NUCLEAR ENERGY INSTITUTE

Alan P. Nelson
SENIOR PROJECT MANAGER,
LICENSING
NUCLEAR GENERATION

May 24, 2001

Mr. Christopher I. Grimes
Chief, License Renewal and Standardization Branch
Division of Regulatory Improvement Programs
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: License Renewal Application Approaches

PROJECT NUMBER: 690

Dear Mr. Grimes:

On May 1, the NEI License Renewal Implementation Guideline Task Force met with the NRC License Renewal staff at NRC White Flint offices. The purpose of the meeting was to present and discuss two examples of how the Generic Aging Lessons Learned (GALL) report is used in a license renewal application. Based on the discussion of May 1, and a follow-up conference call May 3, with the staff, we have repackaged the two examples and they are enclosed for your review. The example titled Plant X demonstrates the use of GALL in an application that follows the format delineated in the draft August 2000 License Renewal Standard Review Plan. The example titled Plant Y demonstrates the use of GALL in an application that follows the six-column format, which is consistent with previous submitted applications.

In an effort to determine which approach optimizes the time to prepare an application and results in the most efficient NRC staff review, please consider the following:

- Does the staff prefer one approach to the other and will one approach be more "review efficient"?
- Based on the "Secondary Chemistry Monitoring Program" example provided in Plant Y, we believe that programs that are evaluated in GALL can be applied to non- GALL evaluated components.

D042

ADD: P.T. Kuo & S.K. Mitra to erids

Feedback on the example approaches is extremely important to the licensees that are committed to filing a license renewal application in fiscal year 2002. In order for those licensees to prepare the application in a timely manner we request the staff provide a demonstration review schedule by June 1, 2001.

We look forward to working with the NRC staff on this project. If you have any questions, please call me at (202) 739- 8110.

Sincerely,

Alan Nelson

Enclosure

c: P.T. Kuo
S.K. Mitra

Chapter 2: Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review, and Implementation Results

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

The determination of mechanical systems within the scope of license renewal is made by initially identifying Plant X mechanical systems and then reviewing them to determine which ones satisfy one or more of the criteria contained in 10 CFR 54.4. This process is described in Section 2.1 and the results of the mechanical systems review are contained in Section 2.2. Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section. These identified components subsequently require an aging management review for license renewal.

The screening results are provided below in four subsections:

- Reactor Coolant Systems
- Engineered Safety Features Systems
- Auxiliary Systems
- Steam and Power Conversion Systems.

2.3.4 STEAM AND POWER CONVERSION SYSTEMS

The Steam and Power Conversion Systems act as a heat sink to remove heat from the reactor and convert the heat generated in the reactor to the plant's electrical output. The following systems are included in this subsection:

- Main Steam
- Feedwater and Blowdown
- Auxiliary Feedwater

2.3.4.1 FEEDWATER

The Feedwater System consists of a supply line to each steam generator. A feedwater isolation valve in each steam generator supply line is located just outside the containment penetration. These valves are motor operated, closing automatically on a Steam Generator Isolation Signal (SGIS). A check valve in each supply line, located inside containment, prevents uncontrolled blowdown from the affected steam generator in the event of a feedwater line break.

The license renewal boundary also includes the piping from the steam generators to the isolation valves for the Blowdown and Primary Sampling Systems.

The Feedwater System boundary is denoted by License Renewal (LR) flags on the following drawing:

- 11405-M-253 Sheet 1, Flow Diagram Steam Generator Feedwater and Blowdown P & ID

The list of Feedwater System component types subject to aging management review and their intended functions is shown in Table 2.3.4.1.

Table 2.3.4.1
Feedwater System Component Types Subject to Aging Management Review and their Intended Functions

Component Type	Intended Functions
PIPES and FITTINGS	Pressure Boundary
VALVES	Pressure Boundary
BOLTING	Pressure Boundary

2.3.4.2 AUXILIARY FEEDWATER

The Auxiliary Feedwater (AFW) System supplies feedwater to the steam generators whenever the reactor coolant system temperature is above 300 deg F and the main feedwater system is not in operation. The AFW System contains one safety-related emergency feedwater storage tank, two safety-related pumps, one non-safety-related pump, plus related piping, valves, and instrumentation. One safety-related pump is electric motor driven, and the other is steam turbine driven. The non-safety-related pump is diesel engine driven. The AFW System can supply the steam generators through two different flow paths. One flow path is through an interconnection with the main feedwater piping upstream of the feedwater regulating valves, after which the water enters the each steam generator through the normal feed ring. This flow path is typically used during normal plant heatup and cooldown evolutions. The other flow path connects to the AFW nozzles on the steam generators. Either safety-related AFW pump can pump water from the EFWST to the steam generators. The non-safety-related AFW pump may be used to pump water from the condensate storage tank to the steam generators. In the event of automatic initiation, such as when the steam generator low level setpoint is reached, the AFW System is designed to automatically start both safety-related AFW pumps and to direct flow to the steam generators via the flow path to the AFW nozzles.

The AFW System boundary is highlighted on the following drawings:

- 11405-M-253 sh. 1, Flow Diagram Steam Generator Feedwater & Blowdown P&ID
- 11405-M-253 sh. 4, Flow Diagram Steam Generator Feedwater & Blowdown P&ID
- 11405-M-254 sh. 2, Flow Diagram Condensate P&ID
- E-4144, FW-10 Lube Oil Schematic P & ID
- EM-1109/1110, Instrument & Control Equipment List
- EM-1368/1369, Instrument & Control Equipment List
- EM-1038, Instrument & Control Equipment List
- EM-1039, Instrument & Control Equipment List
- EM-1117, Instrument & Control Equipment List

The list of Auxiliary Feedwater System component types subject to aging management review and their intended functions is shown in Table 2.3.4.2.

