From: <john.hufnagel@exeloncorp.com>
To: <dja1@nrc.gov>, <gvc@nrc.gov>
Date: 12/19/2005 5:38:26 PM
Subject: Final four AMP program basis documents

Donnie/Greg,

Here are the final four AMP PBDs that we had indicated we would provide in response to your AMP Audit question AMP-147. This brings to 35 the number of upgraded program basis documents that we have provided, enabling the AMP team Auditors to continue their review activities, leading up to the Audit of January 23, 2006.

Attached please find the following four PBDs in Word format:
PBD B.1.14 CCCW, Rev. 0
PBD B.1.32 Water Control Structures, Rev. 0
PBD B.1.26 Buried Piping, Rev. 0
PBD B.1.07 BWR SCC, Rev. 0

Note that these Word files have been "write" protected to prevent inadvertent revisions to the files. This should not preclude viewing, copying, pasting, etc. Let us know if there are any problems.

As you know, these are being provided in response to AMP Audit question AMP-147. An updated response to Audit question AMP-147, is also attached, which reflects that we have provided all the AMP basis documents in support of the upcoming AMP Audit to be conducted the week of January 23, 2006.

Please let me know if there are any questions/problems. Thanks.

- John.

<<PBD B.1.14 CCCW Rev.0.doc>> <<PBD B.1.32 Water Control Structures Rev. 0.doc>> <<PBD B.1.26 Buried piping Rev 0.doc>> <<PBD B.1.7 BWR SCC Rev 0.doc>>

<<12-19-05 Update to AMP-147 Response.pdf>>

CC: <fred.polaski@exeloncorp.com>, <donald.warfel@exeloncorp.com>

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TEXT.htm	3478	
PBD B.1.14 CCCW Rev.0.doc	242176	
PBD B.1.32 Water Control Structures Rev. 0.doc	241664	
PBD B.1.26 Buried piping Rev 0.doc	157184	
PBD B.1.7 BWR SCC Rev 0.doc	171008	
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PROGRAM BASIS DOCUMENT

PBD-AMP-B.1.14

Revision 0

CLOSED CYCLE COOLING WATER SYSTEMS

GALL PROGRAM XI.M21 - CLOSED CYCLE COOLING WATER SYSTEMS

Prepared By: ______________________

Reviewed By: ______________________

Program Owner Review: ______________________

Technical Lead Approval: ______________________

Revision History:

Revision	*Prepared by:*	*Reviewed by:*	*Program Owner:*	*Approved by:*
0	*S. Rafferty-Czincila*	*George Beck*	*Bob Barbieri/ Mike Ford*	*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 Closed Cycle Cooling Water aging management program that are credited for managing aging of piping, piping components, piping elements, pumps and heat exchangers that are included in the scope of license renewal for loss of material and reduction of heat transfer and are exposed to a closed cooling water environment at Oyster Creek 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;
- The identification of Oyster Creek documents required implementing 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.M21. 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 (a) preventive measures to minimize corrosion and stress corrosion cracking (SCC) and (b) testing and inspection to monitor the effects of corrosion and SCC on the intended function of the component.*

b) *The program relies on maintenance of system corrosion inhibitor concentrations within the specified limits of Electric Power Research Institute (EPRI) TR-107396 to minimize corrosion and SCC.*

c) *Non-chemistry monitoring techniques such as testing and inspection in accordance with guidance in EPRI TR-107396 for closed-cycle cooling water (CCCW) systems provide one acceptable method to evaluate system and component performance. These measures will ensure that the intended functions of the CCCW system and components serviced by the CCCW system are not compromised by aging.*

Oyster Creek:

a) The Oyster Creek Closed Cycle Cooling Water System aging management program is an existing program that provides condition monitoring, preventive measures, inspections, and performance testing activities to manage loss of material, cracking, and buildup of deposit aging effects in components in the scope of license renewal exposed to closed-cycle cooling water environments. Oyster Creek controls the risks of Stress Corrosion Cracking (SCC) in the CCCW systems by maintaining their Chloride and Fluoride levels each below 10 ppm as recommended in Table A.1 of the EPRI 1007820, "Closed Cooling Water Chemistry Guideline, Revision 1". The Oyster Creek actual limit is $\leq$ 8ppm with and action level of > 10 ppm for both Fluoride and Chloride. **(Reference: CY-AA-120-400)** Additionally the EDGCCW, RBCCW and TBCCW heat exchangers are either horizontally mounted, or not applicable (i.e. radiators) to the guidance in EPRI 1007820 Section A.1 which states that "SCC is much more likely in vertical exchangers than in horizontal exchangers. This is due to evaporation and increasing temperatures in the vapor zone, below the top tube sheet. The CCW system heat exchangers under consideration are normally horizontal and are not prone to this (SCC) failure mode." Section A.1 of EPRI 1007820 further states that the impurity levels of less than 10 ppm are conservative and represent a very low, acceptable risk.

(a) Preventive activities include measures to mitigate loss of material and buildup of deposit aging effects in components by maintaining water purity and corrosion inhibitors to minimize corrosion.

(b) Performance testing and system and component inspections monitor the effects of corrosion on the intended function of the component.

b) NUREG 1801 refers to EPRI TR-107396 Closed Cooling Water Chemistry Guidelines 1997 Revision. Oyster Creek implements the guidance provided in EPRI 1007820, "Closed Cooling Water Chemistry Guideline, Revision 1" which is the 2004 Revision to TR-107396 to minimize corrosion. Oyster Creek controls the risks of Stress Corrosion Cracking (SCC) in the CCCW systems by maintaining their Chloride and Fluoride levels each below 10 ppm as recommended in Table A.1 of the EPRI 1007820. The Oyster Creek actual limit is $\leq$ 8ppm with and action level of > 10 ppm for both Fluoride and Chloride. **(Reference: CY-AA-120-400)** Additionally the EDGCCW, RBCCW and TBCCW heat exchangers are either horizontally mounted, or not applicable (i.e. radiators) to the guidance in EPRI 1007820 Section A.1 which states that "SCC is much more likely in vertical exchangers than in horizontal exchangers. This is due to evaporation and increasing temperatures in the vapor zone, below the top tube sheet. The CCW system heat exchangers under consideration are normally horizontal and are not prone to this (SCC) failure mode." Section A.1 of EPRI 1007820 further states that the impurity levels of less than 10 ppm are conservative and represent a very low, acceptable risk.

c) Non-chemistry monitoring techniques, such as surveillance tests, include performance monitoring of the Turbine Building Closed Cooling, Reactor Building Closed Cooling and Emergency Diesel Generator Closed Cooling Water. Plant operating conditions would provide indications of degradation in normally operating systems. These testing and inspection activities verify system operability and ensure that aging effects are managed such that system and component functions are maintained. Testing and inspection in accordance with guidance in EPRI 1007820 for closed-cycle cooling water (CCCW) systems provide one acceptable method to evaluate system and component performance. These measures will ensure that the intended functions of the CCCW system and components serviced by the CCCW system are not compromised by aging.

Control of CCCW Chemistry in accordance with EPRI guidelines (1007820) does not preclude buildup of deposits and loss of material due to general, crevice, or pitting corrosion at locations of stagnant flow conditions. A one-time inspection in accordance with B.1.24, One-Time Inspection Program, of components in the scope of license renewal with leakage boundary and leakage boundary/structural support intended functions exposed to closed cycle cooling water will be conducted to confirm the absence of aging effects in stagnant flow areas.

For heat exchangers, an aging management program that uses multiple attributes is considered necessary to effectively address all aging effects. The Open Cycle Cooling Water AMP activities provide input into a program that includes primary and secondary operating fluid chemistry controls, performance monitoring, and inspections of all heat exchangers in the scope of License Renewal at Oyster Creek to manage loss of material and reduction of heat transfer as a result of buildup of deposit. **(Reference: PBD-AMP-B.1.13)**

2.2 Overall NUREG-1801 Consistency

The Oyster Creek Closed Cycle Cooling Water System aging management program is an existing program that is consistent with NUREG-1801 aging management program XI.M21, Closed Cycle

Cooling Water Systems with exceptions as described in 2.3 below.

2.3 Summary of Exceptions to NUREG-1801

NUREG 1801 refers to EPRI TR-107396 Closed Cooling Water Chemistry Guidelines 1997 Revision. Oyster Creek implements the guidance provided in EPRI 1007820 "Closed Cooling Water Chemistry Guideline, Revision 1" which is the 2004 Revision to TR-107396. EPRI periodically updates industry water chemistry guidelines, as new information becomes available. Oyster Creek has reviewed EPRI 1007820 and has determined that the most significant difference is that the new revision provides more prescriptive guidance and has a more conservative monitoring approach. EPRI 1007820 meets the same requirements of EPRI TR-107396 for maintaining conditions to minimize corrosion and microbiological growth in closed cooling water systems for effectively mitigating aging effects.

2.4 Summary of Enhancements to NUREG-1801

None. The existing Oyster Creek Oyster Creek Closed Cycle Cooling Water aging management program is found to be adequate to support the extended period of operation with no enhancements.

3.0 EVALUATIONS AND TECHNICAL BASIS

<u>**Note**</u>

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.

3.0 Scope of Program

<u>NUREG-1801:</u>

A CCCW system is defined as part of the service water system that is not subject to significant sources of contamination, in which water chemistry is controlled and in which heat is not directly *rejected to a heat sink. The program described in this section applies only to such a system. If one or more of these conditions are not satisfied, the system is to be considered an open-cycle cooling water system. The staff notes that if the adequacy of cooling water chemistry control cannot be confirmed, the system is treated as an open-cycle system as indicated in Action III of Generic Letter (GL) 89-13.*

Oyster Creek:

The systems and portions of systems crediting Closed-Cycle Cooling Water System activities for aging management are: (1) not subject to significant sources of contamination, (2) systems where water chemistry is controlled, and (3) systems where heat is not directly rejected to a heat sink.

The components within the scope of License Renewal that are subject to Closed-Cycle Cooling Water System activities are included in Turbine Building Closed Cooling, Reactor Building Closed cooling and Emergency Diesel Generator Closed Cooling Water systems. Chemistry control activities and surveillance testing and inspection activities are controlled by corporate and station procedures. **(Reference: CY-OC-120-110, CY-AA-120-400, 309.1.1, 341, 636.1.010, 636.4.003, 636.4.013, 642.4.001, PMVT0015, PM00120M, PM00184M, PM00189M and PM00209M)**

The Oyster Creek Closed Cycle Cooling Water aging management program manages the aging effect of piping, piping components, piping elements, pumps and heat exchangers that are included in the scope of license renewal for loss of material and reduction of heat transfer and are exposed to a closed cooling water environment at Oyster Creek 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:

None.

Enhancements to NUREG-1801, Element 1:

None.

Comparison and Evaluation Conclusion:

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

3.1 Preventive Actions

NUREG-1801:

a) *The program relies on the use of appropriate materials, lining, or coating to protect the underlying metal surfaces and maintain system corrosion inhibitor concentrations within the specified limits of EPRI TR-107396 to minimize corrosion and SCC.*

b) *The program includes monitoring and control of cooling water chemistry to minimize exposure to aggressive environments*

c) *Application of corrosion inhibitor in the CCCW system to mitigate general, crevice, and pitting corrosion as well as SCC.*

Oyster Creek:

a) Materials are determined by as-built configuration and specifications for Oyster Creek. Linings or coatings are not credited. Closed-Cycle Cooling Water System activities conducted under corporate and station procedures include periodic monitoring and controlling of water chemistry and/or corrosion inhibitor concentrations within specified limits of EPRI 1007820 for nitrite and molybdate inhibitor based CCW systems. Chemistry control activities are controlled by corporate and station procedures. **(Reference: CY-AA-120-400 and CY-OC-120-110)** Oyster Creek controls the risks of Stress Corrosion Cracking (SCC) in the CCCW systems by maintaining their Chloride and Fluoride levels each below 10 ppm as recommended in Table A.1 of the EPRI 1007820, "Closed Cooling Water Chemistry Guideline, Revision 1". The Oyster Creek actual limit is $\leq$ 8ppm with and action level of > 10 ppm for both Fluoride and Chloride. **(Reference: CY-AA-120-400)** Additionally the EDGCCW, RBCCW and TBCCW heat exchangers are either horizontally mounted, or not applicable (i.e. radiators) to the guidance in EPRI 1007820 Section A.1 which states that "SCC is much more likely in vertical exchangers than in horizontal exchangers. This is due to evaporation and increasing temperatures in the vapor zone, below the top tube sheet. The CCW system heat exchangers under consideration are normally horizontal and are not prone to this (SCC) failure mode." Section A.1 of EPRI 1007820 further states that the impurity levels of less than 10 ppm are conservative and represent a very low, acceptable risk.

b) The program includes monitoring and control of cooling water chemistry to minimize exposure to aggressive environments. Application of corrosion inhibitor in the CCCW system to mitigate general, crevice, and pitting corrosion in accordance with EPRI 1007820 as follows **(Reference: CY-AA-120-400):**

Systems with Nitrite Inhibitor (EDGCCW) have the following Control Program:

Nitrite: 600-1500 ppm – Action Level 1: <500 ppm , Action Level 2: <300 or >4000 ppm - Monthly or as Operated

pH: 9.0 to 10.5 – Action Level 1: <8.5 or >11.0, Action Level 2: <8.0 or >11.5 - Monthly or as Operated

Azole: 10 to 100 ppm azole – Action Level 1: <5 ppm, Action Level 2: <3 ppm - Monthly or as Operated

Chloride & Fluoride: ≤8 ppm Cl, ≤8 ppm F – Action Level 2: >10 ppm - Monthly or as Operated

Systems with Nitrite Inhibitor (EDGCCW) Diagnostic Parameters:

Conductivity - Consistent with Nitrite Level and Evaluate Trend - Monthly or as Operated

Nitrate - Evaluate Trend - Quarterly or as Operated

Ammonia - Evaluate Trend – Quarterly

Chloride & Sulfate - Evaluate Trend – Monthly or as Operated

Total Iron, Total Copper – Evaluate Trend - Monthly or as Operated

Microbiological - <10^4 CFU/ml or <1 ng/ml Microbial – Adenosine Triphosphate (ATP) - Monthly or as Operated

Isotopic Activity - Evaluate Trend - Quarterly or as Operated

Systems with Molybdate Inhibitor (RBCCW & TBCCW) have the following Control Program:

Molybdate: 250–1000 ppm as MoO_4– Action Level 1: <200 ppm, Action Level 2: <160 - Weekly

pH: 9.2 to 10.8 – Action Level 1: <9.0 or >11.0, Action Level 2: <8.5 or >11.5 - Weekly

Azole: 10 to 100 ppm as TTA – Action Level 1: <5 ppm, Action Level 2: <3 ppm – Monthly

Chloride & Fluoride: ≤8 ppm Cl, ≤8 ppm F – Action Level 2: >10 ppm – Monthly

Systems with Molybdate Inhibitor (RBCCW & TBCCW) Diagnostic Parameters:

Conductivity - Evaluate Trend - Weekly

Chloride & Sulfate - Evaluate Trend – Monthly

Iron & Copper – Evaluate Trend - Monthly

Microbiological - <10^4 CFU/ml or <1 ng/ml Microbial – ATP – Quarterly

Isotopic Activity - Evaluate Trend – Quarterly

c) Application of a Nitrite inhibitor is used in the EDGCCCW and application of a Molybdate Inhibitor is used in the RBCCW and TBCCW systems to mitigate general, crevice, and pitting corrosion in accordance with EPRI 1007820. **(Reference: CY-AA-120-400)**

Exceptions to NUREG-1801, Element 2:

NUREG 1801 refers to EPRI TR-107396 Closed Cooling Water Chemistry Guidelines 1997 Revision. Oyster Creek implements the guidance provided in EPRI 1007820 "Closed Cooling Water Chemistry Guideline, Revision 1" which is the 2004 Revision to TR-107396. EPRI periodically updates industry water chemistry guidelines, as new information becomes available. Oyster Creek has reviewed EPRI 1007820 and has determined that the most significant difference is that the new revision provides more prescriptive guidance and has a more conservative monitoring approach. EPRI 1007820 meets the same requirements of EPRI

TR-107396 for maintaining conditions to minimize corrosion and microbiological growth in closed cooling water systems for effectively mitigating many aging effects.

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.

3.2 Parameters Monitored or Inspected

NUREG-1801:

a) *The aging management program monitors the effects of corrosion and SCC by testing and inspection in accordance with guidance in EPRI TR-107396 to evaluate system and component condition.*

b) *For pumps, the parameters monitored include flow, discharge pressures, and suction pressures.*

c) *For heat exchangers, the parameters monitored include flow, inlet and outlet temperatures, and differential pressure.*

Oyster Creek:

a) The aging management program monitors the effects of corrosion and SCC by system surveillance testing and component inspections in accordance with guidance in EPRI 1007820 to evaluate system and component condition. **(Reference: 309.1.1, 341, 642.4.001, 636.4.003, 636.4.013, PM00120M, PM00184M, PM00189M and PM00209M)**

Oyster Creek controls the risks of Stress Corrosion Cracking (SCC) in the CCCW systems by maintaining their Chloride and Fluoride levels each below 10 ppm as recommended in Table A.1 of the EPRI 1007820, "Closed Cooling Water Chemistry Guideline, Revision 1". The Oyster Creek actual limit is $\leq$ 8ppm with and action level of > 10 ppm for both Fluoride and Chloride. **(Reference: CY-AA-120-400)** Additionally the EDGCCW, RBCCW and TBCCW heat exchangers are either horizontally mounted, or not applicable (i.e. radiators) to the guidance in

EPRI 1007820 Section A.1, which states "SCC is much more likely in vertical exchangers than in horizontal exchangers. This is due to evaporation and increasing temperatures in the vapor zone, below the top tube sheet. The CCW system heat exchangers under consideration are normally horizontal and are not prone to this (SCC) failure mode." Section A.1 of EPRI 1007820 further states that the impurity levels of less than 10 ppm are conservative and represent a very low, acceptable risk.

