exceptions to NUREG-1801

The Oyster Creek Aboveground Outdoor Tanks aging management program is found to be adequate to support the extended period of operation with the following exceptions:

- The program will be applied to outdoor aluminum storage tanks. Due to corrosion resistance properties of aluminum, the tanks are not painted.
- The program utilizes tank inspections every 5 years in place of system walkdowns each outage.

2.4 Summary of Enhancements to NUREG-1801

None. The new Oyster Creek Aboveground Outdoor Tanks aging management program is found to be adequate to support the extended period of operation with no enhancements.

3.0 EVALUATIONS AND TECHNICAL BASIS

Note

This section is organized by quoting the relevant NUREG-1801 Chapter XI program element (September 2005 version) followed by the related Oyster Creek program attributes and a conclusion of the comparison. Where applicable, the NUREG-1801 program element was separated into logical sub-elements and addressed accordingly.

Implementing procedures and source references are included in ( ) for information purposes. This information from the implementing procedure or source reference has been either directly extracted from or summarized for inclusion into this PBD.

3.1 Scope of Program

NUREG-1801:

The program consists of (a) preventive measures to mitigate corrosion by protecting the external surfaces of carbon steel tanks protected with paint or coatings and (b) periodic system walkdowns to manage the effects of corrosion on the intended function of these tanks. Plant walkdowns cover the entire outer surface of the tank up to its surface in contact with soil or concrete.

Oyster Creek:

This Aboveground Outdoor Tanks aging management program (AMP) applies to the outdoor carbon steel and aluminum tanks as listed herein:

Carbon Steel Tanks

- Carbon Dioxide Tank
- Diesel Generator Fuel Oil Tank *
- Fire Diesel Fuel Oil Tanks
- Fire Protection Water Storage Tank * **
- Nitrogen Storage Tank

Aluminum Tanks

- Condensate Storage Tank *

* Tanks are concrete pad or earthen mounted

** Tank is provided with field-installed insulation

The scope of the AMP includes the use of paint to protect the external surfaces of carbon steel tanks. Visual inspections of the entire tank external surface up to their surface in contact with foundation and the sealants/coatings at the foundation interfaces will manage the effects of both coating degradation and metal surface corrosion on the intended function of the tanks. For tanks not supported by earthen or concrete foundations, inspection of the foundation interface does not apply. The visual inspection of insulated surfaces will require the removal of insulation. Removal of insulation and inspection of the tank surface will be on a sampling basis.

The aluminum tank that is included in this AMP is not painted. It is visually inspected to manage the effects of corrosion on the intended function of this tank. Inspections will be performed on the entire surface of the tank up to their surface in contact with foundation and the sealants/coatings at the foundation interfaces.

This new Oyster Creek Aboveground Outdoor Tanks aging management program will incorporate tank inspections in place of system walkdowns. Concurrent with the generation of the License Renewal Application Oyster Creek was implementing the Exelon Performance Centered Maintenance (PCM) template for tanks. **(Reference: 4.3.1)** The template provides for both external and internal comprehensive inspections including bottom UT measurements for tanks set on earth or concrete and is based on industry guidance. Inspection frequency is based on industry recommendations, specific tank service and coatings life as discussed in Section 3.5.

Existing plant procedures will be revised for external and bottom UT inspection of two tanks **(References: PM00337F, PM86201M).** New procedures will be developed to implement inspections on the remaining tanks in the program.

The Oyster Creek Aboveground Outdoor Tanks aging management program manages the aging effect of loss of material due to corrosion for the systems, components, and environments listed in Table 5.2. The implementing documents for this aging management program are listed in Table 5.1 and are described throughout the individual program element discussions. The commitment numbers under which these implementing documents are being revised are contained within the listings in Table 5.1.

Exceptions to NUREG-1801, Element 1:

NUREG-1801 program scope consists of preventive measures to mitigate corrosion by protecting the external surfaces of carbon steel tanks protected with paint or coatings. The Oyster Creek Aboveground Outdoor Tanks aging management program will also be used to manage the loss of material for aluminum tanks.

Enhancements to NUREG-1801, Element 1:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 1, Scope of Program, with exceptions as described above.