Table 2.3.4.2
Auxiliary Feedwater System Component Types Subject to Aging Management Review and their Intended Functions

Component Type	Intended Functions
ACCUMULATOR	Pressure Boundary
CONTROLLER	Pressure Boundary
FILTER / STRAINER	Pressure Boundary Only
FILTER / STRAINER	Pressure Boundary & Filtration
FLOW ELEMENT / ORIFICE	Pressure Boundary & Flow Measurement
HEAT EXCHANGER	Pressure Boundary
INDICATOR/ RECORDER	Pressure Boundary
PIPE & FITTINGS	Pressure Boundary
PUMP	Pressure Boundary

Table 2.3.4.2
Auxiliary Feedwater System Component Types Subject to Aging Management Review and their Intended Functions

Component Type	Intended Functions
TRANSMITTER/ ELEMENT	Pressure Boundary
TURBINE	Pressure Boundary
VALVE	Pressure Boundary
TANK	Pressure Boundary
BOLTING	Pressure Boundary
CONTROLLER	Pressure Boundary
FLOW ELEMENT / ORIFICE	Pressure Boundary Only
INDICATOR / RECORDER	Pressure Boundary

2.3.4.3 MAIN STEAM AND TURBINE STEAM EXTRACTION

The Main Steam and Turbine Steam Extraction System consists of piping from each steam generator that penetrates the Containment (steam generators are addressed in Sections 2.3.1.3 and 3.2.3). Main steam isolation valves are located in each pipe just outside containment. These pipes connect to a common header which leads to the four turbine stop valves and the Main Steam Isolation Valve (MSIV) in each pipe. Also included in the Main Steam and Turbine Steam Extraction System boundary is the piping to the turbine-driven auxiliary feedwater pump and the associated drains and vents. The MSIV packing leakoff line isolation valve is the boundary prior to the low pressure heaters.

The Main Steam and Turbine Steam Extraction System boundary is highlighted on the following drawing:

- 11405-M-252 Sheet 1, Flow Diagram Steam P & ID

The list of Main Steam and Turbine Steam Extraction System component types subject to aging management review and their intended functions is shown in Table 2.3.4.3.

Table 2.3.4.3
Main Steam and Turbine Steam Extraction System Component Types Subject to Aging Management Review and their Intended Functions

Component Type	Intended Functions
FILTERS/STRAINERS	Pressure Boundary & Filtration
PIPES & FITTINGS	Pressure Boundary
VALVES	Pressure Boundary
BOLTING	Pressure Boundary

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

The determination of structures within the scope of license renewal is made by initially identifying Plant X structures and then reviewing them to determine which ones satisfy one or more of the criteria contained in 10 CFR 54.4. This process is described in Section 2.1 and the results of the structures review are contained in Section 2.2. Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The structures that meet these screening requirements are identified in this section. These identified structures subsequently require an aging management review for license renewal.

2.4.1 CONTAINMENT

The Containment structure is a domed cylinder 140'-4 3/4" high with an outside radius of 58'-10 3/4". The structure is a partially prestressed, reinforced concrete Class I structure composed of cylindrical walls, domed roof and a bottom mat. The mat is common to both the Containment structure and the Auxiliary Building and is supported on steel piles driven to bedrock. The mat incorporates a depressed center portion for the reactor vessel. The Containment has a 1/4" internal carbon steel liner which maintains an essentially leak-tight boundary. The unbonded tendons are in conduits filled with waterproof grease. The tendon anchors are accessible for inspection, testing, and re-tensioning via the tendon access gallery located directly beneath the cylinder walls and at the dome roof.

The reinforced concrete internal structure consists of several levels/compartments supported on the mat by concrete columns. The internal structure is isolated from the Containment shell by a shake space which also permits the distribution and dissipation of any internal differential pressure during postulated accident events. The various floors are at elevations 1060'-0" (concrete), 1056'-8" (steel), 1045'-0" (concrete), and 1013'-0" (concrete). There are several compartments which house mechanical equipment. They are the steam generator and reactor coolant pump compartments, pressurizer compartment, and the reactor cavity.

The Containment structure houses a substantial amount of safety-related and non-safety related mechanical and electrical equipment. There are many mechanical piping and electrical penetrations through the cylinder walls.

The system boundary includes all concrete, steel, elastomer, and fire barrier components within the domed roof (approximate elevation 1031'-5") and cylinder walls (approximate radius of 58'-10"). This includes any components attached to the outside of the cylinder or dome above the Auxiliary Building roof. The post-tensioned tendons, the tendon gallery, equipment and personnel hatches are within the system boundary. The mechanical and electrical penetration sleeves, bellows, and any welds between the sleeve and the liner are included in the system boundary. For each mechanical penetration, the weld between the penetration and the pipe is not within the boundary (see various application sections for the pertinent safety-related and non-safety related systems). The list of Containment component types subject to aging management review and their intended functions is shown in Table 2.4.1.

Table 2.4.1
Containment Component Types Subject to Aging Management Review and Their Intended Functions

Component Type	Intended Functions
Concrete above Ground	Flood protection barrier
Concrete above Ground	Radiation shielding
Concrete above Ground	Shelter, protect and support safety-related components
Concrete above Ground	Spray shield or curbs
Concrete above Ground	Pressure boundary
Concrete above Ground	Missile barrier
Concrete above Ground	Pipe whip restraint
Concrete above Ground	Shielding against high energy line breaks
Concrete below Ground	Flood protection barrier
Concrete below Ground	Radiation shielding
Concrete below Ground	Shelter, protect and support safety-related components
Concrete below Ground	Spray shield or curbs
Concrete below Ground	Pressure boundary
Concrete below Ground	Missile barrier
Concrete below Ground	Pipe whip restraint
Concrete below Ground	Shielding against high energy line breaks
Concrete Interior	Flood protection barrier
Concrete Interior	Radiation shielding
Concrete Interior	Shelter, protect and support safety-related components
Concrete Interior	Spray shield or curbs
Concrete Interior	Pressure boundary
Concrete Interior	Missile barrier
Concrete Interior	Pipe whip restraint
Concrete Interior	Shielding against high energy line breaks
Grout Protected from Weather	Support safety-related components
Structural Steel in Air	Pipe whip restraint