If parameter limits are exceeded, the chemistry control procedures require that corrective action be taken to restore parameters within the acceptable range. CCW Action Level 1 conditions are those that can be addressed using the 12-week work schedule concept, with no discernable increases in corrosion rates or impact on system efficiency. CCW Action Level 1 denotes a condition where system chemistry Control Parameters are outside the normal operating levels (Goal range). The recommended action is to increase monitoring frequency, as appropriate, and return the parameter to within the prescribed Goal range within 90 days. If the parameter has not returned to the normal operating range within 90 days, CCW Action Level 2 is entered. CCW Action Level 2 communicates a more serious condition, requiring action outside the normal 12-week work schedule. Values exceeding the CCW Action Level 2 threshold could initiate short-term system materials degradation. The recommended action is to return the parameter to within the prescribed Goal range within thirty (30) days. If after 30 days in CCW Action Level 2 the parameter has not returned to the normal range, and system operation is to continue, then a risk assessment (engineering evaluation) shall be performed indicating that the out of control parameter will not impact the long term reliability of the system. . **(Reference: CY-AA-120-400)**

b) For pumps, the parameters monitored include flow, discharge pressures, and suction pressures. **(Reference: 309.1.1, 341, 642.4.001, 636.4.003, 636.4.013)**

EDG inspection activities monitor for loss of material and buildup of deposit aging effects every 2 years. **(Reference: 636.1.010)** EDG operability tests are performed monthly and verifying proper coolant temperature during system operation under load. **(Reference: 341)** The system is inspected for pump leaks and piping leaks after every run. Because the system is operated monthly, any indications of the EDGCCW system degradation would be evident by increased engine temperatures. Additionally, the EDG water pumps are replaced every 2 years per the implementing activities listed at the end of this document. **(Reference: PM86104A and PM86104 B)**

The RBCCW system is tested quarterly as part of the IST program therefore all required operational parameters; pump flow and discharge/suction pressures and heat exchangers flow, temperatures and differential pressure are tested and monitored. **(Reference: 642.4.001)** The TBCCW system operating parameters such as pump discharge/suction pressures and heat exchanger temperatures and differential pressure are monitored. **(Reference: 309.1.1)** System flows, temperatures, and discharge/suction pressures are monitored as part of normal plant operational surveillances. Performance testing and inspections monitor both process sides of applicable heat exchangers. The delta P across the RBCCW & TBCCW heat exchangers is monitored. Increased delta P is an indication of fouling/heat transfer degradation. Cleanings are schedule when delta P limits are reached. Additionally the RBCCW & TBCCW heat exchangers are cleaned and inspected annually. **(Reference: PM00120M, PM00184M, PM00189M and PM00209M)**

System walkdowns are performed in accordance with the system manager walkdown procedure which requires the system manager to look at System parameters normal (temperature/pressure/DP/flow/water levels) and Materiel condition of components, supports, etc. **(Reference: ER-AA-2030)**

For components in the scope of license renewal with leakage boundary (spatial) and structural integrity (attached) intended functions (a)(2) that may be exposed to stagnant flow areas, a one-time inspection in accordance B.1.24, One-Time Inspection Program, will be conducted to confirm the absence of aging effects. **(Reference: PBD-AMP-B.1.24)**

c) For heat exchangers, the parameters monitored include flow, inlet and outlet temperatures, and differential pressure as part of system operating procedures. **(Reference: 341, 642.4.001 and 309.1.1)**

<u>Exceptions to NUREG-1801, Element 3:</u>

NUREG 1801 refers to EPRI TR-107396 Closed Cooling Water Chemistry Guidelines 1997 Revision. Oyster Creek implements the guidance provided in EPRI 1007820 "Closed Cooling Water Chemistry Guideline, Revision 1" which is the 2004 Revision to TR-107396. EPRI periodically updates industry water chemistry guidelines, as new information becomes available. Oyster Creek has reviewed EPRI 1007820 and has determined that the most significant difference is that the new revision provides more prescriptive guidance and has a more conservative monitoring approach. EPRI 1007820 meets the same requirements of EPRI TR-107396 for maintaining conditions to minimize corrosion and microbiological growth in closed cooling water systems for effectively mitigating many aging effects.

Enhancements to NUREG-1801, Element 3:

None.

Comparison and Evaluation Conclusion:

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

3.3 Detection of Aging Effects

NUREG-1801:

a) *Control of water chemistry does not preclude corrosion or SCC at locations of stagnant flow conditions or crevices. Degradation of a component due to corrosion or SCC would result in degradation of system or component performance. The extent and schedule of inspections and testing should assure detection of corrosion or SCC before the loss of the intended function of the component.*

b) *Performance and functional testing ensures acceptable functioning of the CCCW system or components serviced by the CCCW system.*

c) *For systems and components in continuous operation, performance adequacy should be verified by monitoring component performance through data trends for evaluation of heat transfer capability, system branch flow changes and chemistry data trends.*

d) *Components not normally in operation are periodically tested to ensure operability.*

Oyster Creek:

a) Control of CCCW Chemistry in accordance with EPRI guidelines (EPRI 1007820, "Closed Cooling Water Chemistry Guideline, Revision 1") does not preclude buildup of deposits and loss of material due to general, crevice, or pitting corrosion at locations of stagnant flow conditions. A one-time inspection in accordance with B.1.24 of components exposed to closed cycle cooling water will be conducted to confirm the absence of aging effects in stagnant flow areas. Oyster Creek controls the risks of Stress Corrosion Cracking (SCC) in the CCCW systems by maintaining their Chloride and Fluoride levels each below 10 ppm as recommended in Table A.1 of the EPRI 1007820. The Oyster Creek actual limit is $\leq$ 8ppm with and action level of > 10 ppm for both Fluoride and Chloride. **(Reference: CY-AA-120-400)** Additionally the EDGCCW, RBCCW and TBCCW heat exchangers are horizontal and per EPRI 1007820 Section A.1: "SCC is much more likely in vertical exchangers than in horizontal exchangers." And that "The CCW system heat exchangers under consideration are normally horizontal and are not prone to this (SCC) failure mode." Section A.1 of EPRI 1007820 further states that the impurity levels of less than 10 ppm are conservative and represent a very low, acceptable risk.

   Periodic inspections of heat exchangers serviced by closed cycle cooling water systems are performed as part of the Open Cycle Cooling Water aging management program B.1.13 and provide an opportunity to detect degradation in areas of stagnant flow in heat exchangers in the scope of license renewal. **(Reference: PBD-AMP-B.1.13)**

b) Performance and functional testing ensures acceptable functioning of the CCCW system or components serviced by the CCCW system.

   Performance monitoring and functional testing verify operability of the EDG as required by Plant Technical Specifications 4.7. RBCCW and EDG testing is conducted under operating surveillance procedures. **(Reference: 642.4.001 and 341)** TBCCW testing is performed under station operating procedures. **(Reference: 309.1.1)** These tests are conducted with sufficient frequency to detect component degradation prior to loss of intended function.

c) For normally operating systems, performance is monitored as part of normal plant operational procedures and surveillances. **(Reference: 309.1.1 and 642.4.001)** The RBCCW system is tested quarterly as part of the IST program; therefore all required operational parameters (pump flow and discharge/suction pressures and heat exchangers flow, temperatures and differential pressure) are tested and monitored. **(Reference: 642.4.001)** The TBCCW system operating parameters such as pump discharge/suction pressures and heat exchanger temperatures and differential pressure are monitored by operations. **(Reference: 309.1.1)** System flows, temperatures, and discharge/suction pressures are monitored as part of normal plant operational surveillances. The delta P across the RBCCW & TBCCW heat exchangers is monitored. Increased delta P is an indication of fouling/heat transfer degradation. Cleanings are schedule when delta P limits are reached. **(Reference: 642.4.001 and 309.1.1)**

The program includes monitoring and control of cooling water chemistry to minimize exposure to aggressive environments. Application of corrosion inhibitor in the CCCW system to mitigate general, crevice, and pitting corrosion in accordance with EPRI 1007820 as follows:

<u>Systems with Nitrite Inhibitor (EDGCCW) have the following Control Program:</u>

<u>Nitrite</u>: 600-1500 ppm – Action Level 1: <500 ppm , Action Level 2: <300 or >4000 ppm - Monthly or as Operated

<u>pH</u>: 9.0 to 10.5 – Action Level 1: <8.5 or >11.0, Action Level 2: <8.0 or >11.5 - Monthly or as Operated

<u>Azole</u>: 10 to 100 ppm azole – Action Level 1: <5 ppm, Action Level 2: <3 ppm - Monthly or as Operated

<u>Chloride & Fluoride</u>: ≤8 ppm Cl, ≤8 ppm F – Action Level 2: >10 ppm - Monthly or as Operated

<u>Systems with Nitrite Inhibitor (EDGCCW) Diagnostic Parameters:</u>

Conductivity - Consistent with Nitrite Level and Evaluate Trend - Monthly or as Operated

Nitrate - Evaluate Trend - Quarterly or as Operated

Ammonia - Evaluate Trend – Quarterly

Chloride & Sulfate - Evaluate Trend – Monthly or as Operated

Total Iron, Total Copper – Evaluate Trend - Monthly or as

Operated

Microbiological - <10^4 CFU/ml or <1 ng/ml Microbial – Adenosine Triphosphate (ATP) - Monthly or as Operated

Isotopic Activity - Evaluate Trend - Quarterly or as Operated

Systems with Molybdate Inhibitor (RBCCW & TBCCW) have the following Control Program:

Molybdate: 250–1000 ppm as MoO_4– Action Level 1: <200 ppm, Action Level 2: <160 - Weekly

pH: 9.2 to 10.8 – Action Level 1: <9.0 or >11.0, Action Level 2: <8.5 or >11.5 - Weekly

Azole: 10 to 100 ppm as TTA – Action Level 1: <5 ppm, Action Level 2: <3 ppm – Monthly

Chloride & Fluoride: ≤8 ppm Cl, ≤8 ppm F – Action Level 2: >10 ppm – Monthly

Systems with Molybdate Inhibitor (RBCCW & TBCCW) Diagnostic Parameters:

Conductivity - Evaluate Trend - Weekly

Chloride & Sulfate - Evaluate Trend – Monthly

Iron & Copper – Evaluate Trend - Monthly

Microbiological - <10^4 CFU/ml or <1 ng/ml Microbial – ATP – Quarterly

Isotopic Activity - Evaluate Trend – Quarterly

d) Components not in operation are periodically tested to ensure operability. EDG inspection activities monitor for loss of material and buildup of deposit aging effects every 2 years. **(Reference: 636.1.010)** EDG operability tests are performed monthly and verify proper coolant temperature during system operation under load. **(Reference: 636.4.003 and 636.4.013)** The system is inspected for pump leaks and piping leaks after every run. Because the system is operated monthly, any indications of the EDGCCW system degradation would be evident by increased engine temperatures. Additionally, the EDG water pumps are replaced every 2 years per the implementing activities listed at the end of this document. **(Reference: 341)**

System walkdowns are performed in accordance with the system manager walkdown procedure which requires the system manager to look at System parameters normal (temperature/pressure/DP/flow/water levels) and Materiel condition of components, supports, etc. **(Reference: ER-AA-2030)**

<u>Exceptions to NUREG-1801, Element 4:</u>

NUREG 1801 refers to EPRI TR-107396 Closed Cooling Water Chemistry Guidelines 1997 Revision. Oyster Creek implements the guidance provided in EPRI 1007820 "Closed Cooling Water Chemistry Guideline, Revision 1" which is the 2004 Revision to TR-107396. EPRI periodically updates industry water chemistry guidelines, as new information becomes available. Oyster Creek has reviewed EPRI 1007820 and has determined that the most significant difference is that the new revision provides more prescriptive guidance and has a more conservative monitoring approach. EPRI 1007820 meets the same requirements of EPRI TR-107396 for maintaining conditions to minimize corrosion and microbiological growth in closed cooling water systems for effectively mitigating many aging effects.

<u>Enhancements to NUREG-1801, Element 4:</u>

None.

<u>Comparison and Evaluation Conclusion:</u>

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

3.4 Monitoring and Trending

<u>NUREG-1801:</u>

a) *The frequency of sampling water chemistry varies and can occur on a continuous, daily, weekly, or as needed basis, as indicated by plant operating conditions and the type of chemical treatment.*

b) *In accordance with EPRI TR-107396, internal visual inspections and performance/functional tests are to be performed periodically to demonstrate system operability and confirm the effectiveness of the program.*

c) *Tests to evaluate heat removal capability of the system and* *degradation of system components may also be used. The testing intervals should be established based on plant-specific considerations such as system conditions, trending, and past operating experience, and may be adjusted based on the results of a reliability analysis, type of service, frequency of operation, or age of components and systems.*

Oyster Creek:

a) Closed-Cycle Cooling Water System activities include monitoring of water chemistry parameters and corrosion inhibitor concentrations on a system specific periodic basis as outlined in corporate and station procedures. In nitrite and molybdate inhibitor based CCW systems, samples are taken in accordance with EPRI 1007820. **(Reference: CY-AA-120-400)** See Section 3.4 for specific parameters and limits.

b) Performance and functional testing for closed cycle cooling water systems is implemented through plant operational surveillances or Technical Specification surveillances. **(Reference: 341, 642.4.001 and 309.1.1)** Visual inspections are performed to confirm the effectiveness of the program. Results of the inspections have not found any significant degradation in the systems nor have they identified any loss of system intended function. **(Reference: 636.1.010, PMVT0015, PM00120M, PM00184M, PM00189M and PM00209M)** Periodic testing and examination frequencies verify component operability and provide indications to allow repair or replacement if degradation is noted. System flows, temperatures, and discharge/suction pressures for normally operating systems are monitored as part of normal plant operational surveillances to demonstrate system operability.

c) This frequency and scope meet the guidelines of EPRI 1007820 for closed cycle cooling water systems. This has proven to be effective in maintaining closed cycle cooling water system and component intended functions by the operating experience Oyster Creek.

EDG inspection activities monitor for loss of material and buildup of deposit aging effects every 2 years. **(Reference: 636.1.010)** EDG operability tests are performed monthly and verify proper coolant temperature during system operation under load in accordance with Technical Specifications Sections 3.7.C and 4.7.A. **(Reference: 341, 636.4.003 and 636.4.013)** Additionally, the EDG water pumps are replaced every 2 years. **(Reference: PM86104A and PM86104B)**

The RBCCW system is tested quarterly in accordance with Technical Specifications Sections 4.3.C and as part of the IST program therefore all required operational parameters; pump flow and discharge/suction pressures and heat exchangers flow, temperatures and differential pressure are tested and monitored. **(Reference: 642.4.001)** The TBCCW system operating parameters such as pump discharge/suction pressures and heat exchanger temperatures and differential pressure are monitored by operations whenever the system is in service. **(Reference: 309.1.1)** System flows, temperatures, and discharge/suction pressures are monitored as part of normal plant operational surveillances. The delta P across the RBCCW & TBCCW heat exchangers is monitored. Increased delta P is an indication of fouling/heat transfer degradation. Cleanings are schedule when delta P limits are reached. **(Reference: 642.4.001 and 309.1.1)**

<u>Exceptions to NUREG-1801, Element 5:</u>

NUREG 1801 refers to EPRI TR-107396 Closed Cooling Water Chemistry Guidelines 1997 Revision. Oyster Creek implements the guidance provided in EPRI 1007820 "Closed Cooling Water Chemistry Guideline, Revision 1" which is the 2004 Revision to TR-107396. EPRI periodically updates industry water chemistry guidelines, as new information becomes available. Oyster Creek has reviewed EPRI 1007820 and has determined that the most significant difference is that the new revision provides more prescriptive guidance and has a more conservative monitoring approach. EPRI 1007820 meets the same requirements of EPRI TR-107396 for maintaining conditions to minimize corrosion and microbiological growth in closed cooling water systems for effectively mitigating many aging effects.

<u>Enhancements to NUREG-1801, Element 5:</u>

None.

<u>Comparison and Evaluation Conclusion:</u>

This element is consistent with NUREG-1801, Element 5; Monitoring and Trending with exceptions as described above.

3.5 Acceptance Criteria

<u>NUREG-1801:</u>

a) Corrosion inhibitor concentrations are maintained within the limits specified in the EPRI water chemistry guidelines for CCCW.

b) System and component performance test results are evaluated in accordance with system and component design basis requirements.

c) Acceptance criteria and tolerances are to be based on system design parameters and functions.

Oyster Creek:

a) Water chemistry, chemical additives, and corrosion inhibitor concentrations are maintained using corporate and station procedures. For nitrite and molybdate inhibitor based CCW systems, limits in these procedures are within the limits specified in EPRI 1007820. **(Reference: CY-AA-120-400)** See Section 3.4 for specific parameters and limits.

b) EDG operability tests are performed monthly and verify proper coolant temperature during system operation under load in accordance with Technical Specifications Sections 3.7.C and 4.7.A. **(Reference: 341, 636.4.003 and 636.4.013)** The RBCCW system is tested quarterly in accordance with Technical Specifications Sections 4.3.C and as part of the IST program; therefore all required operational parameters (pump flow and discharge/suction pressures and heat exchangers flow, temperatures and differential pressure) are tested and monitored. **(Reference: 642.4.001)** The TBCCW system operating parameters such as pump discharge/suction pressures and heat exchanger temperatures and differential pressure, are monitored by operations whenever the system is in service as part of normal plant operational surveillances. **(Reference: 309.1.1)**

c) Acceptance criteria and tolerancesare based on system design parameters and functions.

System and component performance test results are evaluated in accordance with the guidelines of EPRI 1007820 as well as station Technical Specifications. **(Reference: 642.4.001, 341, 636.4.003 and 636.4.013)**

CCW Action Level 1 conditions are those that can be addressed using the 12-week work schedule concept, with <u>no</u> discernable increases in corrosion rates or impact on system efficiency. CCW Action Level 1 denotes a condition where system chemistry Control Parameters are outside the normal operating levels (Goal range). The recommended action is to increase monitoring frequency, as appropriate, and return the parameter to within the prescribed Goal range within 90 days. If the parameter has not returned to the normal operating range within 90 days, CCW Action Level 2 is entered. CCW Action Level 2 communicates a more serious condition, requiring action outside the normal 12-week work schedule. Values exceeding the CCW Action Level 2 threshold could initiate short-term system materials degradation. The recommended action is to return the parameter to within the prescribed Goal range within thirty (30) days. If after 30 days in CCW Action Level 2 the parameter has not returned to the normal range, and system operation is to continue, then a risk assessment (engineering evaluation) will be performed to determine ifthe out of control parameter will impact the long term reliability of the system. **(Reference: CY-AA-120-400)**

For components in the scope of license renewal with leakage boundary (spatial) and structural integrity (attached) intended functions that may be exposed to stagnant flow areas, a one-time inspection in accordance with B.1.24, One-Time Inspection Program, will be conducted to confirm the absence of aging effects. Inspections will be conducted using VT-3 techniques and acceptance criteria. Results will be evaluated by engineering to determine existence and rate of aging, the need for follow-up examinations, and appropriate corrective actions. **(Reference: PBD-AMP-B.1.24)**

Exceptions to NUREG-1801, Element 6:

NUREG 1801 refers to EPRI TR-107396 Closed Cooling Water Chemistry Guidelines 1997 Revision. Oyster Creek implements the guidance provided in EPRI 1007820 "Closed Cooling Water Chemistry Guideline, Revision 1" which is the 2004 Revision to TR-107396. EPRI periodically updates industry water chemistry guidelines, as new information becomes available. Oyster Creek has reviewed EPRI 1007820 and has determined that the most significant difference is that the new revision provides more prescriptive guidance and has a more conservative monitoring approach. EPRI 1007820 meets the same requirements of EPRI TR-107396 for maintaining conditions to minimize corrosion and microbiological growth in closed cooling water systems for effectively mitigating many aging effects.

Enhancements to NUREG-1801, Element 6:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 6, Acceptance Criteria with exceptions as described above.