3.2 Preventive Actions

NUREG-1801:

a) *In accordance with industry practice, tanks are coated with protective paint or coating to mitigate corrosion by protecting the external surface of the tank from environmental exposure.*

b) *Sealant or caulking at the interface edge between the tank and concrete or earthen foundation mitigates corrosion of the bottom surface of the tank by preventing water and moisture from penetrating the interface, which would lead to corrosion of the bottom surface.*

Oyster Creek:

a) In accordance with industry practice, the exposed carbon steel tanks at the Oyster Creek are coated with paint to mitigate corrosion by protecting the external surface of the tank from environmental exposure. No protective paints/coatings are provided for the condensate storage tank, due to the greater corrosion resistance of aluminum.

b) Sealants at the interface edge between the tanks and their foundations for those tanks mounted on concrete pads provide a moisture barrier. For tanks not supported by earthen or concrete foundations, use the sealant or caulking at the tank foundation interface does not apply.

Exceptions to NUREG-1801, Element 2:

NUREG-1801 program scope consists of preventive measures to mitigate corrosion by protecting the external surfaces of carbon steel tanks protected with paint or coatings. The Oyster Creek Aboveground Outdoor Tanks aging management program will also be used to manage the loss of material for aluminum tanks, which due to the corrosion resistance of aluminum are not painted nor coated.

Enhancements to NUREG-1801, Element 2:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 2, Preventive Actions, with exceptions as described above.

3.3 Parameters Monitored or Inspected

NUREG-1801:

The AMP utilizes periodic plant system walkdowns to monitor degradation of coatings, sealants, and caulking because it is a condition directly related to the potential loss of materials.

Oyster Creek:

The program relies on the use of paint as a corrosion preventive and provides for periodic visual inspections to monitor degradation of paint coatings, sealants and caulking and early detection of corrosion (loss of material) of the external surfaces of carbon steel tanks. As discussed in Section 3.1, an inspection program will be used in place of walkdowns. Exposed surfaces of aluminum tanks will undergo visual inspection for corrosion. For field-insulated tanks, a section of insulation is removed to permit inspection of the tank surface. Remaining insulation sheathing is inspected for damage or breaches that could result in underlying corrosion. If damage is noted, the inspection procedure requires that insulation is removed and tank shell examined. **(References: PM00337F, Activity 3, Step 5.A; 4.3.2, Section 4.1.3)** The additional inspection requirements will be incorporated into procedures required to implement the program.

Exceptions to NUREG-1801, Element 3:

None

Enhancements to NUREG-1801, Element 3:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 3, Parameters Monitored or Inspected.

3.4 Detection of Aging Effects

NUREG-1801:

a) *Degradation of exterior carbon steel surfaces cannot occur without degradation of paint or coatings on the outer surface and of sealant and caulking at the interface between the component and concrete. Periodic system walkdowns to confirm that the paint, coating, sealant, and caulking are intact is an effective method to manage the effects of corrosion on the external surface of the component.*

b) *Corrosion may occur at inaccessible locations, such as the tank bottom surface, thus, thickness measurement of the tank bottom is to be taken to ensure that significant degradation is not occurring and the component intended function will be maintained during the extended period of operation.*

Oyster Creek:

a) Degradation of the paint on the carbon steel tank external surfaces will be detected during performance of the visual external inspections. Detecting coating degradation provides an effective method for managing corrosion effects of the underlying carbon steel. For field-insulated tanks, a section of insulation is removed to permit visual inspection of the tank surface. Remaining insulation sheathing is inspected for damage or breaches that could result in underlying corrosion. If damage is noted, the inspection procedure requires that insulation be removed and the tank shell examined. **(Reference: PM00337F)** As aluminum tanks are uncoated, visual inspection of the exposed surfaces for corrosion will be performed. Sealants and caulking at the interface edge between the tanks and their foundations for those tanks mounted on concrete pads are inspected for damaged or missing caulking.

For tanks that are not concrete pad or earthen mounted, inspection of the sealant or caulking at the foundation interface does not apply. The inspection requirements will be added to the existing and new procedures developed to implement the program.

b) Corrosion may occur at inaccessible locations, such as the tank bottom surface in contact with concrete or soil. Therefore, thickness measurements of the tanks supported on earthen or concrete foundations are taken to ensure that significant degradation is not occurring and the component intended function will be maintained during the extended period of operation. The bottom UT inspection requirements will be incorporated into the procedures required to implement the program.