Table 2.4.1
Containment Component Types Subject to Aging Management Review and Their Intended Functions

Structural Steel in Air	Support safety-related components
Carbon Steel Threaded Fasteners	Support non-safety-related components
Carbon Steel Threaded Fasteners	Pressure boundary
Carbon Steel Threaded Fasteners	Shelter, protect and support safety-related components
Carbon Steel Threaded Fasteners	Missile barrier
Stainless Steel Threaded Fasteners	Pressure boundary
Equipment Hatch Gasket	Pressure boundary
Steel Liner	Pressure boundary
Refueling Pool Liner	Pressure boundary
Reactor Cavity Seal Ring	Pressure boundary
Post-Tensioned Tendons	Pressure boundary
Electrical Penetrations	Pressure boundary
Mechanical Penetrations	Pressure boundary
Post-Tensioned Tendons	Shelter, protect and support safety-related components
Post-Tensioned Tendons	Missile barrier
Containment Penetrations With Bellows	Pressure boundary
Trisodium Phosphate Baskets	Shelter, protect and support safety-related components
Equipment Hatch	Pressure boundary
Personnel Air Lock	Pressure boundary
Fuel Transfer Tube	Pressure boundary
Reactor Vessel Missile Shields	Missile barrier

2.4.2 Other Structures

The following structures are included in this subsection

- Auxiliary Building
- Intake Structure
- Turbine Building

2.4.2.1. Auxiliary Building

2.4.2.2. Intake Structure

The Intake Structure is a multi-floored Class 1 structure with an operating floor at elevation 1007'-6". From elevation 960'-10" (bottom of the foundation mat) to elevation 1014'-6", the structure is a box-type reinforced concrete structure with internal bracing provided by concrete walls and floor slabs. The mat foundation is supported on steel pipe piles driven to bedrock. From elevation 1014'-6" to elevation 1035'-7 1/2" (roof elevation), the structure is a braced steel frame clad with aggregate resin panels. The multi-layered built-up roof is supported by metal decking spanning between open web steel joists. The Intake Structure houses and protects both CQE and non-CQE systems and components. The diesel driven fire pump fuel tank enclosure is included in the Intake Structure.

The system boundary includes all concrete, steel, elastomer, and fire barrier components from elevation 960'-10" to elevation 1037'-6" between column lines 101 and 106 and from a distance 11'-8" East of column line AA to a distance 21'-10 3/8" West of column line DD. The enclosure for the Diesel Driven Fire Pump Fuel Tank is included in the system boundary. The circulating water intake and discharge tunnels are not within the system boundary. Component Supports (e.g. pipe supports, cable tray supports, equipment supports, and equipment anchorage) and Piles are to be evaluated as commodities.

A complete list of Intake Structure component types subject to aging management review and their intended functions is shown in Table 2.4.2.2.

Table 2.4.2.2
Intake Structure Component Types Subject to Aging Management Review and Their Intended Functions

Component Type	Intended Functions
Carbon Steel Threaded Fasteners	Flood protection barrier
Carbon Steel Threaded Fasteners	support non-safety-related components
Concrete above Ground	Flood protection barrier
Concrete above Ground	Flood protection barrier
Concrete above Ground	Shelter, protect and support safety-related components
Concrete above Ground	Source of cooling water
Concrete in a Fluid Environment	Flood protection barrier
Concrete in a Fluid Environment	Source of cooling water
Concrete in a Fluid Environment	Support safety-related components
Concrete Interior	Flood protection barrier
Concrete Interior	Missile barrier
Concrete Interior	Shelter, protect and support safety-related components
Flood Panel Seals	Flood protection barrier
Grout Protected From Weather	Support safety-related components
Structural Steel	Flood protection barrier
Structural Steel	Shelter and protect safety-related components

2.4.2.3. Turbine Building

The Turbine Building is a multi-floored Class II structure with an operating floor at elevation 1036'. From the basement floor elevation of 990' to elevation 1007'-6", the structure is a box-type, reinforced concrete structure with internal bracing provided by concrete walls, floor slabs and structural steel. The mat foundation is supported on steel piles driven to bedrock. From elevation 1007'-6" to the roof elevation of 1095'-5", the structure is braced steel frame clad with aggregate resin panels. The multi-layered built-up roof is supported by metal decking spanning between open web steel joists. The turbine generator is located on the operating floor. It is supported by a mass concrete structure referred to as the turbine pedestal. The turbine pedestal is independent from the Turbine Building structure. The Turbine Building houses both Limited CQE and non-CQE systems and components.

Main steam and feed water High Energy Line Break (HELB) restraints and shields are located in the Turbine Building.

The system boundary includes all concrete and steel East of the Auxiliary Building, between column lines 1 and 9 and from 3'-0" East of column line A to

3'-0" West of column line B. The circulating water intake and discharge tunnels are not within the Turbine Building system boundary. Component Supports (e.g. pipe supports, cable tray supports, conduit supports, equipment supports and equipment anchorage) and Piles are evaluated as commodities.

A complete list of Turbine Building component types subject to aging management review and their intended functions is shown in Table 2.4.2.3.