3.6 Corrective Actions

NUREG-1801:

a) *Corrosion inhibitor concentrations outside the allowable limits are returned to the acceptable range within the time period specified in the EPRI water chemistry guidelines for CCCW.*

b) *If the system or component fails to perform adequately, corrective actions are taken. 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) CCW Action Level 1 conditions are those that can be addressed using the 12-week work schedule concept, with no discernable increases in corrosion rates or impact on system efficiency. CCW Action Level 1 denotes a condition where system chemistry Control Parameters are outside the normal operating levels (Goal range). The recommended action is to increase monitoring frequency, as appropriate, and return the parameter to within the prescribed Goal range within 90 days. If the parameter has not returned to the normal operating range within 90 days, CCW Action Level 2 is entered. CCW Action Level 2 communicates a more serious condition, requiring action outside the normal 12-week work schedule. Values exceeding the CCW Action Level 2 threshold could initiate short-term system materials degradation. The recommended action is to return the parameter to within the prescribed Goal range within thirty (30) days. If after 30 days in CCW Action Level 2 the parameter has not returned to the normal range, and system operation is to continue, then a risk assessment (engineering evaluation) shall be performed indicating that the out of control parameter will not impact the long term reliability of the system. Corrosion inhibitor concentrations outside the allowable limits are returned to the acceptable range within the time period specified in the EPRI water chemistry guidelines for CCCW. **(Reference: CY-AA-120-400)**

b) 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. **(Reference: CY-AA-120-400)** The corrective action process 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 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.

3.7 Confirmation Process

NUREG-1801:

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. 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 and administrative controls.

Oyster Creek:

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.

3.8 Administrative Controls

NUREG-1801:

See Item 8, above.

Oyster Creek:

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.

3.9 Operating Experience

NUREG-1801:

Degradation of closed-cycle cooling water systems due to corrosion product buildup (NRC Licensee Event Report [LER] 50-327/93-029-00) or through-wall cracks in supply lines (NRC 50-280/91-019-00) has been observed in operating plants. Accordingly, operating experience demonstrates the need for this program.

Oyster Creek:

Review of industry operating experience has confirmed that Degradation of closed-cycle cooling water systems due to corrosion product buildup (NRC Licensee Event Report [LER] 50-327/93-029-00 - Sequoyah) or through-wall cracks in supply lines (NRC 50-280/91-019-00 - Surry) has been observed in operating plants. A review of plant operating experience at Oyster Creek shows that loss of material and reduction of heat transfer has occurred in several closed cooling water systems. In most cases, the existing Closed Cycle Cooling Water aging management program has identified the degradation and adverse chemistry trends. Actions have been taken in a timely manner to return chemistry parameters to within acceptable limits and to investigate and repair degradation, if necessary. The experience at Oyster Creek with the Closed Cycle Cooling Water program shows that the Closed Cycle Cooling Water program is effective in managing loss of material and reduction of heat transfer by performing visual inspections of components, maintaining chemistry parameters within the EPRI recommended limits, performing UT inspections on system piping and monitoring system performance via station surveillance procedures.

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 Closed Cycle Cooling Water program is being adequately managed in piping, piping components, piping elements and heat exchangers. The following examples of operating experience provide objective evidence that the Closed Cycle Cooling Water program is effective in assuring that intended function(s) will be maintained consistent with the CLB for the period of extended operation:

1) In 2000, UT measurements were taken on RBCCW piping. The results showed that there was extensive pitting on the outside of the piping. The lowest reading was 0.197" with other readings well above 0.300". The minimum wall thickness for the pipe is 0.100" for 8" pipe and 0.125" for 10" pipe. Therefore the actual thickness readings were well above that needed for minimum wall considerations. This example provides objective evidence that significant degradation of the RBCCW piping is not occurring from the inside (CCCW) of the piping and that minimum wall thickness is being maintained. **(Reference: CAP O2000-1408)**

2) In 2001 Water Technology Consultants, Inc performed an assessment of the CCCW Program. The results showed that the RBCCW and TBCCW testing frequency, per site procedures, were met. However, the EDGCCW monitoring did not meet the specified quarterly frequency. **(Reference: Closed Cooling Water Chemistry Assessment Oyster Creek Nuclear Generating Station – Final Report September 6, 2001)** Conversely, since 1999 analysis of pH, azole (Benzotriazole), and nitrite have never entered an action level per the most recent EPRI guidelines. Additionally the closed cycle cooling water is replaced every 2 years. This ensures that corrosion prevention is adequate in the EDG closed cycle cooling water system.

3) The Water Technology Consultants, Inc assessment report also documented that there have been some pipe wall thickness measurements performed in the RBCCW and TBCCW systems and based on this testing there have been no indications of pipe wall loss. **(Reference: Closed Cooling Water Chemistry Assessment Oyster Creek Nuclear Generating Station – Final Report September 6, 2001)**

4) In 2002 Oyster Creek increased their desired molybdate range in all of the closed cycle cooling water systems from 50-125 ppm to 200-1000 ppm. This enabled Oyster Creek to align with industry best practices. This example provides objective evidence that the Closed Cycle Cooling Water program is continually monitoring the system parameters and adjusting the program in an effort to improve the program.

5) In 2004, the pH in the TBCCW system decreased outside the Action Level 1 range for pH. A caustic add was made that returned pH back in spec within the acceptable time period for correcting an Action Level 1 CCW limit. This example provides objective evidence that the Closed Cycle Cooling Water program is effective in monitoring system parameters and returning any adverse trends to within the levels specified in EPRI 1007820 in a timely manner.

The operating experience of the Closed Cycle Cooling Water program did not show any adverse trend in performance. In addition to mitigating loss of material and buildup of deposits by maintaining water chemistry, Oyster Creek monitors the RBCCW, TBCCW and EDGCW for microbiological growth (total bacteria colonies) in accordance with EPRI1007820, "Closed Cooling Water Chemistry Guidelines." To date there have been no adverse trends associated with microbiological growth in closed cycle cooling water systems. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence. The Oyster Creek Closed Cycle Cooling Water program has identified when monitored parameters are outside of acceptable ranges and has and returned any adverse trends to within the levels specified in EPRI 1007820 in a timely manner. Additionally the program is continually monitoring the system parameters and adjusting the program in an effort to improve the Closed Cycle Cooling Water program. There is sufficient confidence that the implementation of the Closed Cycle Cooling Water program will effectively determine loss of material and reduction of heat transfer.

3.10 Conclusion

The Oyster Creek Closed Cycle Cooling Water aging management program is credited for managing loss of material and reduction of heat transfer for the systems, components, and environments listed in Table 5.2. The Oyster Creek Closed Cycle Cooling Water program's elements have been evaluated against NUREG-1801 in Section 3.0. Program exceptions have been identified in Section 2.3. No program enhancements were 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 Closed Cycle Cooling Water aging management program provides reasonable assurance that loss of material and reduction of heat transfer 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 EPRI 1007820, *Closed Cooling Water Chemistry Guideline, Revision 1*

4.3 Oyster Creek Program References

4.3.1 OC-4, *Program Plan Oyster Creek Generating Station Inservice Pressure Testing Program Fourth Inspection Interval*

4.3.2 Oyster Creek Technical Specifications Sections 3.7.C and 4.7.A and 4.3.C.

4.3.3 Water Technology Consultants, Inc., *Closed Cooling Water Chemistry Assessment Oyster Creek Nuclear Generating Station* – Final Report September 6, 2001

5.0 TABLES

5.1 Aging Management Program Implementing Documents

Procedure Number	Procedure Title	Commitment No.	Status

309.1.1	Turbine Building Closed Cooling Water Routine Evolutions	330592.14.13	ACC/ASG
341	Emergency Diesel Generator Operation	330592.14.08	ACC/ASG
636.1.010	Diesel Generator Inspection (24)	330592.14.12	ACC/ASG
636.4.003	Diesel Generator #1 Load Test	330592.14.05	ACC/ASG
636.4.013	Diesel Generator #2 Load Test	330592.14.15	ACC/ASG
642.4.001	RBCCW Inservice Test	330592.14.11	ACC/ASG
CY-OC-120-110	Chemistry Limits and Frequencies	330592.14.14	ACC/ASG
CY-AA-120-400	Closed Cooling Water Chemistry	330592.14.10	ACC/ASG
ER-AA-2030	Conduct of Plant Engineering Manual	330592.14.17	ACC/ASG
PM00120M	Inspect, clean & replace anodes in the TBCCW HX	330592.14.16	ACC/ASG
PM00184M	Clean HX and Replace Anodes in the Heat Exchanger (TBCCW)	330592.14.02	ACC/ASG
PM00189M	Inspect, clean & replace anodes in the RBCCW HX	330592.14.07	ACC/ASG
PM00209M	Inspect, clean & replace anodes in the RBCCW HX	330592.14.06	ACC/ASG
PM86104A	Replace #2 EDG Water Pump	330592.14.03	ACC/ASG
PM86104A	Replace #1 EDG Water Pump	330592.14.04	ACC/ASG
PMVT0015	VT-2 Inspection of Pipe & comps on RBCCW	330592.14.01	ACC/ASG

5.2 Aging Management Review Results

SSC Name	Structure and/or Component	Material	Environment	Aging Effect
Emergency Diesel Generator and Auxiliary System	Temperature Control Manifold (Water Cooling)	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Sensor Element (Temperature Control Manifold)	Stainless Steel	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Sensor Element (Temperature Control Manifold)	Brass	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Tanks (Immersion Heater)	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Tanks (Water Tank)	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Heat Exchangers (Radiator)	Brass (tubes)	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Heat Exchangers (Radiator)	Brass (tube side components)	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Heat Exchanger (Lube Oil Cooler)	Brass (tubes)	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Thermowell	Brass	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Restricting Orifice	Brass	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Restricting Orifice	Brass	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Valve Body	Stainless Steel	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Piping and fittings	Stainless Steel	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Sensor Element (Temperature Control Manifold)	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Valve Body	Brass	Closed Cooling Water (Internal)	Loss of Material
Emergency Diesel Generator and Auxiliary System	Piping and fittings	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material

Main Steam System	Coolers (Sample)	Stainless Steel (Tube Side Components)	Closed Cooling Water (External)	Loss of Material
Process Sampling System	Thermowell	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Process Sampling System	Piping and fittings	Carbon and low alloy steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Process Sampling System	Pump Casing	Carbon and low alloy steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Process Sampling System	Tanks (Reservoir)	Carbon and low alloy steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Process Sampling System	Piping and fittings	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Process Sampling System	Evaporator	Copper	Closed Cooling Water < 140F (Internal)	Loss of Material
Process Sampling System	Valve Body	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Process Sampling System	Valve Body	Carbon and low alloy steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Thermowell	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Pump Casing (Chemical Feed Pump)	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Gauge Snubber	Stainless Steel	Closed Cooling Water <140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Gauge Snubber	Stainless Steel	Closed Cooling Water <140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Filter Housing	Stainless Steel	Closed Cooling Water <140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Level Glass	Copper Alloy	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Tanks (Chemical Mixing Tank)	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Flow Element	Stainless Steel	Closed Cooling Water <140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Valve Body	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Valve Body	Stainless Steel	Closed Cooling Water <140F (Internal)	Loss of Material

Reactor Building Closed Cooling Water System	Valve Body	Copper Alloy	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Valve Body	Stainless Steel	Closed Cooling Water <140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Valve Body	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Piping and fittings	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Thermowell	Stainless Steel	Closed Cooling Water <140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Piping and fittings	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Piping and fittings	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Sample)	Copper	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Piping and fittings	Stainless Steel	Closed Cooling Water <140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Core Spray Pump Room)	Copper	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Tunnel)	Copper	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Post Accident Sample)	Copper	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Shutdown Cooling Pumps)	Copper (Seal Cooler Tubes)	Closed Cooling Water (External)	Reduction of Heat Transfer
Reactor Building Closed Cooling Water System	Coolers (Shutdown Cooling Pumps)	Cast Iron (Bearing Housing Cooler)	Closed Cooling Water (Internal)	Reduction of Heat Transfer
Reactor Building Closed Cooling Water System	Coolers (Shutdown Cooling Pumps)	Copper (Seal Cooler Tubes and Tube Side Components)	Closed Cooling Water (External)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Drywell Equipment Drain Tank)	Carbon Steel (Covers)	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Shutdown Cooling Pumps)	Cast Iron (Bearing Housing Cooler)	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Drywell Equipment Drain Tank)	Stainless Steel (Nozzles, Plates)	Closed Cooling Water < 140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Cleanup Pre-coat Pump)	Carbon Steel (Shell Side Components)	Closed Cooling Water (Internal)	Loss of Material

Reactor Building Closed Cooling Water System	Coolers (Drywell Cooling Units)	Copper	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Cleanup Recirc. Pumps Lube Oil)	Cast Iron (Tube Side Components)	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Cleanup Auxiliary Pump)	Cast Iron (Bearing Housing Cooler)	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Cleanup Auxiliary Pump)	Carbon Steel (Pedestal Cooler)	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Piping and fittings	Cast Iron	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Cleanup Auxiliary Pump)	Stainless Steel (Seal Cooler)	Closed Cooling Water < 140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Coolers (Shutdown Cooling Pumps)	Carbon Steel (Seal Cooler Shell Side Components)	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Fuel Pool Cooling)	Carbon Steel (Tubes)	Closed Cooling Water (External)	Reduction of Heat Transfer
Reactor Building Closed Cooling Water System	Thermowell	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Valve Body	Copper Alloy	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Thermowell	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Rupture Disks	Aluminum	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Pump Casing (RBCCW Pumps)	Cast Iron	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Tanks (RBCCW Surge Tank)	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Shutdown Cooling)	Stainless Steel (Tubes)	Closed Cooling Water (External)	Reduction of Heat Transfer
Reactor Building Closed Cooling Water System	Coolers (Containment Spray Pump Room)	Copper	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Shutdown Cooling)	Carbon Steel (Shell Side Components)	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Fuel Pool Cooling)	Carbon Steel (Shell Side Components)	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Fuel Pool Cooling)	Carbon Steel (Tubes)	Closed Cooling Water (External)	Loss of Material

Reactor Building Closed Cooling Water System	Heat Exchangers (Augmented Fuel Pool Cooling)	Stainless Steel (Plates)	Closed Cooling Water (Internal)	Reduction of Heat Transfer
Reactor Building Closed Cooling Water System	Strainer Body	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Augmented Fuel Pool Cooling)	Stainless Steel (Plates)	Closed Cooling Water < 140F (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Augmented Fuel Pool Cooling)	Carbon Steel (Covers, Nozzles)	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Cleanup Non-Regenerative)	Carbon Steel (Shell Side Components)	Closed Cooling Water (Internal)	Loss of Material
Reactor Building Closed Cooling Water System	Heat Exchangers (Shutdown Cooling)	Stainless Steel (Tubes)	Closed Cooling Water <140F (External)	Loss of Material
Service Water System	Heat Exchangers (RBCCW)	Titanium (Tubes)	Closed Cooling Water (External)	Loss of Material
Service Water System	Heat Exchangers (RBCCW)	Carbon Steel (Shell Side Components)	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Flow Glass	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Control Room AC)	Carbon Steel - Shell Side Components	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Tanks (Surge, Chemical Mixing, Closed Cooling Water)	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Gauge Snubber	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Flow Element	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Filter Housing	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Valve Body	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Flexible Connection	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Thermowell	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Strainer Body	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Heat Exchangers (TBCCW)	Carbon and low alloy steel - Shell Side Components	Closed Cooling Water (Internal)	Loss of Material

Turbine Building Closed Cooling Water System	Level Glass	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Piping and fittings	Galvanized Steel	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Service Air Compressor Aftercooler)	Carbon Steel - Shell Side Components	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Valve Body	Copper Alloy	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Piping and fittings	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Piping and fittings	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Final Feedwater Facility)	Stainless Steel - Shell Side Components	Closed Cooling Water < 140F (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Service Air Compressor InterCooler)	Carbon Steel - Tube Side Components	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Service Air Compressor Cylinders)	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Reactor Recirculation Pump M-G Sets)	Copper Alloy - Tube Side Components	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Turbine Lube Oil)	Carbon Steel - Tube Side Components	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Feedwater and Main Steam Sample)	Copper	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Pump Casing (TBCCW Pumps, Chemical Feed Pump)	Cast Iron	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Valve Body	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Thermal Control Unit)	Carbon Steel - Shell Side Components	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Condenser Vacuum Pump)	Copper Alloy - Tube Side Components	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Condensate Pump Motor)	Copper Alloy	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Feedwater Pump Lube Oil)	Copper Alloy - Tube Side Components	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Coolers (Stator Winding Liquid)	Carbon Steel - Tube Side Components	Closed Cooling Water (Internal)	Loss of Material

Turbine Building Closed Cooling Water System	Coolers (Hydrogen)	Cast Iron - Tube Side Components	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Heat Exchangers (Generator Bus)	Copper - Tube Side Components	Closed Cooling Water (Internal)	Loss of Material
Turbine Building Closed Cooling Water System	Thermowell	Stainless Steel	Closed Cooling Water < 140F (Internal)	Loss of Material

6.0 ATTACHMENTS

6.1 LRA Appendix A

6.2 LRA Appendix B

PROGRAM BASIS DOCUMENT

PBD-AMP-B.1.32

Revision 0

RG 1.127, INSPECTION OF WATER-CONTROL STRUCTURES ASSOCIATED WITH NUCLEAR POWER PLANTS

GALL PROGRAM XI.S7 – RG 1.127, INSPECTION OF WATER-CONTROL STRUCTURES ASSOCIATED WITH NUCLEAR POWER PLANTS

Prepared By:

Reviewed By:

Program Owner Review:

Technical Lead Approval:

Revision History:

Revision	*Prepared by:*	*Reviewed by:*	*Program Owner:*	*Approved by:*
0	*A. Ouaou*	*T.Quintenz*	*S. Niogi*	*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 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program that are credited for managing loss of material, cracking, change in material properties, and loss of form for components of the Intake Structure and Canal (Ultimate Heat Sink), the Dilution Structure, the intake structure trash racks, and the Fire Pond Dam 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 for implementing 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.S7, Inspection of Water-Control Structures Associated with Nuclear Power Plants. 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

<u>NUREG-1801:</u>

a) *Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.127, Revision 1, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," describes an acceptable basis for developing an inservice inspection and surveillance program for dams, slopes, canals, and other water-control structures associated with emergency cooling water systems or flood protection of nuclear power plants. The RG 1.127 program addresses age-related deterioration, degradation due to extreme environmental conditions, and the effects of natural phenomena that may affect water-control structures. The RG 1.127 program recognizes the importance of periodic monitoring and maintenance of water-control structures so that the consequences of age-related deterioration and degradation can be prevented or mitigated in a timely manner.*

b) *RG 1.127 provides detailed guidance for the licensee's inspection program for water-control structures, including guidance on engineering data compilation, inspection activities, technical evaluation, inspection frequency, and the content of inspection reports. Water-control structures covered by the RG 1.127 program include concrete structures; embankment structures; spillway structures and outlet works; reservoirs;*

cooling water channels and canals, and intake and discharge structures; and safety and performance instrumentation. RG 1.127 delineates current NRC practice in evaluating inservice inspection programs for water-control structures. The attributes of an acceptable aging management program (AMP) for license renewal are described below.

c) *For plants not committed to RG 1.127, Revision 1, aging management of water-control structures may be included in the Structures Monitoring Program (XI.S6). Even if plant is committed to RG 1.127, Revision 1, aging management of certain structures and components may be included in the Structures Monitoring Program (XI.S6). However, details pertaining to water-control structures are to incorporate the attributes described herein.*

<u>Oyster Creek:</u>

a) The Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program is an existing program that will be enhanced to require inspection of water control structures identified in the current licensing basis (CLB) that are in scope of license renewal consistent with the requirements of NRC RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants. These structures include the Intake Structure and Canal (Ultimate Heat Sink), Fire Pond Dam, and intake structure trash racks. The scope of the program will also include the Dilution Structure, which is not identified in the CLB as a water control structure, but determined to be part of the intake canal (Ultimate Heat Sink) boundary for license renewal. Structural components and commodities of the structures that are monitored under the existing program include reinforced concrete members, earthen water control structures (intake canal, embankments), and various components of the Fire Pond Dam **(Reference: 125.6)**

The Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program addresses age-related deterioration, degradation due to extreme environmental conditions, and the effects of natural phenomena that may affect the safety function of the water control structures **(Reference: 125.6, ABN-31 paragraph 3.6.11(G); ABN-38 paragraph 3.3)**. Elements of the program are designed to detect degradations and take corrective actions to prevent a loss of an intended function.