Exceptions to NUREG-1801, Element 4:

None.

Enhancements to NUREG-1801, Element 4:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 4, Detection of Aging Effects.

3.5 Monitoring and Trending

NUREG-1801:

a) The effects of corrosion of the aboveground external surface are detectable by visual techniques. Based on operating experience, plant system walkdowns during each outage provide for timely detection of aging effects.

b) The effects of corrosion of the underground external surface are detectable by thickness measurement of the tank bottom and are monitored and trended if significant material loss is detected.

Oyster Creek:

a) The effects of corrosion of the aboveground external tank surfaces are detectable by visual techniques. Periodic inspections provide for timely detection of aging effects. The aboveground tanks external surfaces will be visually inspected

for coating degradation and corrosion on uncoated aluminum by inspections at least once every five years. As discussed in Section 3.1, the new Oyster Creek Aboveground Outdoor Tanks aging management program will incorporate tank inspections in place of system walkdowns. Inspection frequency is determined based on industry recommendations and specific tank service. **(Reference: 4.3.1)** This is consistent with the practical life of external coatings **(Reference: 4.2.2, Section 5.2.6)** and the industry application of structures monitoring programs in response to the Maintenance Rule **(Reference: 4.2.5)**. Refer to Exceptions to NUREG-1801, Element 5 discussion below for additional technical basis.

b) The effects of corrosion of the Diesel Generator Fuel Oil Tank bottom external surface (mounted on concrete) and the condensate storage and the Fire Protection Water Storage Tanks bottom external surfaces (exposed to soil) are detectable by thickness measurement of the tank bottom. Initial thickness measurements will be compared to design requirements. The results of these inspections are monitored and trended if significant material loss is detected such that component intended function is ensured.

Exceptions to NUREG-1801, Element 5:

The program takes exception to the inspection frequency during each outage specified in NUREG-1801 Rev. 1 XI.M29, Aboveground Steel Tanks, for monitoring external surfaces of tank surfaces. The specified frequency by the Oyster Creek program is every 5 years. Technical basis for this exception is as follows.

- The frequency of 5 years specified for monitoring of exterior surfaces of tanks is consistent with the frequency specified for exterior surfaces of supporting structures. The 5year frequency is consistent with industry guidelines and has proven effective in detecting loss of material due to corrosion, and change in material properties of structural elastomer on exterior surfaces of structures. Consequently this frequency will also be effective for detecting loss of material and change in material properties on exterior surfaces of tank before an intended function is impacted.

- Tank components subject to outdoor air are constructed from stainless steel or aluminum, which are not susceptible to accelerated corrosion, or carbon steel components protected by protective coatings such as galvanizing or painting. Plant Operating Experience indicates that monitoring of exterior surfaces of components made of these materials and protective coatings on a frequency of 5 years provides reasonable assurance that loss of material will be detected before an intended function is affected.
- Studies by EPRI (**Reference: 4.2.6, Fig. 4.1-1**) provides corrosion rate curve for carbon steels. This curve was constructed from 55 individual tests representing at least five different steels and six different test locations and environments. The curve shows 0.926 mils per year thickness loss during the first 1 1/2 years, decreasing to 0.21 mils per year after 15 ½ years. EPRI also conducted corrosion tests of ASTM A-36 structural steel at four nuclear plants located in Elma and Richland, Washington; and Midland, Michigan. The tests were conducted for up to 24 months. EPRI concluded that based on the test results the corrosion rate is 0.5 mils per year. If the corrosion rate is conservatively taken as 0.926 mils per year, then the loss of material projected for 5 years is less than 5 mils. This loss of material is insignificant and will not impact the intended function of mechanical components (**References: 4.2.6, 4.2.7**).

Enhancements to NUREG-1801, Element 5:

None.

Comparison and Evaluation Conclusion:

This element is consistent with exceptions with NUREG-1801 Rev. 1 XI.M29, Aboveground Steel Tanks, for monitoring external surfaces of tanks. The specified frequency by the Oyster Creek program is every 5 years; while XI.M29 requires a frequency of each outage. Technical basis for this exception is that, based on plant specific operating experience and industry experience, the 5-year frequency is adequate to provide reasonable assurance that aging effects will be detected and corrected before a loss of an intended function.