Table 2.4.2.3
Turbine Building Component Types Subject to Aging Management Review and Their Intended Functions

Component Type	Intended Functions
Carbon Steel Threaded Fasteners	Support non-safety-related components
Concrete above Ground	Support non-safety-related components
Concrete below Ground	Support non-safety-related components
Concrete Interior	Support non-safety-related components
Grout Protected From Weather	Shield against high energy line break
Grout Protected From Weather	Pipe whip support
Grout Protected From Weather	Support non-safety-related components
Structural Steel	Support non-safety-related components

Chapter 2: Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review, and Implementation Results

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

The determination of mechanical systems within the scope of license renewal is made by initially identifying Plant X mechanical systems and then reviewing them to determine which ones satisfy one or more of the criteria contained in 10 CFR 54.4. This process is described in Section 2.1 and the results of the mechanical systems review are contained in Section 2.2. Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section. These identified components subsequently require an aging management review for license renewal.

The screening results are provided below in four subsections:

- Reactor Coolant Systems
- Engineered Safety Features Systems
- Auxiliary Systems
- Steam and Power Conversion Systems.

2.3.4 STEAM AND POWER CONVERSION SYSTEMS

The Steam and Power Conversion Systems act as a heat sink to remove heat from the reactor and convert the heat generated in the reactor to the plant's electrical output. The following systems are included in this subsection:

- Main Steam
- Feedwater and Blowdown
- Auxiliary Feedwater

2.3.4.1 FEEDWATER

The Feedwater System consists of a supply line to each steam generator. A feedwater isolation valve in each steam generator supply line is located just outside the containment penetration. These valves are motor operated, closing automatically on a Steam Generator Isolation Signal (SGIS). A check valve in each supply line, located inside containment, prevents uncontrolled blowdown from the affected steam generator in the event of a feedwater line break.

The license renewal boundary also includes the piping from the steam generators to the isolation valves for the Blowdown and Primary Sampling Systems.

The Feedwater System boundary is denoted by License Renewal (LR) flags on the following drawing:

- 11405-M-253 Sheet 1, Flow Diagram Steam Generator Feedwater and Blowdown P & ID

The list of Feedwater System component types subject to aging management review and their intended functions is shown in Table 2.3.4.1.

Table 2.3.4.1
Feedwater System Component Types Subject to Aging Management Review and their Intended Functions

Component Type	Intended Functions
PIPES and FITTINGS	Pressure Boundary
VALVES	Pressure Boundary
BOLTING	Pressure Boundary

2.3.4.2 AUXILIARY FEEDWATER

The Auxiliary Feedwater (AFW) System supplies feedwater to the steam generators whenever the reactor coolant system temperature is above 300 deg F and the main feedwater system is not in operation. The AFW System contains one safety-related emergency feedwater storage tank, two safety-related pumps, one non-safety-related pump, plus related piping, valves, and instrumentation. One safety-related pump is electric motor driven, and the other is steam turbine driven. The non-safety-related pump is diesel engine driven. The AFW System can supply the steam generators through two different flow paths. One flow path is through an interconnection with the main feedwater piping upstream of the feedwater regulating valves, after which the water enters the each steam generator through the normal feed ring. This flow path is typically used during normal plant heatup and cooldown evolutions. The other flow path connects to the

AFW nozzles on the steam generators. Either safety-related AFW pump can pump water from the EFWST to the steam generators. The non-safety-related AFW pump may be used to pump water from the condensate storage tank to the steam generators. In the event of automatic initiation, such as when the steam generator low level setpoint is reached, the AFW System is designed to automatically start both safety-related AFW pumps and to direct flow to the steam generators via the flow path to the AFW nozzles.

The AFW System boundary is highlighted on the following drawings:

- 11405-M-253 sh. 1, Flow Diagram Steam Generator Feedwater & Blowdown P&ID
- 11405-M-253 sh. 4, Flow Diagram Steam Generator Feedwater & Blowdown P&ID
- 11405-M-254 sh. 2, Flow Diagram Condensate P&ID
- E-4144, FW-10 Lube Oil Schematic P & ID
- EM-1109/1110, Instrument & Control Equipment List
- EM-1368/1369, Instrument & Control Equipment List
- EM-1038, Instrument & Control Equipment List
- EM-1039, Instrument & Control Equipment List
- EM-1117, Instrument & Control Equipment List

The list of Auxiliary Feedwater System component types subject to aging management review and their intended functions is shown in Table 2.3.4.2.

Table 2.3.4.2
Auxiliary Feedwater System Component Types Subject to Aging Management Review and their Intended Functions

Component Type	Intended Functions
ACCUMULATOR	Pressure Boundary
CONTROLLER	Pressure Boundary
FILTER / STRAINER	Pressure Boundary Only
FILTER / STRAINER	Pressure Boundary & Filtration
FLOW ELEMENT / ORIFICE	Pressure Boundary & Flow Measurement
HEAT EXCHANGER	Pressure Boundary
INDICATOR/ RECORDER	Pressure Boundary
PIPE & FITTINGS	Pressure Boundary
PUMP	Pressure Boundary
TRANSMITTER/ ELEMENT	Pressure Boundary
TURBINE	Pressure Boundary
VALVE	Pressure Boundary
TANK	Pressure Boundary
BOLTING	Pressure Boundary
CONTROLLER	Pressure Boundary

Table 2.3.4.2 Auxiliary Feedwater System Component Types Subject to Aging Management Review and their Intended Functions	
Component Type	**Intended Functions**
FLOW ELEMENT / ORIFICE	Pressure Boundary Only
INDICATOR / RECORDER	Pressure Boundary

2.3.4.3 MAIN STEAM AND TURBINE STEAM EXTRACTION

The Main Steam and Turbine Steam Extraction System consists of piping from each steam generator that penetrates the Containment (steam generators are addressed in Sections 2.3.1.3 and 3.2.3). Main steam isolation valves are located in each pipe just outside containment. These pipes connect to a common header which leads to the four turbine stop valves and the Main Steam Isolation Valve (MSIV) in each pipe. Also included in the Main Steam and Turbine Steam Extraction System boundary is the piping to the turbine-driven auxiliary feedwater pump and the associated drains and vents. The MSIV packing leakoff line isolation valve is the boundary prior to the low pressure heaters.