The Fire Pond Dam is a small earthen dam with timber spillway designed to impound fresh water used primarily for fire protection. The dam is classified hazard category III (low hazard) and subject to periodic inspections to satisfy the requirements of New Jersey Dam Safety Standards, N.J.A.C 7:20-1.1 et seq (**Reference: 4.3.13**). Inspection activities, technical evaluation, inspection frequency, and the content of the inspection report are consistent with the requirements of RG. 1.127 guidance. The dam is not currently addressed in the Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants aging management program implementing procedures. The dam however is inspected to ensure public safety consistent with NRC RG 1.127 requirements. The program implementing procedure (**Reference: 125.6**) will be enhanced to include monitoring of the dam.

b) The Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plants is implemented through the Oyster Creek Structures Monitoring aging management program B.1.31. The program provides guidance for inspecting the Intake Structure and Canal (Ultimate Heat Sink), including earthen water control structures (intake canal, embankments), and the Dilution Structure (**Reference: 125.6 paragraph 2.0**). The enhanced program will provide additional guidance as described in section 2.4 to ensure consistency with NUREG-1801, Program XI.S7, Inspection of Water Control Structures Associated With Nuclear Power Plants.

Safety and performance instrumentation such as seismic instrumentation, horizontal and vertical movement instrumentation, uplift instrumentation, and other instrumentation described in RG 1.127 are not incorporated in the design of Oyster Creek water control structures. Thus inspection activities related to safety and performance instrumentation are not applicable, and are not specified in the implementing documents.

Inspections of water control structures, other than the Fire Pond Dam, are conducted by or under the direction of qualified engineers experienced in the investigation, design, construction, and operation of the structures. A professional engineer licensed to inspect dams conducts inspection of the dam. Inspections are conducted systemtically using checklists and other documents as required to minimize the possibility of overlooking significant features (**Reference: 125.6 paragraph 7, Attachment 125.6-1; 4.3.13**). Technical evaluations are performed if observed degradations have the potential for impacting the intended function of the water control structures. Inspections frequency is every 4 years except for submerged structures, which are inspected when the structures are dewatered. The program will be enhanced as described in Section 2.4 to provide additional assurance that age related degradations are detected and corrected before a loss of an intended function.

c) The Oyster Creek original design did not commit to the requirements of RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. However in response to NUREG-0822, Integrated Plant Safety Assessment Systematic Evaluation Program (SEP) Topic III-3.C, Oyster Creek evaluated water control structures consistent with the requirements of RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants, and presented to the NRC the evaluation results and the proposed Oyster Creek RG. 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. surveillance program. In a letter dated June 24, 1982, the NRC provided the results of its review and comments on the proposed surveillance program This letter and NUREG-1382, Safety Evaluation Report related to the full-term operating license for Oyster Creek Nuclear Generating Station (**Reference: 4.3.18; 4.32**) formed the basis for the existing Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program. Elements of the program have been incorporated in the Oyster Creek Structures Monitoring aging management program; except for the Fire Pond Dam.

The Fire Pond Dam is currently inspected under the New Jersey Dam Safety Standards, N.J.A.C 7:20-1.1 et seq. The dam inspection will be administered under the Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program for the period of extended operation.

2.2 Overall NUREG-1801 Consistency

The Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants is consistent with NUREG-1801 aging management program XI.S7, Inspection of Water-Control Structures Associated with Nuclear Power Plants, with exceptions and enhancements described below.

2.3 Summary of Exceptions to NUREG-1801

The Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants takes exception to the inspection frequency specified in NUREG-1801 XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. This exception is applicable only to submerged structures. Technical basis for this exception is explained in Section 3.4 below. *This is a new exception not previously identified in the LRA*

2.4 Summary of Enhancements to NUREG-1801

The existing Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program is found to be adequate to support the extended period of operation with following enhancements.

- The program will provide for monitoring of submerged structural components and trash racks.
- Parameters monitored will be enhanced to include change in material properties, due to leaching of calcium hydroxide, and aggressive chemical attack.
- Add the requirement to inspect steel components for loss of material, due to corrosion
- Add the requirement to inspect wooden piles and sheeting for loss of material and change in material properties.
- The program will provide for periodic inspection of components submerged in salt water (Intake Structure and Canal, Dilution structure) and in the water of the fire pond dam.
- The program will be enhanced to include periodic inspection of the Fire Pond Dam for loss of material and loss of form.
- The program will be enhanced to require performing a baseline inspection of submerged water control structures

prior to entering the period of extended operation. A second inspection will be performed 6 years after this baseline inspection and a third 8 years after the second. After each inspection an evaluation will be performed to determine if the identified degradations warrant more frequent inspections or corrective actions. *This constitutes a new enhancement not previously identified in the LRA.*

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.

3.0 Scope of Program

NUREG-1801:

a) *RG 1.127 applies to water-control structures associated with emergency cooling water systems or flood protection of nuclear power plants.*

b) *The water-control structures included in the RG 1.127 program are concrete structures; embankment structures; spillway structures and outlet works; reservoirs; cooling water channels and canals, and intake and discharge structures; and safety and performance instrumentation.*

Oyster Creek:

a) The Oyster RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants applies to water control structures associated with emergency cooling water system. The program will be enhanced to include the Fire Pond Dam. There are no water control structures that are credited for flood protection.

b) Water control structures in scope of license renewal are included in the scope Oyster Creek RG. 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program. These structures are the Intake Structure and Canal (Ultimate Heat Sink), the Dilution Structure, and the intake structure trash racks. Structural components and commodities of the structures that are monitored under the existing program include reinforced concrete members, and earthen water control structures (intake canal, embankments. The enhanced program will include the Fire Pond Dam and its various components, including the spillway, and embankments.

There are no safety and performance instrumentation such as seismic instrumentation, horizontal and vertical movement instrumentation, uplift instrumentation, and other instrumentation described in RG 1.127 in the scope of Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plants aging management program. These instrumentations are not incorporated in the design of Oyster Creek water control structures.

The Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program manages the aging effect of loss of material, cracking, change in material properties, and loss of form for water control structures, components, and environments listed in Table 5.2. Intake structure trash racks are not included in Table 5.2; but the trash racks are included with components monitored under the Oyster Creek Structures Monitoring aging management program. 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:

- The program will provide for monitoring of submerged structural components and trash racks.
- The program will provide for periodic inspection of components submerged in salt water (Intake Structure and Canal, Dilution structure) and in the water of the Fire Pond Dam.
- The program will be enhanced to include periodic inspection of the Fire Pond Dam for loss of material and loss of form.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801 Program, XI.S7, Inspection of Water-Control Structures Associated with Nuclear Power Plants, Element 1, Scope of Program, with enhancements

3.1 Preventive Actions

NUREG-1801:

No preventive actions are specified; RG 1.127 is a monitoring program.

Oyster Creek:

The Oyster Creek RG 1.127, Inspection of Water-Control Structures aging management program, specifies no preventive actions. The program is a condition monitoring program established to detect age related degradations and deteriorations due to extreme environmental conditions, and the effects of natural phenomena that may affect the water control structures.

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, XI.S7, Inspection of Water-Control Structures Associated with Nuclear Power Plants, Element 2, Preventive Actions.

3.2 Parameters Monitored or Inspected

NUREG-1801:

a) RG 1.127 identifies the parameters to be monitored and inspected for water-control structures. The parameters vary depending on the particular structure. Parameters to be monitored and inspected for concrete structures include cracking, movements (e.g., settlement, heaving, deflection), conditions at junctions with abutments and embankments, erosion, cavitation, seepage, and leakage.

b) Parameters to be monitored and inspected for earthen embankment structures include settlement, depressions, sink holes, slope stability (e.g., irregularities in alignment and variances from originally constructed slopes), seepage, proper functioning of drainage systems, and degradation of slope *protection features.*

c) *Further details of parameters to be monitored and inspected for these and other water-control structures are specified in Section C.2 of RG 1.127.*

Oyster Creek:

a) Parameters monitored/inspected for reinforced concrete components include loss of material due to various aging mechanisms, including erosion and cavitation, cracking due to various aging mechanisms including settlement, and change in material properties due to leaching of calcium hydroxide. Steel components associated with earthen water control structures (intake canal, embankments), Fire Pond Dam, and trash racks are monitored for loss of material due to pitting and corrosion. Wooden components are monitored/inspected for loss of material and change in material properties. Slopes for earthen water control structures at junction with abutments are monitored for loss of material and loss of form (cracks, sinkholes, erosion, and slope instability).

b) Parameters monitored and inspected for earthen water control structures include settlement, depressions, sink holes, slope stability (e.g., irregularities in alignment and variances from originally constructed slopes), and loss of slope protection liner. These parameters are considered loss of material and loss of form. Earthen water control structures have no drainage systems, and thus monitoring of drainage systems is not applicable.

c) Details of parameters monitored are consistent with the guidance specified in Section C.2 of RG 1.127.

Exceptions to NUREG-1801, Element 3:

None.

Enhancements to NUREG-1801, Element 3:

- Parameters monitored for concrete will be enhanced to include change in material properties, due to leaching of calcium hydroxide, and aggressive chemical attack.
- Parameters monitored will include inspection of steel components for loss of material due to corrosion and pitting.
- Parameters monitored will include inspection of wooden piles and sheeting for loss of material and change in

material properties.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, XI.S7, Inspection of Water-Control Structures Associated with Nuclear Power Plants, Element 3, Parameters Monitored or Inspected, with enhancements.

3.3 Detection of Aging Effects

NUREG-1801:

a) *Visual inspections are primarily used to detect degradation of water-control structures. In some cases, instruments have been installed to measure the behavior of water-control structures.*

b) *RG 1.127 indicates that the available records and readings of installed instruments are to be reviewed to detect any unusual performance or distress that may be indicative of degradation.*

c) *RG 1.127 describes periodic inspections, to be performed at least once every five years.*

d) *Similar intervals of five years are specified in ACI 349.3R for inspection of structures continually exposed to fluids or retaining fluids. Such intervals have been shown to be adequate to detect degradation of water-control structures before they have a significant effect on plant safety. RG 1.127 also describes special inspections immediately following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, tornadoes, and intense local rainfalls.*

Oyster Creek:

a) Visual inspections are used to detect degradations of the Oyster Creek water control structures. Oyster Creek has no instruments that measure the behavior of water control structures. **(Reference: 125.6 paragraph 4.0)**

b) There are no records and readings of instruments to review. Oyster Creek current licensing basis has no requirements for instruments to detect behavior of the water control structures.

c) Oyster Creek water control structures are monitored periodically to detect age related degradations that could impact their intended function. Accessible structures are monitored on a frequency of 4 years consistent with the frequency for implementing the requirements of the 10 CFR Part 50.65, Maintenance Rule. Inaccessible structures are inspected when they become accessible. The intake structure components submerged in water are inspected when the structure is dewatered **(Reference: 125.6 paragraph 2.3)**.

As an enhancement to the existing Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program, Oyster Creek committed to inspect submerged structures prior to the period of extended operation. Additional inspections will be performed when the structures are dewatered or on a frequency not to exceed 10 years. After each inspection, the identified degradations will be evaluated to determine if more frequent inspections are warranted to ensure that the intended function of the water control structures is not adversely impacted.

During the NRC aging management program (AMP) review audit, the Staff indicated that the 10-year inspection frequency is not consistent with the 5-year frequency specified in NUREG-1801 Program XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants and requested technical basis for concluding a 10 year inspection frequency is sufficient for submerged portions of water control structures. Oyster Creek indicated that the review of the CLB concluded that the existing Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants program is based on SEP Topic III-3.C commitments, which do not address submerged structures. The 10-year inspection frequency was determined sufficient, based on operating experience, to detect significant age related degradations before an intended function of the water control structures is adversely impacted. Additionally Oyster Creek will perform a baseline inspection of underwater structures and evaluate identified age related degradations to establish if there is a need for more frequent inspection to provide reasonable assurance that aging effects are adequately managed. The Staff noted that the presented existing operating experience related to underwater structure is not sufficient for the Staff to conclude with reasonable assurance that the 10-year inspection frequency is adequate.

As a result of the Staff's concern, Oyster Creek agreed to perform a baseline inspection of submerged water control structures prior to entering the period of extended period of operation. A second inspection will be performed 6 years after the baseline inspection. A third inspection will be performed 8 years after the second inspection. Following each inspection, the identified degradations will be evaluated to determine if more frequent inspections are warranted or there is a need for corrective actions to ensure that age related degradations are adequately managed. *This constitutes a new enhancement not previously identified in the LRA.*

d) The Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants aging management program is not committed to the inspection frequencies specified in ACI 349.3R. The inspection frequency of Oyster Creek water control structures is discussed in item c) above.

The Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants program requires inspection of water control structures, associated with emergency cooling system, following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, and tornadoes. There are no requirements to inspect water control structures following intense local rainfalls because no part of the structures is credited for flood protection in the CLB **(Reference: ABN-31, paragraph 3.6.11(G); ABN-38 paragraph 3.3)**

<u>Exceptions to NUREG-1801, Element 4:</u>

The Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants takes exception to the inspection frequency specified in NUREG-1801 XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. This exception is applicable only to submerged structures. Technical basis for this exception is explained above. *This is a new exception not previously identified in the LRA.*

<u>Enhancements to NUREG-1801, Element 4:</u>

The Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants aging management program will be enhanced to require performing a baseline inspection of submerged water control structures prior to entering the extended period of operation. A second inspection will be performed 6 years after the baseline inspection, with a third inspection 8 years after the second. Following each inspection, the identified degradations will be evaluated to determine if more frequent inspections are warranted or there is a need for corrective actions to ensure that age related degradations are adequately managed. *This constitutes a new enhancement not previously identified in the LRA*

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801 XI.S7, Inspection of Water-Control Structures Associated with Nuclear Power Plants, Element 4, Detection of Aging Effects with enhancements and an exception.

3.4 Monitoring and Trending

NUREG-1801:

a) *Water-control structures are monitored by periodic inspection as described in RG 1.127.*

b) *In addition to monitoring the aging effects identified in Attribute (3) above, inspections also monitor the adequacy and quality of maintenance and operating procedures. RG 1.127 does not discuss trending.*

Oyster Creek:

a) Water control structures are monitored by periodic inspections consistent with RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants, except as noted in paragraph 3.4 above.

b) The Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants aging management program requires periodic inspection of water control structures for aging related degradations. The existing program contains no requirements for monitoring the adequacy and quality of maintenance and operating procedures. According to NRC RG 1.127 this requirement applies to the maintenance and operating procedures that pertain to the safety of the dam. The inspection of the Fire Pond Dam is conducted in accordance with New Jersey Department of Environmental Protection's Dam Safety Section,"Guidance for Inspection of Existing Dams" dated March 2004". The inspections include monitoring of maintenance and operating procedures related to the safety features of the dam **(Reference: 4.3.13 Appendix A).**

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 XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants, Element 5, Monitoring and Trending.

3.5 Acceptance Criteria

NUREG-1801:

a) *Acceptance criteria to evaluate the need for corrective actions are not specified in RG 1.127. However, the "Evaluation Criteria" provided in Chapter 5 of ACI 349.3R-96 provides*

b) *Acceptance criteria (including quantitative criteria) for determining the adequacy of observed aging effects and specifies criteria for further evaluation. Although not required, plant-specific acceptance criteria based on Chapter 5 of ACI 349.3R-96 are acceptable. Acceptance criteria for earthen structures such as dams, canals, and embankments are to be consistent with programs falling within the regulatory jurisdiction of the Federal Energy Regulatory Commission (FERC) or the U.S. Army Corps of Engineers.*

Oyster Creek:

a) The Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants aging management program uses quantitative criteria and qualified personnel for determining the adequacy of the observed aging effects. Acceptance criteria and criteria for further evaluation are provided in the program and are consistent with the criteria outlined in industry codes and standards including ACI 349.3R –96 **(Reference: 125.6 paragraph 4.2 and 7.0)**

b) For water structures other than the Fire Pond Dam, observed aging effects are evaluated by qualified personnel with experience in the design, and inspection of nuclear structures consistent with the requirements of 10 CFR Part 50.65**(Reference: 125.6 paragraph 4.2)**. The Fire Pond Dam is inspected by a professional engineer certified to perform dam inspection in accordance with the New Jersey Department of Environmental Protection's Dam Safety Section," Guidance for Inspection of Existing Dams" dated March 2004"Jersey. Acceptance criteria is based on quantitative evaluation of the dam's condition to ensure public safety consistent with the objective of FERC and RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants **(Reference: 4.3.13)**. These existing Fire Pond Dam inspections will be continued and administered under the Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants.

<u>Exceptions to NUREG-1801, Element 6:</u>

None.

<u>Enhancements to NUREG-1801, Element 6:</u>

None.

<u>Comparison and Evaluation Conclusion:</u>

This element is consistent with NUREG-1801 XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants, Element 6, Acceptance Criteria.

3.6 Corrective Actions

<u>NUREG-1801:</u>

RG 1.127 recommends that the licensee's inservice inspection and surveillance program include periodic inspections of water-control structures to identify deviations in structural conditions due to age-related deterioration and degradation from the original design basis. When findings indicate that significant changes have occurred, the conditions are to be evaluated. This includes a technical assessment of the causes of distress or abnormal conditions, an evaluation of the behavior or movement of the structure, and recommendations for remedial or mitigating measures. 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.