3.6 Acceptance Criteria

NUREG-1801:

a) Any degradation of paint, coating, sealant, and caulking is reported and will require further evaluation. Degradation consists of cracking, flaking, or peeling of paint or coatings, and drying, cracking or missing sealant and caulking.

b) Thickness measurements of the tank bottom are evaluated against the design thickness and corrosion allowance.

Oyster Creek:

a) Degradation of tank paint, caulking or sealants, damage to insulation or corrosion of tank external surfaces is reported and will require further evaluation for potential impact on the associated tanks intended function. Degradation consists of cracking, flaking, peeling; missing paint, caulking or sealants or surface corrosion of uncoated surfaces. The requirement to document and initiate further evaluations when acceptance criteria are not met will be added to the program implementing procedures.

b) The results of the UT thickness measurements of the tank bottom will be evaluated against the applicable design thicknesses and corrosion allowances.

Exceptions to NUREG-1801, Element 6:

None.

Enhancements to NUREG-1801, Element 6:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 6, Acceptance Criteria.

3.7 Corrective Actions

NUREG-1801:

The site corrective actions program, quality assurance (QA) procedures, site review and approval process, and administrative controls are implemented in accordance with 10 CFR Part 50, Appendix B. As discussed in the appendix to this report, the staff

finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions, confirmation process, and administrative controls.

Oyster Creek:

Evaluations are performed for test or inspection results that do not satisfy acceptance criteria and a condition report is initiated to document the concern in accordance with plant administrative procedures that meet the requirements of 10 CFR Part 50, Appendix B. The corrective action program and specific corrective action steps as specified in procedures ensure that any conditions adverse to quality are promptly corrected. If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude repetition.

Exceptions to NUREG-1801, Element 7:

None.

Enhancements to NUREG-1801, Element 7:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 7, Corrective Actions.

3.8 Confirmation Process

NUREG-1801:

See Item 7, above.

Oyster Creek:

See Item 3.7, above.

Exceptions to NUREG-1801, Element 8:

None.

Enhancements to NUREG-1801, Element 8:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 8, Confirmation Process.

3.9 Administrative Controls

NUREG-1801:

See Item 7, above.

Oyster Creek:

See Item 3.7, above.

Exceptions to NUREG-1801, Element 9:

None.

Enhancements to NUREG-1801, Element 9

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 9, Administrative Controls.

3.10 Operating Experience

NUREG-1801:

Coating degradation, such as flaking and peeling, has occurred in safety-related systems and structures (Nuclear Regulatory Commission [NRC] Generic Letter [GL] 98-04). Corrosion damage near the concrete-metal interface and sand-metal interface has been reported in metal containments (NRC Information Notice [IN] 89-79, Supplement 1, and NRC IN 86-99, Supplement 1).

Oyster Creek:

Review of industry Operating Experience has confirmed that breakdown of Level 1 coatings and subsequent blockage has occurred in safety-related systems and structures (NRC Generic Letter 98-04). Corrosion damage has occurred at the concrete-metal and sand-metal interface of metal containments (IN 89-79 and IN 86-99). A review of plant Operating Experience at Oyster Creek shows that coatings degradation, insulation damage and

corrosion damage at the soil-metal interfaces of outdoor tanks have occurred. The new Oyster Creek Aboveground Outdoor Tanks aging management program includes the inspection techniques necessary to manage the loss of material of exposed tanks surfaces, those under insulation and those supported by concrete pad or soil.

Operating Experience, both internal and external, is used in two ways at Oyster Creek to enhance plant programs, prevent repeat events, and prevent events that have occurred at other plants from occurring at Oyster Creek. The first way in which operating experience is used is through the Oyster Creek Operating Experience process. The Operating Experience process screens, evaluates, and acts on operating experience documents and information to prevent or mitigate the consequences of similar events. The second way is through the process for managing programs. This process requires the review of program related Operating Experience by the Program Owner.

Both of these processes review Operating Experience from both external and internal (also referred to as in-house) sources. External Operating Experience may include such things as INPO documents (e.g., SOERs, SERs, SENs, etc.), NRC documents (e.g., GLs, LERs, INs, etc.), General Electric documents (e.g., RCSILs, SILs, TILs, etc.), and other documents (e.g., 10CFR Part 21 Reports, NERs, etc.). Internal operating experience may include such things as event investigations, trending reports, and lessons learned from in-house events as captured in program notebooks, self-assessments, and in the 10 CFR Part 50, Appendix B Corrective Action Process.