The Main Steam and Turbine Steam Extraction System boundary is highlighted on the following drawing:

- 11405-M-252 Sheet 1, Flow Diagram Steam P & ID

The list of Main Steam and Turbine Steam Extraction System component types subject to aging management review and their intended functions is shown in Table 2.3.4.3.

Table 2.3.4.3 Main Steam and Turbine Steam Extraction System Component Types Subject to Aging Management Review and their Intended Functions	
Component Type	**Intended Functions**
FILTERS/STRAINERS	Pressure Boundary & Filtration
PIPES & FITTINGS	Pressure Boundary
VALVES	Pressure Boundary
BOLTING	Pressure Boundary

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

The determination of structures within the scope of license renewal is made by initially identifying Plant X structures and then reviewing them to determine which ones satisfy one or more of the criteria contained in 10 CFR 54.4. This process is described in Section 2.1 and the results of the structures review are contained in Section 2.2. Section 2.1 also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The structures that meet these screening requirements are identified in this section. These identified structures subsequently require an aging management review for license renewal.

2.4.1 CONTAINMENT

The Containment structure is a domed cylinder 140'-4 3/4" high with an outside radius of 58'-10 3/4". The structure is a partially prestressed, reinforced concrete Class I structure composed of cylindrical walls, domed roof and a bottom mat. The mat is common to both the Containment structure and the Auxiliary Building and is supported on steel piles driven to bedrock. The mat incorporates a depressed center portion for the reactor vessel. The Containment has a 1/4" internal carbon steel liner which maintains an essentially leak-tight boundary. The unbonded tendons are in conduits filled with waterproof grease. The tendon anchors are accessible for inspection, testing, and re-tensioning via the tendon access gallery located directly beneath the cylinder walls and at the dome roof.

The reinforced concrete internal structure consists of several levels/compartments supported on the mat by concrete columns. The internal structure is isolated from the Containment shell by a shake space which also permits the distribution and dissipation of any internal differential pressure during postulated accident events. The various floors are at elevations 1060'-0" (concrete), 1056'-8" (steel), 1045'-0" (concrete), and 1013'-0" (concrete). There are several compartments which house mechanical equipment. They are the steam generator and reactor coolant pump compartments, pressurizer compartment, and the reactor cavity.

The Containment structure houses a substantial amount of safety-related and non-safety related mechanical and electrical equipment. There are many mechanical piping and electrical penetrations through the cylinder walls.

The system boundary includes all concrete, steel, elastomer, and fire barrier components within the domed roof (approximate elevation 1031'-5") and cylinder walls (approximate radius of 58'-10"). This includes any components attached to the outside of the cylinder or dome above the Auxiliary Building roof. The post-tensioned tendons, the tendon gallery, equipment and personnel hatches are within the system boundary. The mechanical and electrical penetration sleeves, bellows, and any welds between the sleeve and the liner are included in the system boundary. For each mechanical penetration, the weld between the penetration and the pipe is not within the boundary (see various application sections for the pertinent safety-related and non-safety related systems). The list of Containment component types subject to aging management review and their intended functions is shown in Table 2.4.1.

Table 2.4.1
Containment Component Types Subject to Aging Management Review and Their Intended Functions

Component Type	Intended Functions
Concrete above Ground	Flood protection barrier
Concrete above Ground	Radiation shielding
Concrete above Ground	Shelter, protect and support safety-related components
Concrete above Ground	Spray shield or curbs
Concrete above Ground	Pressure boundary
Concrete above Ground	Missile barrier
Concrete above Ground	Pipe whip restraint
Concrete above Ground	Shielding against high energy line breaks
Concrete below Ground	Flood protection barrier
Concrete below Ground	Radiation shielding
Concrete below Ground	Shelter, protect and support safety-related components
Concrete below Ground	Spray shield or curbs
Concrete below Ground	Pressure boundary
Concrete below Ground	Missile barrier
Concrete below Ground	Pipe whip restraint
Concrete below Ground	Shielding against high energy line breaks
Concrete Interior	Flood protection barrier
Concrete Interior	Radiation shielding
Concrete Interior	Shelter, protect and support safety-related components
Concrete Interior	Spray shield or curbs
Concrete Interior	Pressure boundary
Concrete Interior	Missile barrier
Concrete Interior	Pipe whip restraint
Concrete Interior	Shielding against high energy line breaks
Grout Protected from Weather	Support safety-related components
Structural Steel in Air	Pipe whip restraint
Structural Steel in Air	Support safety-related components
Carbon Steel Threaded Fasteners	Support non-safety-related components
Carbon Steel Threaded Fasteners	Pressure boundary
Carbon Steel Threaded Fasteners	Shelter, protect and support safety-related

Table 2.4.1 Containment Component Types Subject to Aging Management Review and Their Intended Functions	
	components
Carbon Steel Threaded Fasteners	Missile barrier
Stainless Steel Threaded Fasteners	Pressure boundary
Equipment Hatch Gasket	Pressure boundary
Steel Liner	Pressure boundary
Refueling Pool Liner	Pressure boundary
Reactor Cavity Seal Ring	Pressure boundary
Post-Tensioned Tendons	Pressure boundary
Electrical Penetrations	Pressure boundary
Mechanical Penetrations	Pressure boundary
Post-Tensioned Tendons	Shelter, protect and support safety-related components
Post-Tensioned Tendons	Missile barrier
Containment Penetrations With Bellows	Pressure boundary
Trisodium Phosphate Baskets	Shelter, protect and support safety-related components
Equipment Hatch	Pressure boundary
Personnel Air Lock	Pressure boundary
Fuel Transfer Tube	Pressure boundary
Reactor Vessel Missile Shields	Missile barrier