<u>Oyster Creek:</u>

The Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants aging management program requires periodic inspections of water control structures to identify deviations in structural conditions due to age-related deterioration and degradation from the original design basis. Evaluations are performed for inspection results that do not satisfy established criteria and an Issue Report is initiated to document the concern in accordance with 10 CFR Part 50, Appendix B, Corrective Action Program. The corrective action process 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 condition is determined and an action plan is developed to preclude repetition.

<u>Exceptions to NUREG-1801, Element 7:</u>

None.

<u>Enhancements to NUREG-1801, Element 7:</u>

None.

<u>Comparison and Evaluation Conclusion:</u>

This element is consistent with NUREG-1801 XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants, Element 7, Corrective Actions.

3.7 Confirmation Process

<u>NUREG-1801:</u>

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.

<u>Oyster Creek:</u>

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.

<u>Exceptions to NUREG-1801, Element 8:</u>

None.

<u>Enhancements to NUREG-1801, Element 8:</u>

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801 XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants, Element 8, Confirmation Process.

3.8 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.

Oyster Creek:

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 XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants, Element 9, Administrative Controls.

3.9 Operating Experience

NUREG-1801:

Degradation of water-control structures has been detected, through RG 1.127 programs, at a number of nuclear power plants, and in some cases, it has required remedial action. No loss of intended functions has resulted from these occurrences. Therefore, it can be concluded that the inspections implemented in accordance with the guidance in RG 1.127 have been successful in detecting significant degradation before loss of intended function occurs.

NOTE: For dam inspection and maintenance, programs under the regulatory jurisdiction of FERC or the U.S. Army Corps of Engineers, continued through the period of extended operation, will *be adequate for the purpose of aging management. For programs not falling under the regulatory jurisdiction of FERC or the U.S. Army Corps of Engineers, the staff will evaluate the effectiveness of the aging management program based on compatibility to the common practices of the FERC and Corps programs.*

Oyster Creek:

Review of industry operating experience noted that degradations have occurred in water control structures associated with nuclear power plants. The degradations were detected though the RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants aging management program and corrected before a loss of an intended function. The plant specific operating experience review also shows that degradations have occurred and have been identified through the Structures Monitoring aging management program which implements Oyster Creek RG 1.127, Inspection of Water Control Structures Associated With Nuclear Power Plants requirements. The degradations were generally minor; but some required corrective actions to ensure that the intended function is maintained.

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 loss of material, cracking, and change in material properties for concrete components, loss of material and change in material properties for wooden components, and loss of material, and loss of form for the dam, and the canal slopes is being adequately managed in water control structures. The following examples of operating experience provide objective evidence that the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program is effective in assuring that intended function(s) will be maintained consistent with the CLB for the period of extended operation:

1. In 1985, GPUN launched an investigation to evaluate the structural condition of the intake structure **(Reference: 4.3.17)**. Cracking attributed to freeze-thaw and some corrosion of rebar were observed on the operating deck underside. In the1986 refueling outage, GPUN dewatered the north bay of the intake structure, cleaned up the marine growth on the concrete surface under the water line and performed additional inspections, including taking core-bores for compressive strength testing. Only a few areas with minor degradations were found under the water line. Degraded areas were repaired before the north bay was returned to service. The repaired areas were inspected again during the 1994 refueling outage. A few areas of re-occurring rebar corrosion were observed and repaired.

   Similar degradations were observed on the operating deck of the south bay. The degradations were repaired during the 1988, 1989 refueling outage and re-inspected during the 1994 refueling outage. The inspection results of the south bay during the 1994 refueling outage showed that the structure is in good condition. Inspections performed in 2002 noted local spalling and cracking of concrete in addition to some rusted support members. The inspector concluded that the overall condition of the Intake structure is structurally sound and acceptable to perform its intended function. The 2002 inspection also identified minor cracks on the lower deck walls of the dilution structure. The cracks were determined not to have an adverse impact on the intended function of the structure.

   Inspection of the intake canal, performed in 2001, identified some cracks and fissures, voids, holes, and localized washout of coatings that protect embankment slopes from erosion. The degradations were evaluated and determined not to impact the intended function of the intake canal (Ultimate Heat Sink). The degradations are inspected periodically and evaluated to ensure that the intended function of the intake canal is not adversely impacted.

2. The 1992 "Regular Inspection" of the Fire Pond Dam identified two areas of the downstream sheeting that were bulging outward from the dam. To stabilize the situation, approximately 130 cubic yards of riprap was placed in the scour areas and along the entire downstream length of the spillway. Inspections performed in 2001 found no areas of erosion or structural instability. The inspection concluded that repairs made in 1992 seemed to have stabilized the spillway and no additional movement was noted during the inspection **(Reference 4.3.12 page 2; 4.3.13 paragraph 3)**.

   The 2004 "Informal Inspection" of the Fire Pond Dam noted signs of erosion downstream of the right spillway wing wall, which has exposed the lower part of the bulkhead. This could compromise the integrity of the spillway wing wall and further triggered erosion of the area. However the dam and appurtenant structures are in a safe condition **(Reference: 4.3.13 paragraph 5)**

3. CAP 00360630 was issued in August 2005 as a result of low level in the north structure. The cause of the low water level was attributed to debris accumulation on the trash racks. Also the trash racks collapsed due to excessive load of the debris and hydrostatic pressure. Inspection and evaluation of the failure mechanism of the trash rack concluded that the failure is not age degradation related. Instead, the failure was due to a design feature of the trash racks purposely provided to fail under excessive load to avoid catastrophic failure of the intake structure.

The operating experience of Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program did not show any adverse trend in 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 implementation of Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program will effectively manage age related degradations associated with water control structures consistent with the current licensing basis. Periodic self-assessments of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program are performed to identify the areas that need improvement to maintain the quality performance of the program.

3.10 Conclusion

The Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program is credited for managing loss of material, cracking, change in material properties, and loss of form for the structures, components, and environments listed in Table 5.2. The Oyster Creek RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants 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 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Structures aging management program provides reasonable assurance that managing loss of material, cracking, and change in material properties for concrete components, loss of material and change in material properties for wooden components, and loss of material, and loss of form for the dam, and the canal slopes and embankment 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 Regulatory Guide 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plants, Rev. 1

4.2.2 NEI 96-03, "Industry Guideline for Monitoring the Condition of Structures at Nuclear Power Plants", Revision D (draft).

4.2.3 ACI 349.3R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures".

4.3 Oyster Creek Program References

4.3.1 10 CFR Part 50, Section 65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants", Office of the Federal Register, National Archives and Records Administration, 2000.

4.3.2 NUREG-1382 Safety Evaluation Report related to the full-term operating license for Oyster Creek Nuclear Generating Station, Docket 50-219.

4.3.3 NUREG-0822, Integrated Plant Safety Assessment, Systematic Evaluation Program Oyster Creek Nuclear Generating Station, GPU Nuclear Corporation and Jersey Central Power & Light Company, Docket 50-219; Final Report dated January 1983.

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

4.3.5 NUMARC 93-01, Revision 2, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants", Nuclear Management and Resources Council, Inc.

4.3.6 Procedure 125.6, "Building Structure Monitoring Plan", Revision. 4

4.3.7 TDR 1245, "OC Plant Critical Structures, Life Extension Assessment".

4.3.8 Procedure ABN-32, "Abnormal Intake Level".

4.3.9 Procedures ABN-31, "High Winds"

4.3.10 Procedure ABN-38, "Station Seismic Event"

4.3.11 "Intake Structure Inspection Report, Run Cycle 16 Nov. 1996"

4.3.12 Report No. 176-1, Regular Dam Inspection Report, Freshwater Impounding Pond Dam Oyster Creek Generating Station dated November 2001.

4.3.13 2004 Informal Inspection of Fresh Water Impounding of Fresh Water Impounding Pond Dam at Oyster Creek Generating Station File No. 33-24, dated January 2005.

4.3.14 Final Report on Evaluation of the Bulkhead Repairs at the Oyster Creek Nuclear Generating Station, dated April 1988.

4.3.15 CAP No. 02001-0747, "The Trash rack rail at the intake structure is severely corroded"

4.3.16 Calculation C-1302-168-5320-006, "Intake Structure Operating Slab Concrete Repair"

4.3.17 Specification OCIS 402558-003, "Below Water Line Concrete Surface Inspection & Testing at Intake Structure"

4.3.18 NRC letter dated June 24, 1982, Oyster Creek, Evaluation of SEP Topic III-3.C, Inservice Inspection of Water Control Structures.

4.3.19 Procedure ABN-32, Abnormal Intake Level

4.3.20 GPU letter to NRC dated November 1,1981, Transmittal of Safety assessment Reports for SEP Topics

4.3.21 NRC letter data January 22, 1982, SEP Topic II-3.C, Request for Additional Information

4.3.22 NRC AMP Information Requests, AMP-073, AMP-074, AMP-075, AMP-076, AMP-077, and AMP-078.

5.0 TABLES

5.1 Aging Management Program Implementing Documents

Procedure Number	Procedure Title	Commitment No.	Status
125.6	Building Structure Monitoring Plan	330592.32.01	ACC/ASG
ABN-31	High Winds	330592.32.02	ACC/ASG
ABN-32	Abnormal Intake Level	330592.32.03	ACC/ASG
ABN-38	Station Seismic Event	330592.32.04	ACC/ASG

5.2 Aging Management Review Results

SSC Name	Structure and/or Component	Material	Environment	Aging Effect
Dilution Structure	Reinforced concrete foundation	Concrete	Water - flowing	Loss of Material
Dilution Structure	Reinforced concrete foundation	Concrete	Soil	Cracking
Dilution Structure	Reinforced concrete Walls	Concrete	Outdoor Air	Change in Material Properties
Dilution Structure	Reinforced concrete Walls	Concrete	Outdoor Air	Cracking
Dilution Structure	Reinforced concrete Walls	Concrete	Outdoor Air	Loss of Material
Dilution Structure	Reinforced concrete foundation	Concrete	Soil	Cracking
Dilution Structure	Reinforced concrete Walls	Concrete	Aggressive Environment	Change in Material Properties
Dilution Structure	Reinforced concrete Walls	Concrete	Aggressive Environment	Cracking
Dilution Structure	Reinforced concrete Walls	Concrete	Aggressive Environment	Loss of Material
Dilution Structure	Reinforced concrete foundation	Concrete	Aggressive Environment	Loss of Material
Dilution Structure	Reinforced concrete foundation	Concrete	Aggressive Environment	Change in Material Properties
Dilution Structure	Reinforced concrete foundation	Concrete	Water - flowing	Change in Material Properties
Dilution Structure	Reinforced concrete foundation	Concrete	Aggressive Environment	Cracking
Dilution Structure	Reinforced concrete Walls	Concrete	Aggressive Environment	Cracking
Dilution Structure	Reinforced concrete Walls	Concrete	Outdoor Air	Loss of Material
Dilution Structure	Reinforced concrete Walls	Concrete	Outdoor Air	Cracking
Dilution Structure	Reinforced concrete Walls	Concrete	Soil	Cracking
Dilution Structure	Reinforced concrete Walls	Concrete	Water - flowing	Change in Material Properties
Dilution Structure	Reinforced concrete Walls	Concrete	Water - flowing	Loss of Material
Dilution Structure	Reinforced concrete Walls	Concrete	Outdoor Air	Cracking

5.2 Aging Management Review Results

Dilution Structure	Reinforced concrete foundation	Concrete	Aggressive Environment	Cracking
Fire Pond Dam	Fire Pond Dam	Various (concrete, wood, soil, rock, grout, galvanized steel)	Water - flowing, Water standing	Loss of material, Loss of form
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Outdoor Air	Loss of Material
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Aggressive Environment	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Aggressive Environment	Change in Material Properties
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Aggressive Environment	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Outdoor Air	Loss of Material
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Outdoor Air	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Outdoor Air	Change in Material Properties
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Slab	Concrete	Outdoor Air	Loss of Material
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Slab	Concrete	Outdoor Air	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Earthen water control structures (intake canal, embankments)	Various (Gravel, Tar, Soil, wood, galvanized steel)	Water (flowing, standing)	Loss of Form
Intake Structure and Canal (Ultimate Heat Sink)	Earthen water control structures (intake canal, embankments)	Various (Gravel, Tar, Soil, wood, galvanized steel)	Water (flowing, standing)	Loss of Material
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Outdoor Air	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Water - Flowing	Change in Material Properties
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Slab	Concrete	Outdoor Air	Change in Material Properties

5.2 Aging Management Review Results

Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Aggressive Environment	Change in Material Properties
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Outdoor Air	Change in Material Properties
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Outdoor Air	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Outdoor Air	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Outdoor Air	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Outdoor Air	Loss of Material
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Outdoor Air	Loss of Material
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Slab	Concrete	Soil	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Soil	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Slab	Concrete	Outdoor Air	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Water - Flowing	Loss of Material
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Outdoor Air	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Aggressive Environment	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Aggressive Environment	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Aggressive Environment	Loss of Material
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Water - Flowing	Loss of Material

5.2 Aging Management Review Results

Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Aggressive Environment	Loss of Material
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Slab	Concrete	Outdoor Air	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Slab	Concrete	Outdoor Air	Loss of Material
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Soil	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete foundation	Concrete	Soil	Cracking
Intake Structure and Canal (Ultimate Heat Sink)	Reinforced concrete Walls	Concrete	Water - Flowing	Change in Material Properties

6.0 ATTACHMENTS

6.1 LRA Appendix A

6.2 LRA Appendix B

PROGRAM BASIS DOCUMENT

PBD-AMP-B.1.26

Revision 0

BURIED PIPING INSPECTION

GALL PROGRAM XI.M34 - BURIED PIPING AND TANKS INSPECTION

Prepared By: ________________

Reviewed By: ________________

Program Owner Review: ________________

Technical Lead Approval: ________________

Revision History:

Revision	*Prepared by:*	*Reviewed by:*	*Program Owner:*	*Approved by:*
0	*S. Rafferty-Czincila*	*C. Micklo*	*Pete Tamburro*	*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 Buried Piping Inspection aging management program that are credited for managing loss of material due to the effects of corrosion on the pressure-retaining capacity of piping and components in a soil (external) environment 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. M34 - Buried Piping and Tanks Inspection. 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

<u>NUREG-1801:</u>

a) The program includes preventive measures to mitigate corrosion.

b) Periodic inspection to manage the effects of corrosion on the pressure-retaining capacity of buried steel piping and tanks.

c) Gray cast iron, which is included under the definition of steel, is also subject to a loss of material due to selective leaching, which is an aging effect managed under Chapter XI.M33, "Selective Leaching of Materials."

d) Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings.

e) Buried piping and tanks are inspected when they are excavated during maintenance and when a pipe is dug up and inspected for any reason.

f) This program is an acceptable option to manage buried piping and tanks, except further evaluation is required for the program element/attributes of detection of aging effects (regarding inspection frequency) and operating experience.

<u>Oyster Creek:</u>

a) The program includes preventive measures such as coating and wrapping to prevent loss of material caused by corrosion of the external surface of buried piping. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. **(Reference: ER-AA-330-008, SP-9000-06-003 and SP-9000-06-004)**

b) The program includes measures such as periodic inspection to manage the effects of corrosion on the pressure-retaining capacity of buried piping. **(Reference: TR-116 and SA-AA-117, Step 4.7)**

c) Gray cast iron, which is included under the definition of steel, is also subject to a loss of material due to selective leaching, which is an aging effect managed under B.1.25 "Selective Leaching of Materials" aging management program. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. **(Reference: PBD-AMP-B.1.25)**

d) The program includes preventive measures such as coating and wrapping to prevent loss of material caused by corrosion of the external surface of buried piping. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. **(Reference: ER-AA-330-008, SP-9000-06-003 and SP-9000-06-004)**

e) Periodic inspections are performed to manage the effects of corrosion on the pressure-retaining capacity of buried piping. Buried piping is inspected when it is excavated during maintenance and when a pipe is dug up and inspected for any reason. **(Reference: SA-AA-117, Step 4.7)**

f) Based on Oyster Creek operating experience, there has been only one underground leak that developed as a result of failure of the external coating of carbon steel pipe. In 1992 the Service Water system developed a leak that resulted from failure of the external coating. The root cause evaluation determined that failure was due to improper original coating application. Additionally, in 1980, 1992 & 1996 leaks developed in buried aluminum Condensate Transfer pipe. As a result 90% of the AL piping was replaced and relocated aboveground. Subsequently, Oyster Creek initiated the Oyster Creek Underground Piping Program in which the inspection and modifications of the remaining 25 feet of buried AL Condensate Transfer system pipe are tracked. **(Reference: TR-116)** To date, there have been no other buried pipe leaks due to external degradation. Although failure of buried piping has occurred, it has been determined that the loss of integrity of the buried piping leaks were caused primarily from the inside of the buried piping, which is evaluated with the Open Cycle Closed Cooling Water aging management program. **(Reference: PBD-AMP-B.1.13)** Therefore the frequency of inspection, at least once in the 10 years prior to the period of extended operation and at least once in the first 10 years of extended operation, is adequate.

Additionally, there have been several yard excavation activities to date that have uncovered buried piping and inspections of the buried piping have been performed. The results of these inspections have shown no significant external coating failures. Coatings have been repaired during these inspections in accordance with corporate procedures. In addition other inspections and testing have been performed and are documented in Technical Data Report "Pipe Integrity Inspection Program", Topical Report "Emergency Service Water and Service Water Piping Plan" and Topical Report "Oyster Creek Underground Piping Program Description and Status" report. **(Reference: TDR-829, TR-140 and TR-116)** All inspection data and analysis are documented in the above referenced documents.

Oyster Creek does not have any buried tanks as defined by NUREG-1801, Section X1.M.34 Buried Piping and Tanks Inspection AMP. Therefore the Oyster Creek AMP only consists of buried piping. Additionally, NUREG-1801, Section X1.M.34 Buried Piping and Tanks Inspection AMP only includes buried carbon steel piping; however, Oyster creek has other pipe material in its buried piping program that will be managed as part of this AMP.

2.2 Overall NUREG-1801 Consistency

The Oyster Creek Buried Piping Inspection program is an existing program that is consistent with NUREG-1801 aging management program XI.M34 with exceptions and enhancements as described in 2.3 and 2.4 below.

2.3 Summary of Exceptions to NUREG-1801

- NUREG-1801, Section X1.M.34 Buried Piping and Tanks Inspection AMP only includes buried carbon steel piping; however, Oyster Creek has other material, such as stainless steel, aluminum, bronze and cast iron, in their buried piping program that will be managed as part of this AMP. NUREG-1801, Section X1.M.34 Buried Piping and Tanks Inspection AMP relies on preventive measures such as coatings and wrappings; however, portions of buried stainless steel and bronze piping may not be coated or wrapped. Inspections of buried piping that is not wrapped will inspect for loss of material due to general pitting, crevice, and microbiologically influenced corrosion.

- Oyster Creek does not have any buried tanks in the scope of license renewal.