Demonstration that the Oyster Creek Aboveground Outdoor Tanks aging management program to effectively manage loss of material in components susceptible to corrosion will be achieved through objective evidence. The following industry Operating Experience and site specific findings at Oyster Creek have been utilized in creating the Oyster Creek Aboveground Outdoor Tanks aging management program:

1. During the March 1991 refueling outage seepage was discovered outside the Condensate Storage Tank. Initial inspections of the tank bottom revealed pitting and thru wall leaks. Further visual inspections revealed pitting/blistering throughout the bottom plate and thinning was detected by UT. Visual examination of floor samples removed from the tank revealed external corrosion attack on the tank bottom. The tank

was previously inspected in 1980. At that time, localized patch plate repairs were made. The tank bottoms were subsequently replaced. To enhance corrosion resistance a new bed of low iron silica sand was installed, tar/felt paper was installed between the new bottom plate and the top of the support ring and exterior caulking was installed at the floor to concrete interface to prevent water intrusion underneath the tank. **(Reference: 4.3.3).**

2. In 1981 Oyster Creek specified and subsequently installed a Fire Protection Water Storage Tank. In 1989 damaged roof insulation was replaced to preclude rainwater infiltration and the roof coating was touched up. Foam insulation panels with aluminum sheathing on the external surface were installed and all seams sealed. **(References: 4.3.4, 4.3.5).** This system requires no regular maintenance other than periodic inspections that are included in implementing inspection document **(References: PM00337F, Activity 3, Step 5.A; 4.3.2, Section 4.1.3).**

As noted above, the CST provided over 10 years of service after inspections before leakage commenced. The insulation damage suffered by the Fire Protection Water Storage Tank after eight years of service did not result in significant tank degradation. Because previous degradation and failures occurred after more than 10 years of service, inspections on a five year frequency are adequate to detect aging prior to loss of intended function. The plant Operating Experience provides objective evidence that this AMP will adequately manage aging of components prior to the loss of intended function.

The Aboveground Outdoor Tank Inspection Program is a new program being implemented at Oyster Creek, and therefore, no program experience exists. The program will initiate new inspections and incorporate those activities in place for tank management of petroleum and fire protection tanks. This program incorporates new tank inspections being developed at Oyster Creek in place of system walkdowns as discussed in Section 3.1. A review of the operating history has confirmed that inspections for the aging affects experienced on Oyster Creek are included in the program and justify a five-year frequency. Additionally, corrective actions have been taken to limit corrosion of tanks. This demonstrates that the Aboveground Outdoor Tanks aging management program will be effective and be revised as necessary to manage corrosion of the tanks within the program.

3.11 Conclusion

The Oyster Creek Aboveground Outdoor Tanks aging management program is credited for managing loss of material for the systems, components, and environments listed in Table 5.2. The Oyster Creek Aboveground Outdoor Tanks program's elements have been evaluated against NUREG-1801 in Section 3.0. Program exceptions have been identified in Section 2.3. Program enhancements have been identified in Section 2.4. The implementing documents for this aging management program are listed in Table 5.1. The relevant Operating Experience has been reviewed and incorporated into the aging management program as documented in Section 3.10.

Based on the above, the implementation of the new Oyster Creek Aboveground Outdoor Tanks aging management program will provide reasonable assurance that loss of material will be adequately managed so that the intended functions of components within the scope of license renewal will be maintained during the period of extended operation.

4.0 REFERENCES

4.1 Generic to Aging Management Programs

4.1.1 10 CFR 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants*

4.1.2 10 CFR 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants*

4.1.3 NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Revision 1, dated September 2005

4.1.4 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 1, dated September 2005

4.2 Industry Standards

4.2.1 NFPA-25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems, 1998 Edition

4.2.2 SAND96-0343, February 1996, Aging Management Guideline for Commercial Nuclear Power Plants - Tanks and Pools

4.2.3 25 PA Code 245 "Administration of the Storage Tank and Spill Prevention Program"

4.2.4 ER-MW-450, Revision 0, Structures Monitoring - Exelon Nuclear

4.2.5 NRC Regulatory Guide 1.160, Revision 2, *Monitoring the Effectiveness of Maintenance At Nuclear Power Plants*, U.S. Nuclear Regulatory Commission, March 1997