2.4.2 *Other Structures*

The following structures are included in this subsection

- Auxiliary Building
- Intake Structure
- Turbine Building

2.4.2.1. Auxiliary Building

2.4.2.2. Intake Structure

The Intake Structure is a multi-floored Class 1 structure with an operating floor at elevation 1007'-6". From elevation 960'-10" (bottom of the foundation mat) to elevation 1014'-6", the structure is a box-type reinforced concrete structure with internal bracing provided by concrete walls and floor slabs. The mat foundation is supported on steel pipe piles driven to bedrock. From elevation 1014'-6" to elevation 1035'-7 1/2" (roof elevation), the structure is a braced steel frame clad with aggregate resin panels. The multi-layered built-up roof is supported by metal decking spanning between open web steel joists. The Intake Structure houses and protects both CQE and non-CQE systems and components. The diesel driven fire pump fuel tank enclosure is included in the Intake Structure.

The system boundary includes all concrete, steel, elastomer, and fire barrier components from elevation 960'-10" to elevation 1037'-6" between column lines 101 and 106 and from a distance 11'-8" East of column line AA to a distance 21'-10 3/8" West of column line DD. The enclosure for the Diesel Driven Fire Pump Fuel Tank is included in the system boundary. The circulating water intake and discharge tunnels are not within the system boundary. Component Supports (e.g. pipe supports, cable tray supports, equipment supports, and equipment anchorage) and Piles are to be evaluated as commodities.

A complete list of Intake Structure component types subject to aging management review and their intended functions is shown in Table 2.4.2.2.

Table 2.4.2.2
Intake Structure Component Types Subject to Aging Management Review and Their Intended Functions

Component Type	Intended Functions
Carbon Steel Threaded Fasteners	Flood protection barrier
Carbon Steel Threaded Fasteners	support non-safety-related components
Concrete above Ground	Flood protection barrier
Concrete above Ground	Flood protection barrier
Concrete above Ground	Shelter, protect and support safety-related components
Concrete above Ground	Source of cooling water
Concrete in a Fluid Environment	Flood protection barrier
Concrete in a Fluid Environment	Source of cooling water
Concrete in a Fluid Environment	Support safety-related components
Concrete Interior	Flood protection barrier
Concrete Interior	Missile barrier
Concrete Interior	Shelter, protect and support safety-related components
Flood Panel Seals	Flood protection barrier
Grout Protected From Weather	Support safety-related components
Structural Steel	Flood protection barrier
Structural Steel	Shelter and protect safety-related components

2.4.2.3. Turbine Building

The Turbine Building is a multi-floored Class II structure with an operating floor at elevation 1036'. From the basement floor elevation of 990' to elevation 1007'-6", the structure is a box-type, reinforced concrete structure with internal bracing provided by concrete walls, floor slabs and structural steel. The mat foundation is supported on steel piles driven to bedrock. From elevation 1007'-6" to the roof elevation of 1095'-5", the structure is braced steel frame clad with aggregate resin panels. The multi-layered built-up roof is supported by metal decking spanning between open web steel joists. The turbine generator is located on the operating floor. It is supported by a mass concrete structure referred to as the turbine pedestal. The turbine pedestal is independent from the Turbine Building structure. The Turbine Building houses both Limited CQE and non-CQE systems and components.

Main steam and feed water High Energy Line Break (HELB) restraints and shields are located in the Turbine Building.

The system boundary includes all concrete and steel East of the Auxiliary Building, between column lines 1 and 9 and from 3'-0" East of column line A to 3'-0" West of column line B. The circulating water intake and discharge tunnels are not within the Turbine Building system boundary. Component Supports (e.g. pipe supports, cable tray supports, conduit supports, equipment supports and equipment anchorage) and Piles are evaluated as commodities.

A complete list of Turbine Building component types subject to aging management review and their intended functions is shown in Table 2.4.2.3.

Table 2.4.2.3
Turbine Building Component Types Subject to Aging Management Review and Their Intended Functions

Component Type	Intended Functions
Carbon Steel Threaded Fasteners	Support non-safety-related components
Concrete above Ground	Support non-safety-related components
Concrete below Ground	Support non-safety-related components
Concrete Interior	Support non-safety-related components
Grout Protected From Weather	Shield against high energy line break
Grout Protected From Weather	Pipe whip support
Grout Protected From Weather	Support non-safety-related components
Structural Steel	Support non-safety-related components

Chapter 3 AGING MANAGEMENT REVIEW RESULTS

For those structures and components that are identified as being subject to an aging management review, 10 CFR 54.21(a)(3) requires demonstration that the effects of aging will be adequately managed so that their intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. The information provided in this chapter provides essential input to the required aging management review as it identifies and discusses the aging effects requiring management.

This chapter describes the results of the aging management reviews of the components and structures, identified in Chapter 2, Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review, and Implementation Results. This chapter:

- provides references to the descriptions of common aging management programs
- identifies the components and structural components subject to aging management review, and their intended functions
- discusses the materials and internal and external environments
- describes or references the processes used to identify aging effects
- describes industry and plant-specific operating experiences with respect to the aging effects
- identifies the aging effects requiring management
- lists the aging management programs for aging effects requiring management.

For those structures and components identified as being subject to an aging management review, the results are contained in Section 3.1 for Reactor Coolant Systems, Section 3.2 for Engineered Safety Features Systems, Section 3.3 for Auxiliary Systems, Section 3.4 for Steam And Power Conversion Systems, Section 3.5 for Structures and Structural Components, and Section 3.6 for Electrical and Instrumentation and Controls. Aging management program descriptions are contained in Appendix B.

3.4 Aging Management of Steam and Power Conversion System

The Plant X systems evaluated in this section of the application consist of the main steam and extraction steam systems, the main and auxiliary feedwater systems, condensate system, steam generator blowdown system and associated components.