2.4 Summary of Enhancements to NUREG-1801

The Buried Piping Inspection aging management program will be enhanced to include:

- Fire protection components in the scope of the program.
- Inspection of buried piping within ten years of entering the period of extended operation, unless an opportunistic inspection occurs within this ten-year period.
- Piping located inside the vault in the scope of the program. The vault is considered a manhole that is located between the reactor building and the exhaust tunnel.

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.

3.0 Scope of Program

NUREG-1801:

a) *The program relies on preventive measures such as coating, wrapping and periodic inspection for loss of material caused by corrosion of the external surface of buried steel piping and tanks. Loss of material in these components, which may be exposed to aggressive soil environment, is caused by general, pitting, and crevice corrosion, and microbiologically-influenced corrosion (MIC).*

b) *Periodic inspections are performed when the components are* *excavated for maintenance or for any other reason. The scope of the program covers buried components that are within the scope of license renewal for the plant.*

Oyster Creek:

a) The Buried Piping Inspection aging management program is an existing program that provides for managing loss of material due to general corrosion, pitting, crevice corrosion and microbiologically-influenced corrosion (MIC) of ferrous materials through the use of piping and component coatings and wrappings, periodic inspections, and pressure testing. The program relies on preventive measures such as coating and wrapping and periodic inspection for loss of material caused by corrosion of the external surface of buried steel piping. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. **(Reference: ER-AA-330-008, SA-AA-117, SP-9000-06-003 and SP-9000-06-004)**

b) Periodic inspections are performed when the components are excavated for maintenance or for any other reason. The corporate procedure, "Excavation, Trenching, and Shoring" directs engineering to perform inspections of piping exposed during excavation for coating degradation or corrosion. **(Reference: SA-AA-117, Step 4.7)** The Oyster Creek buried piping activities consist of inspections, preventive and condition-monitoring measures to manage the loss of material due to corrosion from external environments for buried ferrous piping in the scope of license renewal. Additionally, Oyster Creek utilizes corporate procedures to control application maintenance and periodic assessment of safety related and non-safety related coatings. **(Reference: ER-AA-330-008)**

System components within the scope of License Renewal include buried portions of the Emergency Service Water, Service Water, Roof Drains & Overboard Discharge, Drywell Floor and Equipment Drains, RBCCW, Fire Protection, Condensate Transfer, Containment Spray, Reactor Building Floor and Equipment Drain, Spent Fuel Pool Cooling, Water Treatment & Distr., Heating and Process Steam, and Miscellaneous Floor & Equipment Drain systems.

The Containment Spray, Drywell Floor & Equipment Drain and Miscellaneous Floor & Equipment Drains have pipe that runs through a vault located between the reactor building and the tunnel. The Containment Spray piping has a safety related LR function and therefore the other piping located in the vault with the Containment Spray piping are in the scope of LR for spatial interaction. The environment of this vault has been conservatively considered buried.

The Roof Drains & Overboard Discharge, RBCCW, Condensate Transfer, Reactor Building Floor and Equipment Drain, Spent Fuel Pool Cooling, and Miscellaneous Floor & Equipment Drain systems have buried piping that runs from the tunnel into the reactor building.

ESW, SW, Condensate Transfer and Fire Protection have various locations for buried components outside plant buildings.

This program only inspects the external surfaces of buried components. The aging management of the internal environment of buried components will be handled by the programs associated with the water inside the buried components including B.1.02 "Water Chemistry", B.1.13 "Open-Cycle Cooling Water System Program", B.1.14 "Closed-Cycle Cooling Water System Program, and B.1.20 "Fire Water System Program."

The Oyster Creek Buried Piping Inspection aging management program manages the aging effect of loss of material due to the effects of corrosion on the pressure-retaining capacity of piping and components in a soil (external) environment 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, Section X1.M.34 Buried Piping and Tanks Inspection AMP only includes buried carbon steel piping, however Oyster Creek has other material, such as stainless steel, aluminum, bronze and cast iron, in their buried piping program that will be managed as part of this AMP. NUREG-1801, Section X1.M.34 Buried Piping and Tanks Inspection AMP relies on preventive measures such as coatings and wrappings, however portions of buried stainless steel and bronze piping may not be coated or wrapped. Inspections of buried piping that is not wrapped will inspect for loss of material due to general pitting, crevice, and microbiologically influenced corrosion.

- Oyster Creek does not have any buried tanks in the scope of license renewal.

<u>Enhancements to NUREG-1801, Element 1:</u>

The Buried Piping Inspection aging management program will be enhanced to include:

- Fire protection components in the scope of the program.
- Inspection of buried piping within ten years of entering the period of extended operation, unless an opportunistic inspection occurs within this ten-year period.
- Piping located inside the vault in the scope of the program.

<u>Comparison and Evaluation Conclusion:</u>

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

3.1 Preventive Actions

<u>NUREG-1801:</u>

In accordance with industry practice, underground piping and tanks are coated during installation with a protective coating system, such as coal tar enamel with a fiberglass wrap and a kraft paper outer wrap, a polyolifin tape coating, or a fusion bonded epoxy coating to protect the piping from contacting the aggressive soil environment.

<u>Oyster Creek:</u>
The Buried Piping Inspection program relies on preventive measures such as coating and wrapping to protect the piping from coming in contact with the soil environment. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. **(Reference: ER-AA-330-008, SP-9000-06-003 and SP-9000-06-004)**

<u>Exceptions to NUREG-1801, Element 2:</u>

NUREG-1801, Section X1.M.34 Buried Piping and Tanks Inspection AMP only includes buried carbon steel piping, however Oyster Creek has other material, such as stainless steel, aluminum, bronze and cast iron, in their buried piping program that will be managed as part of this AMP. NUREG-1801, Section X1.M.34 Buried Piping and Tanks Inspection AMP relies on preventive measures such as coatings and wrappings, however portions of buried stainless steel and bronze piping may not be coated or wrapped. Inspections of buried piping that is not wrapped will inspect for loss of material due to general pitting, crevice, and microbiologically influenced corrosion.

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.

3.2 Parameters Monitored or Inspected

NUREG-1801:

a) *The program monitors parameters such as coating and wrapping integrity that are directly related to corrosion damage of the external surface of buried steel piping and tanks. Coatings and wrappings are inspected by visual techniques.*

b) *Any evidence of damaged wrapping or coating defects, such as coating perforation, holidays, or other damage, is an indicator of possible corrosion damage to the external surface of piping and tanks.*

Oyster Creek:

a) External surfaces are inspected by visual techniques whenever buried components are uncovered during station excavation activities per the Exelon Corporate Procedure, "Excavation, Trenching, and Shoring". **(Reference: SA-AA-117, Step 4.7)** Inspection of buried components identifies coating degradation, if coated, or base metal corrosion, if uncoated. Additionally, preventive maintenance activities open and sample the water inside the vault next to the Reactor Building every 182 days. The vault is considered a manhole that is located between the reactor building and the exhaust tunnel. **(Reference: PM10201M)** This preventive maintenance activity will be enhanced to include inspection of the piping located inside the vault.

b) Any evidence of damaged wrapping or coating defects is an indicator of possible corrosion damage to the external surface. Inspections of buried piping that is not wrapped will inspect for loss of material due to general pitting, crevice, and microbiologically influenced corrosion. Degraded coatings are repaired per the Oyster Creek procedures and specifications. **(Reference: ER-AA-330-008, SA-AA-117 and SP-9000-06-04)**

Exceptions to NUREG-1801, Element 3:

None.

Enhancements to NUREG-1801, Element 3:

The Buried Piping Inspection aging management program will be enhanced to include:

- Fire protection components in the scope of the program.
- Inspection of buried piping within ten years of entering the period of extended operation, unless an opportunistic inspection occurs within this ten-year period.
- Piping located inside the vault in the scope of the program.

Comparison and Evaluation Conclusion:

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

3.3 Detection of Aging Effects

NUREG-1801:

a) *Inspections performed to confirm that coating and wrapping are intact are an effective method to ensure that corrosion of external surfaces has not occurred and the intended function is maintained.*

b) *Buried piping and tanks are opportunistically inspected whenever they are excavated during maintenance. When opportunistic, the inspections are performed in areas with the highest likelihood of corrosion problems, and in areas with a history of corrosion problems, within the areas made accessible to support the maintenance activity.*

c) *The applicant's program is to be evaluated for the extended period of operation. It is anticipated that one or more opportunistic inspections may occur within a ten-year period. Prior to entering the period of extended operation, the applicant* *is to verify that there is at least one opportunistic or focused inspection is performed within the past ten years.*

d) *Upon entering the period of extended operation, the applicant is to perform a focused inspection within ten years, unless an opportunistic inspection occurred within this ten-year period.*

e) *Any credited inspection should be performed in areas with the highest likelihood of corrosion problems, and in areas with a history of corrosion problems.*

<u>Oyster Creek:</u>

a) Inspections will be performed to confirm that coating and wrapping are intact. These inspections are an effective method to ensure that corrosion of external surfaces has not occurred and the intended function is maintained. Inspections are performed to confirm that coating and wrapping are intact. External inspections of buried components will occur opportunistically when they are excavated during maintenance. **(Reference: SA-AA-117, Step 4.7)**

b) Buried piping will be opportunistically inspected whenever excavated for maintenance. The inspections will be performed on all of the areas made accessible to support the maintenance activity. **(Reference: SA-AA-117, Step 4.7)** Areas with the highest likelihood of corrosion problems, and areas with a history of corrosion problems have been identified in Topical Report "Oyster Creek Underground Piping Program Description and Status". **(Reference: TR-116)**

c) There have been several yard excavation activities to date that have uncovered buried piping and inspections of the buried piping. Oyster Creek has performed focused inspection on their underground piping within the past ten years. **(Reference: TR-116)** Several inspections have been performed on the ESW and SW systems, which have a high likelihood of corrosion problems and have a history of corrosion related problems. In addition other inspections and testing have been performed per the Technical Data Report "Pipe Integrity Inspection Program" and Topical Report "Oyster Creek Underground Piping Program Description and Status". **(Reference: TDR-829 and TR-116)**

d) Upon entering the period of extended operation inspection of buried piping will be performed within ten years, unless an opportunistic inspection occurs within this ten-year period.

e) Areas with the highest likelihood of corrosion problems, and areas with a history of corrosion problems have been identified in Topical Report "Oyster Creek Underground Piping Program Description and Status". **(Reference: TR-116)** These are primarily in the ESW and SW systems. Inspections in these areas have been performed within the past ten years. **(Reference: TR-116)**

Additionally, Inservice Service Testing and monitoring for the ESW, SW, RBCCW, Fire Protection and Condensate Transfer systems are performed. **(Reference: 641.4.001, 644.4.002, 607.4.014, 607.4.015, 645.6.023 and 642.4.001)** Monitoring and trending from the performance of these tests can aid in the detection of system pipe leaks. Periodic leak testing and component inspections are being credited as well. Section XI Pressure Testing directs testing of buried cooling water piping for the detection of leaks. **(Reference: ER-AA-330-001 and 2400-SMM-3900.04)** This pressure testing is performed via pump surveillances.

<u>Exceptions to NUREG-1801, Element 4:</u>

None.

<u>Enhancements to NUREG-1801, Element 4:</u>

The Buried Piping Inspection aging management program will be enhanced to include:

- Fire protection components in the scope of the program.
- Inspection of buried piping within ten years of entering the period of extended operation, unless an opportunistic inspection occurs within this ten-year period.
- Piping located inside the vault in the scope of the program.

<u>Comparison and Evaluation Conclusion:</u>

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

3.4 Monitoring and Trending

<u>NUREG-1801:</u>

Results of previous inspections are used to identify susceptible locations.

<u>Oyster Creek:</u>

There have been several yard excavation activities to date that have uncovered buried piping; inspections of the buried piping have been performed. In addition other inspections and testing have been performed per Technical Data Report "Pipe Integrity Inspection Program" and Topical Report "Oyster Creek Underground Piping Program Description and Status". **(Reference: TDR-829 and TR-116)** These inspection and test results are documented as part of the program or procedural processes and sent to the appropriate station personnel for trending and analysis. Results of previous inspections are used to identify susceptible locations. **(Reference: TR-116)**

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.

3.5 Acceptance Criteria

NUREG-1801:

Any coating and wrapping degradations are reported and evaluated according to site corrective actions procedures.

Oyster Creek:

Any coating and wrapping degradations are reported and evaluated according to site corrective actions procedures. External component degradation is reported and evaluated whenever buried commodities are uncovered during yard excavation activities. In addition, evidence of metal surface corrosion and any leakage detected through periodic testing and visual inspections will be evaluated and used to confirm the system and components ability to perform their intended functions. Any leakage identified is evaluated and appropriate corrective actions are implemented. **(Reference: SA-AA-117, Step 4.7, 2400-SMM-3900.04 and ER-AA-330-008)**

Exceptions to NUREG-1801, Element 6:

NUREG-1801, Section X1.M.34 Buried Piping and Tanks

Inspection AMP only includes buried carbon steel piping, however Oyster Creek has other material, such as stainless steel, aluminum, bronze and cast iron, in their buried piping program that will be managed as part of this AMP. NUREG-1801, Section X1.M.34 Buried Piping and Tanks Inspection AMP relies on preventive measures such as coatings and wrappings, however portions of buried stainless steel and bronze piping may not be coated or wrapped. Inspections of buried piping that is not wrapped will inspect for loss of material due to general pitting, crevice, and microbiologically influenced corrosion.

Enhancements to NUREG-1801, Element 6:

The Buried Piping Inspection aging management program will be enhanced to include:

- Fire protection components in the scope of the program.
- Inspection of buried piping within ten years of entering the period of extended operation, unless an opportunistic inspection occurs within this ten-year period.
- Piping located inside the vault in the scope of the program.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1801, Element 6, Acceptance Criteria, with exceptions and enhancements as described above.

3.6 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 the requirements of 10 CFR Part 50, Appendix B. 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 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 the various annotated 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.

3.7 Confirmation Process

NUREG-1801:

See Item 7, above.

Oyster Creek:

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.

3.8 Administrative Controls

NUREG-1801:

See Item 7, above.

Oyster Creek:

See Item 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.

3.9 Operating Experience

NUREG-1801:
Operating experience shows that the program described here is effective in managing corrosion of external surfaces of buried steel piping and tanks. However, because the inspection frequency is plant-specific and depends on the plant operating experience, the applicant's plant-specific operating experience is further evaluated for the extended period of operation.

Oyster Creek:

A review of plant operating experience at Oyster Creek shows that there has been only one underground leak that developed as a result of failure of the external portion of buried pipe. In 1992 the Service Water system developed a leak that resulted from failure of the external coating. The root cause evaluation determined that failure was due to improper original coating application. Subsequently, Oyster Creek initiated the Oyster Creek Underground Piping Program. Additionally, in 1980, 1992 & 1996 leaks developed in buried aluminum Condensate Transfer pipe. As a result 90% of the AL piping was replaced and relocated aboveground. Subsequently, Oyster Creek initiated the Oyster Creek Underground Piping Program in which the inspection and modifications of the remaining 25 feet of buried AL Condensate Transfer system pipe are tracked. The primary contributor of the buried aluminum pipe at Oyster Creek high corrosion rate is galvanic corrosion. The galvanic mechanism is primarily due to the interaction between the aluminum pipe wall and the large copper grounding grind located on the west side of the plant. The grounding grid protects the main transformers and other electrical equipment and lies in the same footprint as the majority of the direct buried aluminum pipe; before it was replaced by above ground pipe. The dissimilar metals and moisture in the soil result in a high electrical/chemical potential that drive the galvanic corrosion. Corrosion occurs in local areas where the coating was not properly applied or has broken down. By moving the AL pipe to aboveground the aging mechanism of galvanic corrosion concern is eliminated. Additionally, the Oyster Creek Underground Piping Program tracks the inspection and modifications of the remaining 25 feet of buried AL Condensate Transfer system pipe. **(Reference: TR-116)** To date, there have been no other buried pipe leaks due to external degradation.

Although failure of buried piping has occurred, it has been determined that the integrity of the buried piping leaks were caused by degradation of the inside of the buried piping which is evaluated with the Open Cycle Closed Cooling Water aging management program. **(Reference: PBD-AMP-B.1.13)** The existing Buried Piping Inspection aging management program has identified the loss of material due to general corrosion, pitting, crevice corrosion and microbiologically-influenced corrosion (MIC) of ferrous materials and change in material properties on the external surfaces of buried pipe. The experience at Oyster Creek with the Buried Piping Inspection program shows that the Buried Piping Inspection program is effective in managing loss of material due to general corrosion, pitting, crevice corrosion and microbiologically-influenced corrosion (MIC) of ferrous materials and change in material properties on the external surfaces of buried pipe.

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 loss of material is being adequately managed in the Buried Piping Inspection program. The following examples of operating experience provide objective evidence that the Buried Piping Inspection program is effective in assuring that intended function(s) will be maintained consistent with the CLB for the period of extended operation:

1. Oyster Creek has performed numerous external inspections of their buried components between 1991 and present day. The results of these inspections have shown no significant external coating failures. Coatings have been repaired during these inspections in accordance with corporate procedures. **(Reference: TR-116)**

2. In 2004 50% of the buried ESW and 10% of SW piping were replaced with new, coated piping. Oyster Creek is planning to replace the other 50% of the ESW buried piping prior to entering the period of extended operation, with subsequent SW replacements to follow. **(Reference: TR-116)**

3. In 1993 an inspection of 20 feet of RBCCW was performed and the results showed that the external coating was in good condition..

4. In 1992 the Fire Protection system underground piping was inspected via excavation and some internal inspection. The External coating was in good condition as well as the internal carbon steel. **(Reference: TR-116)**

5. In 1980 the uncoated aluminum underground piping in the vicinity of the Condensate Storage Tank was replaced. In 1991 and 1994 buried piping adjacent to the Condensate transfer shack was determined to have severe corrosion during an

inspection. As a result, a significant modification was performed which relocated aluminum piping aboveground, in tunnels or vaults. Currently 90% of all AL piping is located aboveground. The remaining buried AL pipe was inspected in 1993 and has an expected service life of 15-20 years. Action Request A2116126 has been submitted to perform and inspection of the remaining buried, uncoated AL pipe prior to December 2008. The remaining buried AL piping does have cathodic protection. **(Reference: TR-116)**

The operating experience of the Oyster Creek Buried Piping Inspection program has shown objective evidence that the program has identified susceptible buried pipe locations and has created an monitoring program that has been effective in preventing failures prior to the loss of system intended function.

The operating experience of the Buried Piping Inspection program did not show any adverse trend in 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 implementation of the Buried Piping Inspection program will effectively determine loss of material due to the manage the effects of corrosion on the pressure-retaining capacity of buried piping. Appropriate guidance for reevaluation, repair or replacement is provided for locations where loss of material was identified. Periodic self-assessments of the Buried Piping Inspection program are performed to identify the areas that need improvement to maintain the quality performance of the program.