4.2.6 EPRI TR-103840, BWR Containment Industry Report, July 1994.

4.2.7 AMR-PP-01-DRE-QCD Rev 0 DRF A22-00108-03, Corrosion of Steel in an Inside (Sheltered Environment)

4.3 Oyster Creek Program References

4.3.1 Exelon Performance Centered Maintenance (PCM) Template for Tanks, 7/22/02

4.3.2 SP-1302-52-108, Revision 3, Specification for Inspection of Tanks

4.3.3 SP-1302-52-110, Revision 2, Specification for Repairs to Condensate Storage Tank

4.3.4 OCIS 323606-001, Revision 0, Installation Specification for Redundant Fire Protection Water Supply Tank Roof Insulation Replacement

4.3.5 218.2-79-27, Revision 3, Installation Specification – Redundant Fire Protection Water Supply Tank

4.3.6 AMP-148, Aboveground Outdoor Tanks, Schedule of Plant Walkdowns, 10/20/05

5.0 TABLES

5.1 Aging Management Program Implementing Documents

Number	Procedure	Procedure Title	Commitment No.	Status
1.	New PM42404M	T-11-1 CST External Inspection	330592.21.01	ACC/ASG
2.	New PM	T-11-1 CST Internal Inspection	330592.21.02	ACC/ASG
3.	New PM	T-39-2 EDG FO External Inspection	330592.21.03	ACC/ASG
4.	PM86201M	T-39-2 EDG FO Internal Inspection	330592.21.04	ACC/ASG
5.	New PM	T-23-3 N2 External Inspection	330592.21.05	ACC/ASG
6.	New PM	T-9-102 CO2 External Inspection	330592.21.06	ACC/ASG
7.	PM00337F	T-9-101 FPWST Internal / External Inspection	330592.21.07	ACC/ASG
8.	New PM	T-9-103/104 FDFO External Inspection	330592.21.08	ACC/ASG

5.2 Aging Management Review Results

SSC Name	Structure and/or Component	Material	Environment	Aging Effect
Condensate Transfer System	Tanks (CST)	Galvanized Steel	Outdoor Air (External)	Loss of Material
Condensate Transfer System	Tanks (CST)	Stainless Steel	Outdoor Air (External)	Loss of Material
Condensate Transfer System	Tanks (CST)	Galvanized Steel	Outdoor Air (Internal)	Loss of Material
Condensate Transfer System	Tanks (CST)	Stainless Steel	Outdoor Air (Internal)	Loss of Material
Condensate Transfer System	Tanks (CST)	Aluminum	Outdoor Air (Internal)	Loss of Material
Condensate Transfer System	Tanks (CST)	Aluminum	Outdoor Air (External)	Loss of Material
Condensate Transfer System	Filter Housing (CST)	Aluminum	Outdoor Air (External)	Loss of Material
Condensate Transfer System	Tanks (CST)	Aluminum	Soil (External)	Loss of Material
Condensate Transfer System	Filter Housing (CST)	Aluminum	Outdoor Air (Internal)	Loss of Material
Condensate Transfer System	Filter (CST)	Aluminum	Outdoor Air (External)	Loss of Material
EDG and Auxiliary System	Tanks (EDG Fuel Oil)	Carbon and low alloy steel	Outdoor Air (External)	Loss of Material
Fire Protection System	Tanks (FPWST)	Carbon and low alloy steel	Outdoor Air (External)	Loss of Material
Fire Protection System	Tanks (FPWST)	Carbon and low alloy steel	Soil (External) (Tank bottom)	Loss of Material
Fire Protection System	Tank Heater (RFWST)	Stainless Steel	Outdoor Air (External)	Loss of Material
Fire Protection System	Tanks (CO2)	Carbon and low alloy steel	Outdoor Air (External)	Loss of Material
Fire Protection System	Tanks (FD Fuel Oil)	Carbon and low alloy steel	Outdoor Air (External)	Loss of Material
Nitrogen Supply System	Tanks (N2)	Carbon and low alloy steel	Outdoor Air (External)	Loss of Material

6.0 ATTACHMENTS

6.1 LRA Appendix A

6.2 LRA Appendix B