The Main Steam System consists of piping from each steam generator that penetrates the containment wall to the main steam isolation valves that are located in each pipe just outside containment. The Extraction Steam System consists of steam lines leading from the turbine to the feedwater heaters including drains. Also included in the Main Steam and Extraction Steam System boundary is the piping to the turbine-driven auxiliary feedwater pump and the associated drains and vents.

The Feedwater System consists of a supply line to each steam generator. A feedwater isolation valve in each steam generator supply line is located just outside the containment penetration. These valves are motor operated, closing automatically on a Steam Generator Isolation Signal (SGIS). A check valve in each supply line, located inside containment, prevents uncontrolled blowdown from the affected steam generator in the event of a feedwater line break. The Feedwater System boundary also includes the piping from the steam generators to the isolation valves for the Blowdown and Primary Sampling Systems.

The Auxiliary Feedwater (AFW) System supplies feedwater to the steam generators whenever the reactor coolant system temperature is above 300 degrees F and the main feedwater system is not in operation. The AFW System contains one safety-related emergency feedwater storage tank (EFWST), two safety-related pumps, one non-safety-related pump, plus related piping, valves, and instrumentation. One safety-related pump is electric motor driven, and the other is steam turbine driven. The non-safety-related pump is diesel engine driven. The AFW System can supply the steam generators through two different flow paths. One flow path is through an interconnection with the main feedwater piping upstream of the feedwater regulating valves, after which the water enters the each steam generator through the normal feed ring. This flow path is typically used during normal plant heatup and cooldown evolutions. The other flow path connects to the AFW nozzles on the steam generators. Either safety-related AFW pump can pump water from the EFWST to the steam generators. The non-safety-related AFW pump may be used to pump water from the condensate storage tank to the steam generators. In the event of automatic initiation, such as when the steam generator low level setpoint is reached, the AFW System is designed to automatically start both safety-related AFW pumps and to direct flow to the steam generators via the flow path to the AFW nozzles.

OPERATING EXPERIENCE:

Site: Searches were conducted of pertinent site records, including the Condition Report (CR) system, and discussions were held with appropriate site personnel. These efforts revealed no evidence of additional aging effects requiring management.

Industry: Searches were conducted of industry records. These reviews revealed no evidence of additional aging effects requiring management.

3.4.1 Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Table 3.4.1 shows the component groups (combinations of materials and environments), and aging management programs evaluated in the GALL Report that are relied on for license renewal of the Steam and Power Conversion System for Plant X.

3.4.1.1 Further Evaluation of Aging Management as Recommended by GALL

3.4.1.1.1 Thermal Fatigue

Fatigue was not identified as a TLAA for Plant X. Thermal fatigue was identified as an aging effect requiring management. The Fatigue Monitoring Program described in Appendix B manages fatigued.

3.4.1.1.2 Water Chemistry

GALL Report Sections VIII G1.1 and VIII G1.2 indicate that the verification of the effectiveness of the water chemistry program should be conducted with an inspection of stagnant flow locations within the systems. These inspections are either being conducted in accordance with the Periodic Surveillance and Preventive Maintenance Program or will be conducted in accordance with the Age-Related Degradation Inspection Program prior to expiration of the current license. Both programs are described in Appendix B.

3.4.1.1.3 Carbon steel components of oil coolers in oil

The loss of material due to microbiologically influenced corrosion is only applicable to carbon steel components of oil coolers at Plant X because the environment for auxiliary feedwater piping is only treated water. If there is a potential for water contamination and water pooling in a lube oil system, loss of material due to general corrosion and microbiologically influenced corrosion are concerns for carbon steel. Corrosion is therefore considered to be an aging effect requiring management due to the need to

Table 3.4.1

Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Component Group	Aging Effect / Mechanism	Aging Management Program	GALL Further evaluation recommended	Discussion
Piping and fittings in main feedwater line and in steam line	Cumulative fatigue damage	Fatigue Monitoring Program	Yes, TLAA.	See Section 3.4.1.1.1
Carbon steel piping, valve bodies, pump casing, and tanks. (except main steam system)	Loss of material	Water Chemistry	Yes, detection of aging effects should be further evaluated	This group includes low alloy steel components at Plant X. See Section 3.4.1.1.2 for discussion of further evaluation.
Oil coolers	Loss of material from general and microbiologically influenced corrosion	Periodic Surveillance and Preventive Maintenance	Yes, plant specific	See Section 3.4.1.1.3
Carbon steel piping, valve bodies, and pump casings	Wall thinning from flow-accelerated corrosion	Flow Accelerated Corrosion	No	The information in the GALL report bounds Plant X
Carbon steel piping and valve bodies in main steam system	Loss of material from crevice and pitting corrosion	Water Chemistry	No	This group includes low alloy steel components at Plant

Table 3.4.1

Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Component Group	Aging Effect / Mechanism	Aging Management Program	GALL Further evaluation recommended	Discussion
				X. The information in the GALL report bounds Plant X
External surface of carbon steel components	Loss of material from atmospheric corrosion	General Corrosion of External Surfaces		Aging management program is different from that described in GALL – see Section 3.4.1.2.1
Closure bolting in high-pressure or high-temperature systems	Loss of material from atmospheric corrosion and crack initiation and growth from cyclic loading, stress corrosion cracking.	General Corrosion of External Surfaces		Aging management program is different from that described in GALL – see Section 3.4.1.2.2

employ periodic lube oil sampling to ensure that water is not present, thereby confirming that the condition which could potentially cause this aging effect does not exist.

As discussed in Appendix B the Periodic Surveillance and Preventive Maintenance ensures water is not present in lubricating oil and that the oil is changed on a refueling frequency.