3.10 Oyster Creek:

The Oyster Creek Buried Piping Inspection aging management program is credited for managing manage the effects of loss of material due to corrosion on the pressure-retaining capacity of buried carbon steel piping for the systems, components, and environments listed in Table 5.2. The Oyster Creek Buried Piping Inspection 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 Buried Piping Inspection aging management program provides reasonable assurance that the effects of loss of material due to corrosion on the pressure-retaining capacity of buried carbon steel piping is 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 EPRI 1003103, *Guidelines on Nuclear Safety-Related Coatings,* November 2001.

4.3 Oyster Creek Program References

4.3.1 TDR-829, *Inspection History of OCNGS Pipe Integrity Program*

4.3.2 Topical Report 116, *Oyster Creek Underground Piping Program Description and Status*

5.0 TABLES

5.1 Aging Management Program Implementing Documents

Procedure Number	Procedure Title	Commitment No.	Status

ST41401B (641.4.001)	Service Water Pump 1-2 IST w/ vibrations	330592.26.01	ACC/ASG
ST41401A (641.4.001)	Service Water Pump 1-1 IST w/ vibrations	330592.26.06	ACC/ASG
ST44402E (644.4.002)	COND TRANSFER PUMP 'A' COMPREHENSIVE TEST (IST)	330592.26.02	ACC/ASG
ST44402F (644.4.002)	COND TRANSFER PUMP 'B' COMPREHENSIVE TEST (IST)	330592.26.03	ACC/ASG
TDR-829	Inspection History of OCNGS Pipe Integrity Program	330592.26.04	ACC/ASG
Topical Report 140	Emergency Service Water and Service Water Piping Plan	330592.26.05	ACC/ASG
PM******* (new)	New PM for 10 year inspections	330592.26.07	ACC/ASG
SA-AA-117	Excavation, Trenching, and Shoring	330592.26.08	ACC/ASG
Topical Report 116	Oyster Creek Underground Piping Program Description and Status	330592.26.09	ACC/ASG
ER-AA-330-008	Exelon Service Level I and Safety Related (Service Level III) Protective Coatings	330592.26.22	ACC/ASG
SP-9000-06-003	Application and Repair of Service Level II Coatings	330592.26.23	ACC/ASG
SP-9000-06-004	Application and Repair of Service Level III Coatings	330592.26.13	ACC/ASG
642.4.001	RBCCW Inservice Test	330592.26.16	ACC/ASG

607.4.015	Containment Spray and ESW System 2 Pump Operability, IST and Containment Spray Pumps Trip	330592.26.17	ACC/ASG
607.4.014	Containment Spray and ESW System 1 Pump Operability, IST and Containment Spray Pumps Trip	330592.26.18	ACC/ASG
ER-AA-330-001	Section XI Pressure Testing	330592.26.24	ACC/ASG
2400-SMM-3900.04	System Pressure Test Procedure (ASME XI)	330592.26.19	ACC/ASG
645.6.023	Fire Suppression Water System Underground Flow Test	330592.26.25	ACC/ASG
PM10201M	Remove Manway Cover and Inspect Piping Vault for flooding - Needs enhancement.	330592.26.20	ACC/ASG

5.2 Aging Management Review Results

SSC Name	Structure and/or Component	Material	Environment	Aging Effect
Condensate Transfer System	Piping and fittings	Aluminum	Soil (External)	Loss of Material
Containment Spray System	Piping and fittings	Carbon and low alloy steel	Soil (External)	Loss of Material
Drywell Floor and Equipment Drains	Piping and fittings	Carbon and low alloy steel	Soil (External)	Loss of Material
Emergency Service Water System	Piping and fittings	Carbon and low alloy steel (w/coating or wrapping)	Soil (External)	Loss of Material
Fire Protection System	Piping and fittings	Carbon and low alloy steel	Soil (External)	Loss of Material
Fire Protection System	Valve Body	Cast Iron	Soil (External)	Loss of Material
Fire Protection System	Valve Body	Carbon and low alloy steel	Soil (External)	Loss of Material
Fire Protection System	Fire hydrant	Cast Iron	Soil (External)	Loss of Material
Heating & Process Steam System	Piping and fittings	Stainless Steel	Soil (External)	Loss of Material
Heating & Process Steam System	Piping and fittings	Carbon and low alloy steel	Soil (External)	Loss of Material
Miscellaneous Floor and Equipment Drain System	Piping and fittings	Carbon and low alloy steel	Soil (External)	Loss of Material
Reactor Building Closed Cooling Water System	Piping and fittings	Carbon and low alloy steel	Soil (External)	Loss of Material
Roof Drains and Overboard Discharge	Piping and fittings	Bronze	Soil (External)	Loss of Material
Roof Drains and Overboard Discharge	Piping and fittings	Carbon and low alloy steel (w/coating or wrapping)	Soil (External)	Loss of Material
Service Water System	Piping and fittings	Carbon and low alloy steel (w/coating or wrapping)	Soil (External)	Loss of Material
Service Water System	Valve Body	Carbon and low alloy steel	Soil (External)	Loss of Material
Spent Fuel Pool Cooling System	Piping and fittings	Aluminum	Soil (External)	Loss of Material
Spent Fuel Pool Cooling System	Piping and fittings	Carbon and low alloy steel	Soil (External)	Loss of Material
Water Treatment & Distr. System	Piping and fittings	Aluminum	Soil (External)	Loss of Material

6.0 ATTACHMENTS

6.1 LRA Appendix A

6.2 LRA Appendix B

PROGRAM BASIS DOCUMENT

PBD-AMP-B.1.07

Revision 0

BWR STRESS CORROSION CRACKING

GALL PROGRAM XI.M7 - BWR STRESS CORROSION CRACKING

Prepared By: ______________________

Reviewed By: ______________________

Program Owner Review: ______________________

Technical Lead Approval: ______________________

Revision History:

Revision	*Prepared by:*	*Reviewed by:*	*Program Owner:*	*Approved by:*
0	*Joe Ely*	*S. Rafferty-Czincila*	*Greg Harttraft*	*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 (PBD) is to document and evaluate those activities of the Oyster Creek BWR Stress Corrosion Cracking aging management program that are credited for managing Cracking Initiation and Growth due to intergranular stress corrosion cracking (IGSCC) in boiling water reactor (BWR) coolant pressure boundary piping made of stainless steel (SS) and nickel alloy 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.

The purpose of this PBD is to identify and describe the basis for the BWR Stress Corrosion Cracking aging management program and associated activities credited for managing Cracking Initiation and Growth due to IGSCC in SS and nickel alloy reactor coolant pressure boundary (RCPB) piping, welds and components. This PBD also provides a comparison of the credited Oyster Creek program with the elements of the corresponding NUREG-1801 Chapter XI program XI.M7. 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

<u>NUREG-1801:</u>

a) *The program to manage intergranular stress corrosion cracking (IGSCC) in boiling water reactor (BWR) coolant pressure boundary piping made of stainless steel (SS) and nickel based alloy components is delineated in NUREG-0313, Rev. 2, and Nuclear Regulatory Commission (NRC) Generic Letter (GL) 88-01 and its Supplement 1. The material includes base metal and welds.*

b) *The program includes (a) preventive measures to mitigate IGSCC, and*

c) *(b) inspection and flaw evaluation to monitor IGSCC and its effects.*

d) *The staff-approved boiling water reactor vessel and internals project (BWRVIP-75) report allows for modifications to the inspection scope in the GL 88-01 program.*

<u>Oyster Creek:</u>

a) Oyster Creek has an NRC approved integrated program to mitigate IGSCC. Oyster Creek addresses the management of Cracking Initiation and Growth due to IGSCC in RCPB piping, welds and components through the implementation of ASME Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components." The Oyster Creek IGSCC inspection program has been established for piping identified in NRC Generic Letter 88-01, and is consistent with the requirements of NUREG-0313, Rev. 2, and Nuclear Regulatory Commission (NRC) Generic Letter (GL) 88-01 and its Supplement 1. The program includes the alternate measures approved by the NRC in BWRVIP-75, "BWR Vessel and Internals Project Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules." **(Reference: OC-2 Program Plan)**

b) Water chemistry is controlled through implementation of the recommendations of EPRI BWRVIP-130, "BWR Vessel and Internals Project BWR Water Chemistry Guidelines." (Reference: PBD-AMP-B.1.02, Water Chemistry)

c) Inspection and flaw evaluation is conducted in accordance with the Oyster Creek ISI Program Plan **(Reference: OC-1 Program Plan)** and corporate procedure. **(Reference: ER-AA-330-002)** Repairs and replacements are controlled by corporate procedure. **(Reference: ER-AA-330-009)**

d) The inspection scope identified in GL 88-01 has been modified for the Oyster Creek IGSCC inspection program to reflect that defined in the staff-approved BWRVIP-75, "BWR Vessel and Internals Project Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules." **(Reference: OC-2 Program Plan)**

2.2 Overall NUREG-1801 Consistency

The Oyster Creek BWR Stress Corrosion Cracking aging management program is an existing program that is consistent with NUREG-1801 aging management program XI.M7 with enhancements as described in 2.4 below.

2.3 Summary of Exceptions to NUREG-1801

None. The existing Oyster Creek BWR Stress Corrosion Cracking aging management program is found to be adequate to support the extended period of operation with no exceptions.

2.4 Summary of Enhancements to NUREG-1801

The Oyster Creek BWR Stress Corrosion Cracking aging management program will be enhanced to include:

- The program will require that, for those components within the scope of the BWR Stress Corrosion Cracking aging management program, all new and replacement SS materials be low-carbon grades of SS with carbon content limited to 0.035 wt. % maximum and ferrite content limited to 7.5% minimum.

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.

3.0 Scope of Program

NUREG-1801:

a) *The program focuses on (a) managing and implementing countermeasures to mitigate IGSCC and*

b) *(b) performing inservice inspection (ISI) to monitor IGSCC and its effects on the intended function of BWR components.*

c) *The program is applicable to all BWR piping and piping welds made of austenitic SS and nickel alloy that is 4 in. or larger in nominal diameter and contains reactor coolant at a temperature above 93°C (200°F) during power operation, regardless of code classification. The program also applies to pump casings, valve bodies and reactor vessel attachments and appurtenances, such as head spray and vent components.*

d) *NUREG-0313 and NRC GL 88-01, respectively, describe the technical basis and staff guidance regarding mitigation of*

IGSCC in BWRs.

e) *Attachment A of NRC GL 88-01 delineates the staff-approved positions regarding materials, processes, water chemistry, weld overlay reinforcement, partial replacement, stress improvement of cracked welds, clamping devices, crack characterization and repair criteria, inspection methods and personnel, inspection schedules, sample expansion, leakage detection, and reporting requirements.*

<u>Oyster Creek:</u>

a) Oyster Creek has committed to the requirements for mitigating IGSCC. Reactor coolant water chemistry is monitored and maintained in accordance with the guidelines in EPRI BWRVIP-130 to maintain high water purity to reduce susceptibility to SCC or IGSCC. (Reference: PBD-AMP-B.1.02, Water Chemistry)

b) The ISI program is described in PBD-AMP-B.1.01, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD.

c) The scope of the BWR Stress Corrosion Cracking aging management program includes RCPB piping, welds and components, of four inches and larger nominal pipe size, made of SS and nickel alloy. Pump casings, valve bodies and reactor vessel attachments and appurtenances, such as head spray and vent components, are also included. (Reference: PBD-AMP-B.1.01, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD)

d) The Oyster Creek IGSCC inspection program incorporates the technical basis and staff guidance described in NUREG-0313 and NRC GL 88-01, respectively, modified to reflect the alternate requirements of the staff-approved BWRVIP-75 report. (Reference: PBD-AMP-B.1.01, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, and Reference: PBD-AMP-B.1.02, Water Chemistry)

e) The Oyster Creek IGSCC inspection program incorporates applicable requirements that are consistent with the recommendations of Attachment A of NRC GL 88-01. These requirements are reflected in the Oyster Creek ISI and Water Chemistry programs discussed further above and in the appropriate sections throughout this document. (Reference: PBD-AMP-B.1.01, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, and Reference: PBD-AMP-B.1.02, Water Chemistry)

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.

3.1 Preventive Actions

NUREG-1801:

The comprehensive program outlined in NUREG-0313 and NRC GL 88-01 addresses improvements in all three elements that, in combination, cause IGSCC. These elements consist of a susceptible (sensitized) material, a significant tensile stress, and an aggressive environment. Sensitization of nonstabilized austenitic SSs containing greater than 0.03 wt.% carbon involves precipitation of chromium carbides at the grain boundaries during certain fabrication or welding processes. The formation of carbides creates an envelope of chromium depleted region that, in certain environments, is susceptible to stress corrosion cracking (SCC). Residual tensile stresses are introduced from fabrication processes, such as welding, surface grinding, or forming. High levels of dissolved oxygen or aggressive contaminants, such as sulfates or chlorides, accelerate the SCC processes.

a) *The program delineated in NUREG-0313, NRC GL 88-01, and in the staff-approved BWRVIP-75 report includes recommendations regarding selection of materials that are resistant to sensitization, use of special processes that reduce residual tensile stresses, and monitoring and maintenance of coolant chemistry.*

b) *The resistant materials are used for new and replacement components and include low-carbon grades of austenitic SS and weld metal, with a maximum carbon of 0.035 wt.% and a minimum ferrite of 7.5% in weld metal and cast austenitic stainless steel (CASS). Inconel 82 is the only commonly used nickel-base weld metal considered to be resistant to SCC; other nickel-alloys, such as Alloy 600 are evaluated on an individual* *basis.*

c) *Special processes are used for existing, new, and replacement components. These processes include solution heat treatment, heat sink welding, induction heating, and mechanical stress improvement.*

d) *The program delineated in NUREG-0313 and NRC GL 88-01 does not provide specific guidelines for controlling reactor water chemistry to mitigate IGSCC. Maintaining high water purity reduces susceptibility to SCC or IGSCC. The program description, and evaluation and technical basis of monitoring and maintaining reactor water chemistry are addressed through implementation of Section XI.M2, "Water Chemistry."*

<u>Oyster Creek:</u>

a) The Oyster Creek ISI program described in PBD-AMP-B.1.01 and the Oyster Creek Water Chemistry program described in PBD-AMP-B.1.02, respectively, incorporate the recommendations regarding selection of materials that are resistant to sensitization and use of special processes that reduce residual tensile stresses, and monitoring and maintenance of coolant chemistry, delineated in NUREG-0313, NRC GL 88-01, and the staff-approved BWRVIP-75 report.

b) Resistant materials used at Oyster Creek for new and replacement components include low-carbon grades of SS. Weld metal carbon content is limited to 0.035 wt. % maximum with a minimum ferrite of 7.5%. The program will be enhanced to require that, for those components within the scope of the BWR Stress Corrosion Cracking aging management program, all new and replacement SS materials be low-carbon grades of SS with carbon content limited to 0.035 wt. % maximum and ferrite content limited to 7.5% minimum. **(Reference: SYS-LL-OC-1, Line Specification Numbers MV-5, MV-5A, NC-4, ND-10A, ND-10B, ND-10C, ND-1A, ND-1B, ND-1C, ND-9B, NE-1A, NE-1B, NE-1C, NE-2, NE-5, NU-3, NU-4, NZ-3, RHC-2A, RHC-2B, and SS-1; CC-AA-501-1017, Attachment 1)**

c) Special processes such as solution heat treatment and heat sink welding are used. Mechanical Stress Improvement Process (MSIP) or Induction Heating Stress Improvement (IHSI) has been used on all assessable welds **(Reference: OC-2 Program Plan section 3.0).**

d) Reactor coolant water chemistry is monitored and maintained in accordance with the guidelines in BWRVIP-130, "BWR Vessel and Internals Project BWR Water Chemistry Guidelines" to maintain high water purity to reduce susceptibility to SCC or IGSCC. Oyster Creek also implemented Hydrogen Water Chemistry in 1992 and Noble Metals in 2002 to further reduce susceptibility of the RCPB piping system to SCC or IGSCC. The program description, evaluation and technical basis of monitoring and maintaining reactor water chemistry are presented in PBD-AMP-B.1.02, Water Chemistry.

Exceptions to NUREG-1801, Element 2:

None.

Enhancements to NUREG-1801, Element 2:

The program will be enhanced to require that, for those components within the scope of the BWR Stress Corrosion Cracking aging management program, all new and replacement SS materials be low-carbon grades of SS with carbon content limited to 0.035 wt. % maximum and ferrite content limited to 7.5% minimum.

Comparison and Evaluation Conclusion:

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

3.2 Parameters Monitored or Inspected

NUREG-1801:

The program detects and sizes cracks and detects leakage by using the examination and inspection guidelines delineated in NUREG-0313, Rev. 2, and NRC GL 88-01 or the referenced BWRVIP-75 guideline as approved by the NRC staff.

Oyster Creek:

Augmented examination requirements for IGSCC are conducted in accordance with the Oyster Creek ISI Program Plan. These are based on the examination and inspection guidelines delineated in NUREG 0313, Rev. 2, and GL 88-01. Oyster Creek implements BWRVIP-75 to apply a technical evaluation approach applicable to the materials and degradation mechanisms of systems to justify the examination criteria. **(Reference: OC-2 Program Plan section 4.0)**

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.

3.3 Detection of Aging Effects

NUREG-1801:

a) *The extent, method, and schedule of the inspection and test techniques delineated in NRC GL 88-01 or BWRVIP-75 are designed to maintain structural integrity and ensure that aging effects will be discovered and repaired before the loss of intended function of the component. The inspection guidance in approved BWRVIP-75 replaces the extent and schedule of inspection in NRC GL 88-01.*

b) *The program uses volumetric examinations to detect IGSCC.*

c) *NRC GL 88-01 recommends that the detailed inspection procedure, components, and examination personnel be qualified by a formal program approved by the NRC. These inspection guidelines, updated in the approved BWRVIP-75 document, provide the technical basis for revisions to NRC GL 88-01 inspection schedules. Inspection can reveal cracking and leakage of coolant.*

d) *The extent and frequency of inspection recommended by the program are based on the condition of each weld (e.g., whether the weldments were made from IGSCC-resistant material, whether a stress improvement process was applied to a weldment to reduce residual stresses, and how the weld was repaired if it had been cracked).*

Oyster Creek:

a) The extent, method, and schedule of inspection and test techniques are in accordance with the ISI Program Plan at Oyster Creek. Augmented examination requirements for IGSCC are also in accordance with the ISI Program Plan at

Oyster Creek. The Oyster Creek ISI Program Plan incorporates the guidance delineated in NRC GL 88-01 and BWRVIP-75. **(Reference: OC-2 Program Plan)**

b) Ultrasonic examinations of piping welds susceptible to IGSCC are conducted in accordance with commitments associated with GL 88-01. **(Reference: OC-2 Program Plan)**

c) Oyster Creek's augmented inspection program for IGSCC is incorporated in the Oyster Creek ISI program, a formal program that is periodically reviewed and approved, in accordance with the requirements of 10 CFR 50.55a, by the NRC. The IGSCC inspection guidelines conform to the recommendations of NRC GL 88-01, as updated by the approved BWRVIP-75 document, and variances from the NRC staff positions are reviewed and approved by the NRC. Personnel performing ultrasonic testing (UT) on applicable Reactor Vessel and piping welds for ASME Section XI are qualified to the requirements Appendix VIII of Section XI, applicable Edition and Addenda, or to the alternative requirements approved by the NRC. **(Reference: OC-1 Program Plan; OC-2 Program Plan)**

d) Oyster Creek's augmented inspection program for IGSCC conforms to the NRC positions on inspection schedules, methods, personnel, and sample expansion delineated in Generic Letter 88-01. Any variances from the NRC staff positions are reviewed and approved by the NRC. **(Reference: OC-2 Program Plan)**

<u>Exceptions to NUREG-1801, Element 4:</u>

None.

<u>Enhancements to NUREG-1801, Element 4:</u>

None.

<u>Comparison and Evaluation Conclusion:</u>

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

3.4 Monitoring and Trending

<u>NUREG-1801:</u>

The extent and schedule for inspection, in accordance with the *recommendations of NRC GL 88-01 or approved BWRVIP-75 guidelines, provide timely detection of cracks and leakage of coolant. Based on inspection results, NRC GL 88-01 or approved BWRVIP-75 guidelines provide guidelines for additional samples of welds to be inspected when one or more cracked welds are found in a weld category.*

<u>Oyster Creek:</u>

The extent and schedule of augmented tests and examinations are in accordance with the ISI Program Plan at Oyster Creek, which includes guidelines for reportable indication resolution, additional examination, and successive examination in accordance with NRC GL 88-01 and BWRVIP-75 guidelines. **(Reference: OC-1 Program Plan; ER-AA-330-002; ER-AA-330-009)**

<u>Exceptions to NUREG-1801, Element 5:</u>

None.

<u>Enhancements to NUREG-1801, Element 5:</u>

None.

<u>Comparison and Evaluation Conclusion:</u>

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

3.5 Acceptance Criteria

<u>NUREG-1801:</u>

a) As recommended in NRC GL 88-01, any indication detected is evaluated in accordance with ASME Section XI, IWB-3600 of Section XI of the 1986 Edition of the ASME Boiler and Pressure Vessel Code and the guidelines of NUREG- 0313.

b) Applicable and approved BWRVIP-14, BWRVIP-59, BWRVIP-60, and BWRVIP-62 documents provide guidelines for evaluation of crack growth in SSs, nickel alloys, and low-alloy steels. An applicant may use BWRVIP-61 guidelines for BWR vessel and internals induction heating stress improvement effectiveness on crack growth in operating plants.

<u>Oyster Creek:</u>

a) Relevant conditions detected during examinations are evaluated in accordance with ASME Section XI Articles IWB-3000, for Class 1. The ASME Section XI portion of the program currently complies with the requirements of the 1995 Edition through 1996 Addenda of the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," and is implemented through facility procedures. **(Reference: OC-1 Program Plan, OC-2 Program Plan, ER-AA-330-002, and Procedure ER-AA-330-009)**

b) If the flaw does not meet the acceptance criteria of IWB-3600, repairs or replacements are accomplished in accordance with applicable Section XI rules and requirements. When a flaw exceeds the applicable acceptance standards of IWB-3500 a condition report is initiated in accordance with applicable procedures. An analytical evaluation is performed in accordance with IWB-3600 to determine its acceptability for continued service without repair or replacement. This analytical evaluation shall be submitted to the NRC Staff for approval before resumption of operation. **(Reference: ER-AA-330-002 section 4.12.4)** These criteria are consistent with the guidelines of BWRVIP-14, -59, -60, -61, and -62. Mechanical Stress Improvement Process (MSIP) or Induction Heating Stress Improvement (IHSI) has been used on all assessable welds. **(Reference: OC-2 Program Plan section 3.0)**

<u>Exceptions to NUREG-1801, Element 6:</u>

None.

<u>Enhancements to NUREG-1801, Element 6:</u>

None.

<u>Comparison and Evaluation Conclusion:</u>

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

3.6 Corrective Actions

<u>NUREG-1801:</u>

The guidance for weld overlay repair and stress improvement or replacement is provided in NRC GL 88-01; ASME Section XI, Subsections IWB-4000 and IWB-7000, IWC-4000 and IWC-7000, or IWD-4000 and IWD-7000, respectively for Class 1, 2, or 3 components; and ASME Code Case N-504-1. As discussed in the

NUREG-1801, Rev. 1 XI M-28 September 2005 appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions.

Oyster Creek:

If the flaw does not meet the acceptance criteria of IWB-3600, repairs or replacements are accomplished in accordance with applicable Section XI rules and requirements. **(Reference: ER-AA-330-002; ER-AA-330-009)** Evaluations are performed for inspection results that do not satisfy established criteria and a condition report is initiated to document the concern in accordance with plant administrative procedures. 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 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.

3.7 Confirmation Process

NUREG-1801:

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. 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 and administrative controls.

Oyster Creek:

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.

3.8 Administrative Controls

NUREG-1801:

See Item 8, above.

Oyster Creek:

See Item 3.8, 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.

3.9 Operating Experience

NUREG-1801:

Intergranular stress corrosion cracking has occurred in small- and large-diameter BWR piping made of austenitic stainless steel and nickel-base alloys. Cracking has occurred in recirculation, core spray, residual heat removal (RHR), control rod drive (CRD) return line penetrations, and reactor water cleanup (RWCU) system piping welds (NRC GL 88-01, NRC Information Notices [INs] 82-39, 84-41, and 04-08). The comprehensive program outlined in NRC GL 88-01, NUREG-0313, and in the staff-approved BWRVIP-75 *report addresses mitigating measures for SCC or IGSCC (e.g., susceptible material, significant tensile stress, and an aggressive environment). The GL 88-01 program has been effective in managing IGSCC in BWR reactor coolant pressure-retaining components and the revision to the GL 88-01 program, according to the staff-approved BWRVIP-75 report, will adequately manage IGSCC degradation.*

<u>Oyster Creek:</u>

Review of industry operating experience has confirmed that IGSCC has occurred in the small- and large-diameter BWR piping made of austenitic stainless steel and nickel-base alloys, and that such cracking has occurred in recirculation, core spray, residual heat removal (RHR), control rod drive (CRD) return line penetrations, and reactor water cleanup (RWCU) system piping welds (NRC GL 88-01, NRC Information Notices [INs] 82-39, 84-41, and 04-08). A review of plant operating experience at Oyster Creek shows that IGSCC occurred in the Core Spray, Reactor Recirculation, and Shutdown Cooling systems. In most cases, the existing BWR Stress Corrosion Cracking aging management program has identified the IGSCC prior to leaks occurring. However, there have been some cases where through wall leakage as a result of IGSCC was identified during pressure testing. As a result of these pipe failures, the BWR SCC program was modified to improve water chemistry, de-sensitize the susceptible materials, and more accurately identify susceptible locations prior to failure. The experience at Oyster Creek with the BWR SCC program shows that the BWR SCC program is effective in managing IGSCC in austenitic stainless steel and nickel-base alloy RCPB piping and components.

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.), Westinghouse documents (e.g., TBs, 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 cracking due to IGSCC is being adequately managed in the RCPB piping and components. The following examples of operating experience provide objective evidence that the BWR SCC program is effective in assuring that intended function(s) will be maintained consistent with the CLB for the period of extended operation:

1) Of the 380 welds in the GL 88-01 scope, including 85 in the RWCU system outside the second containment isolation valves, Oyster Creek eventually identified, during the period the program was being implemented, 11 welds in service with indications of IGSCC. Nine were repaired with full structural overlays (four in the Core Spray system, four in the Reactor Recirculation system, and one in the Shutdown Cooling system). Two Reactor Recirculation system welds, which were both stress improved before initial inspections determined indication of IGSCC, remained in service without repair. However, subsequent to implementation of the NRC approved Performance Demonstration Initiative (PDI), inspections performed in 2002 and 2004 using the improved PDI examination technique determined these welds did not exhibit any indication of IGSCC. Oyster Creek, therefore, does not currently have any indication of IGSCC. This example provides objective evidence that the program's repair and stress improvement techniques are effective in mitigating the effects of IGSCC, and that the continually improving inspection techniques have been effective in conservatively identifying IGSCC.

2) To date, IGSCC indication has been found in 40 welds. Following numerous piping replacements 11 welds with indications of IGSCC remained in service. As discussed above, nine of the eleven welds were repaired with full structural overlays, and the remaining two were determined, after implementation of improved PDI inspection techniques, to be

free of IGSCC indication. No new indications of IGSCC have been detected by inspection during the last six (6) outages. This example provides objective evidence that the Oyster Creek BWR Stress Corrosion Cracking aging management program has been effective in both detecting and mitigating the effects of IGSCC.

3) Since Generic Letter 88-01 was issued, Oyster Creek has performed numerous examinations on piping subject to the generic letter requirements. During this period, Oyster Creek has improved water chemistry and employed stress improvement and Hydrogen Water Chemistry (HWC) as IGSCC mitigators (HWC was implemented in 1992). In addition, examination procedures have been improved and examination personnel have received training on the latest techniques for IGSCC detection and have gained years of experience in the detection and sizing of IGSCC. This example provides further objective evidence that the Oyster Creek BWR Stress Corrosion Cracking aging management program is subject to continuing improvement through the effective determination and implementation evolving methods for detecting and mitigating the effects of IGSCC.

4) From 1988 to 2000, during pressure testing of the Core Spray system, three indications of through wall leakage were identified, and in 1991 three other IGSCC indications were identified by UT examination. One of the through wall indications was found in a low temperature (non GL 88-01) location. This weld was repaired with a full weld overlay. These are additional examples of the effectiveness of the program for identifying and correcting the effects of IGSCC well before loss of the affected systems' intended function(s) occurs.

5) In 1991, all Isolation Condenser large bore piping outside the drywell (from the drywell penetrations to the Isolation Condensers) that has been susceptible to IGSCC was replaced with IGSCC resistant material, and all new welds were stress improved. All piping within the four Isolation Condenser drywell penetrations and the two RWCU system drywell penetrations, which contain welds that are not accessible, were also replaced with IGSCC resistant material. Piping at the Isolation Condensers on 95' elevation was also replaced with IGSCC resistant material in 1998, and the Head Cooling Spray Nozzle Assembly, the 4-inch tee and flange of the reactor vent line have also been replaced. These replacements have reduced the number of susceptible welds. This example objectively

demonstrates the proactive nature of the program through preventive repair and replacement of susceptible piping before a potential loss of the affected systems' intended function(s) can occur.

6) All accessible welds inside the drywell (except the RWCU system) have been stress improved. Zinc injection was implemented in 2000, and Noble Metal Chemical Addition (NMCA) was implemented in 2002. This is further objective evidence of the program's proactive preventive nature.

The operating experience of the BWR SCC program did not show any adverse trend in 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 implementation of the BWR SCC program will effectively manage the effects of cracking due to IGSCC in austenitic stainless steel and nickel-base alloy RCPB piping and components. Appropriate guidance for reevaluation, repair, or replacement is provided for locations where inspections reveal indication of the onset of IGSCC that could lead to failure of the component prior to the next scheduled inspection. Periodic self-assessments of the BWR SCC program are performed to identify the areas that need improvement to maintain the quality performance of the program.

3.10 Conclusion

The Oyster Creek BWR Stress Corrosion Cracking aging management program is credited for managing cracking initiation and growth due to IGSCC in SS and nickel alloy for the systems, components, and environments listed in Table 5.2. The Oyster Creek BWR Stress Corrosion Cracking aging management 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 BWR Stress Corrosion Cracking aging management program provides reasonable assurance that cracking initiation and growth due to IGSCC in SS and nickel alloy RCPB piping, welds and components 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 NRC Generic Letter 88-01, "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping," U.S. Nuclear Regulatory Commission, January 25, 1988; Supplement 1, February 4, 1992.

4.2.2 NUREG-0313, Rev. 2, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," W. S. Hazelton and W. H. Koo, U.S. Nuclear Regulatory Commission, 1988.

4.2.3 BWRVIP-75, "BWR Vessel and Internals Project Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedule," October 1999

4.2.4 ASME Boiler and Pressure Vessel Code, Section XI, "Rules for In-service Inspection of Nuclear Plant Components," 1995 Edition through 1996 Addendum

4.3 Oyster Creek Program References

4.3.1 Document Number OC-1, Rev. 1 "ISI Program Plan, Oyster Creek Nuclear Generating Station, Fourth Interval"

4.3.2 Amergen Letter No. 2130-02-20228 dated August 1, 2002 "Proposed Alternatives and Relief Request to the

Requirements of 10CFR5055a Concerning the Fourth Ten-Year Interval Inservice Inspection Program and Proposed Alternative to Containment Inspection Program"

4.3.3 Amergen Letter No. 2130-03-30262 dated September 26, 2003, "Alternatives and Reliefs Concerning the Fourth 10-Year Interval Inservice Inspection Program"

4.3.4 Document Number OC-2, Rev. 0, "IGSCC Inspection Program (Generic Letter 88-01 and BWRVIP-75)"

4.3.5 GPU Nuclear Letter No. 5000-89-1712 dated January 31, 1989 "Generic Letter 88-01 (TR-050 Rev. 1, GPUN Response to Generic Letter 88-01 and NUREG 0313, Rev. 2)"

4.3.6 GPU Nuclear Letter No. 5000-90-1938 dated June 7, 1990 "Generic Letter 88-01"

4.3.7 GPU Nuclear Letter No. 1940-98-20418 dated July 29, 1998 "Request for Approval of Alternate 17R Outage Inspections Related to Generic Letter 88-01 Intergranular Stress Corrosion Cracking (IGSCC) Commitments"

4.3.8 GPU Nuclear Letter No. 1940-98-30611 dated October 14, 1998 "Reduced Scope of Intergranular Stress Corrosion Cracking (IGSCC) Inspection for Oyster Creek Nuclear Generating Station During Refueling Outage

4.3.9 OC-IS-402585-001, Rev. 5, "Installation Specification for Repair and Replacement of Reactor Coolant Systems Piping Oyster Creek Nuclear Generating Station"

4.3.10 LS-OS-125, "Corrective Action Program (CAP) Procedure"

5.0 TABLES

5.1 Aging Management Program Implementing Documents

Procedure Number	Procedure Title	Commitment No.	Status
OC-2 Program Plan	IGSCC Inspection Program (Generic Letter 88-01 and BWRVIP-75)	330592.07.01	ACC/ASG
OC-1 Program Plan	ISI Program Plan Fourth Ten-Year Inspection Interval	330592.07.02	ACC/ASG
ER-AA-330-002	Inservice Inspection of Section XI Welds and Components	330592.07.03	ACC/ASG

ER-AA-330-009	ASME Section XI Repair/Replacement Program	330592.07.04	ACC/ASG
SYS-LL-OC-1	Line List and Specification	330592.07.05	ACC/ASG
CC-AA-501-1017	Welding Filler Material Procurement Requirements	330592.07.06	ACC/ASG

5.2 Aging Management Review Results

SSC Name	Structure and/or Component	Material	Environment	Aging Effect
Core Spray System	Valve Body	CASS	Treated Water (Internal)	Cracking Initiation and Growth
Core Spray System	Piping and fittings	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Core Spray System	Valve Body	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Isolation Condenser System	Valve Body	CASS	Steam (Internal)	Cracking Initiation and Growth
Isolation Condenser System	Piping and fittings	Stainless Steel	Steam (Internal)	Cracking Initiation and Growth
Isolation Condenser System	Piping and fittings	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Isolation Condenser System	Valve Body	CASS	Treated Water (Internal)	Cracking Initiation and Growth
Isolation Condenser System	Valve Body	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Isolation Condenser System	Valve Body	Stainless Steel	Steam (Internal)	Cracking Initiation and Growth
Nuclear Boiler Instrumentation	Piping and fittings	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Reactor Pressure Vessel	Nozzle Safe Ends (Recirculation Inlet & Outlet)	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Reactor Pressure Vessel	Nozzle Safe Ends (Core Spray, Isolation Condenser & CRD Return)	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Reactor Recirculation System	Flow Element	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Reactor Recirculation System	Piping and fittings	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Reactor Recirculation System	Pump Casing	CASS	Treated Water >482F (Internal)	Cracking Initiation and Growth
Reactor Recirculation System	Valve Body	CASS	Treated Water >482F (Internal)	Cracking Initiation and Growth
Reactor Recirculation System	Valve Body	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth

Reactor Water Cleanup System	Piping and fittings	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Reactor Water Cleanup System	Valve Body	CASS	Treated Water >482F (Internal)	Cracking Initiation and Growth
Reactor Water Cleanup System	Valve Body	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Shutdown Cooling System	Valve Body	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth
Shutdown Cooling System	Piping and fittings	Stainless Steel	Treated Water (Internal)	Cracking Initiation and Growth

6.0 ATTACHMENTS

6.1 LRA Appendix A

6.2 LRA Appendix B

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		Hufnagel, John	☐	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 (J.G. Hufnagel)

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 (J.G. Hufnagel)

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.

12/12/05 Update (J.G. Hufnagel)

The following seven AMP PBDs were provided to the NRC via e-mail on December 9, 2005: PBD B.3.01, Metal Fatigue; PBD B.1.36, Electrical (E-3); PBD B.1.13, Open Cycle Cooling Water; PBD B.1.06, BWR CRD return nozzle; PBD B.1.03, Reactor Head Closure Studs; PBD B.1.30, Masonry Walls and PBD B.1.05, Feedwater Nozzles. Delivery of these was confirmed on 12/9 via an e-mail response from Greg Cranston, NRC AMP Audit team Lead.

The following two AMP PBDs were completed and transmitted to NRC Project Manager Donnie Ashley and AMP Audit Team Lead Greg Cranston on 12/12/05: PBD B.1.27, Section XI IWE and PBD B.1.33, Coatings Program. This completes the delivery of Batch 4 of the AMP PBDs, which were to be delivered by 12/12/05.

12/19/05 Update (J.G. Hufnagel)

The following three AMP PBDs were provided to the NRC via e-mail on December 16, 2005:
PBD B.3.02 EQ, Rev. 0
PBD B.1.10 Cast Austenitic Stainless Steel, Rev. 0
PBD B.1.04 Vessel Attachment welds, Rev 0

NRC receipt of these was verbally confirmed with Project Manager Donnie Ashley.

The following four AMP PBDs were completed and electronically transmitted to NRC Project Manager Donnie Ashley and AMP Audit Team Lead Greg Cranston on 12/19/05:

PBD B.1.14 CCCW, Rev. 0
PBD B.1.32 Water Control Structures, Rev. 0
PBD B.1.26 Buried Piping, Rev. 0
PBD B.1.07 BWR SCC, Rev. 0

This completes delivery, by December 19, 2005, of the upgraded AMP Program Basis Documents that support the ten element reviews for the aging management programs being audited by the NRC during the week of January 23, 2006. The response to this request is now complete. - J.G. Hufnagel, 12/19/05

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