3.4.1.2 Aging Management Programs or Evaluations that Are Different from those Described in the GALL Report

3.4.1.2.1 External surfaces of carbon steel components

Carbon steel items (with or without an external coating) in a plant indoor air external environment are susceptible to external general corrosion, although such corrosion would be minimal if the carbon steel remains in a dry condition. As discussed in Appendix B the General Corrosion of External Surfaces Program manages this aging effect.

3.4.1.2.2 Pressure boundary bolting on treated water or oil systems

Crack initiation and growth from cyclic loading, stress corrosion cracking has not been observed in closure bolting on systems containing non-borated treated water and on systems containing oil located in a plant indoor air external environment.

General corrosion is an aging effect requiring management for closure bolting due to the potential for external leakage of the process fluid, although external leakage of non-borated treated water would not be expected to rapidly corrode bolting.

No aging effects requiring management were identified for pressure boundary bolting on oil systems because (1) the bolting is routinely exposed to a plant indoor air environment which is not conducive to any aging effects, and (2) external leakage of oil will not corrode carbon or low-alloy steel bolting materials.

As discussed in Appendix B the General Corrosion of External Surfaces Program manages this aging effect.

3.4.2 Components or Aging Effects that Are Not Addressed in the GALL Report

Table 3.4.2 contains Steam and Power Conversion System aging management review results for internal and external environments. These tables include the component types, materials, environments, aging effects requiring management, and the programs and activities for managing aging.

The following combinations of materials and environments exist for the components subject to aging management in the Steam and Power Conversion System.

- Aluminum in Oil
- Copper Alloy in Oil
- Copper Alloy in Treated Water
- Glass in Oil or Treated Water
- Stainless Steel in Treated Water and Saturated steam
- Stainless Steel in Oil
- Aluminum in Plant Indoor Air
- Copper Alloy in Plant Indoor Air
- Stainless Steel in Plant Indoor Air
- Glass in Plant Indoor Air

3.4.2.1 Aluminum in Oil

Component Group Description:

This group includes aluminum and aluminum alloy items with a lubricating oil internal environment.

Aging Effects Requiring Management, and Mechanisms:

Loss of Material

If there is a potential for water contamination and water pooling in a lube oil system, loss of material is a concern. Loss of material is therefore an aging effect requiring management due to the need to employ periodic lube oil sampling to ensure that water is not present.

Aging Management Program

As discussed in Appendix B the Periodic Surveillance and Preventive Maintenance ensures water is not present in lubricating oil and that the oil is changed on a refueling frequency.

3.4.2.2 Copper Alloy in Oil

Component Group Description:

This group includes copper and copper alloy items in a lubricating oil internal environment.

Aging Effects Requiring Management, and Mechanisms:

Loss of Material

There is a potential for loss of material of copper alloys in a treated water environment if the zinc content of the material is greater than 15%. Loss of material is identified as an aging effect requiring management for items in this group because their specific zinc content could not be confirmed to be in a range where loss of material aging effects are not plausible.

Aging Management Program

As discussed in Appendix B the Periodic Surveillance and Preventive Maintenance ensures water is not present in lubricating oil and that the oil is changed on a refueling frequency.

3.4.2.3 Copper Alloy in Treated Water

Component Group Description:

Includes copper & copper alloy items in treated water as an internal environment.

Aging Effects Requiring Management, and Mechanisms:

Loss of Material

If there is a potential for water contamination and water pooling in a lube oil system, loss of material is a concern. Loss of material is therefore an aging effect requiring management due to the need to employ periodic lube oil sampling to ensure that water is not present

Aging Management Program

As discussed in Appendix B the Periodic Surveillance and Preventive Maintenance ensures water is not present in lubricating oil and that the oil is changed on a refueling frequency.

3.4.2.4 Glass in Oil or Treated Water

Component Group Description:

This AMR group covers glass items, such as sight glasses, where the glass functions as part of a fluid pressure boundary, and the internal environment is oil or water.

Aging Effects Requiring Management, and Mechanisms:

Sight glasses are used in applications such as local tank level indicators and pipe flow indicators. The glass functions as part of the pressure boundary of the respective system.

Glass is an amorphous inorganic oxide cooled to a rigid condition without crystallization. Depending on the desired properties of the glass, varying amounts of modifiers, fluxes, and stabilizers are added. Glass is susceptible to hydrofluoric and caustic attack and it is subject to slight attack by hot water. It is hydrolytically decomposed during hot water attack rather than dissolved. Its resistance to hot water is dependent on the composition of the glass (e.g., modifiers, fluxes, and stabilizers). Uniform or selective attack can occur.

The glass of level gauges and flow indicators is exposed to chemically controlled DI water in various plant tanks and pipelines at essentially ambient temperature. It is not exposed to hot water, hydrofluoric, or caustic conditions.

The glass is not exposed to conditions that may degrade it. Glass is unaffected by aging mechanisms and is not subject to any aging effects requiring management.

3.4.2.5 Stainless Steel in Treated Water and Saturated Steam

Component Group Description:

This group includes stainless steel components with an internal environment of treated water.

Aging Effects Requiring Management, and Mechanisms:

Loss of Material - Pitting Corrosion

Pitting corrosion is not a plausible aging effect for stainless steel in a treated water environment if halogens are less than 150 ppb and sulfates are less than 100 ppb. Pitting corrosion is considered to be an aging effect requiring management due to the need to adhere to chemistry limits for treated water which ensure that these parameters are in a range where this mechanism is not plausible.

Loss of Material - Crevice Corrosion

Crevice corrosion is not a plausible aging effect for stainless steel in a treated water environment if the dissolved oxygen level is less than 100 ppb. Crevice corrosion is considered to be an aging effect requiring management due to the need to adhere to chemistry limits for treated water which ensure that these parameters are in a range where this mechanism is not plausible.

Cracking

Cracking is not a plausible aging effect for stainless steel in a treated water environment if halogens are less than 150 ppb and sulfates are less than 100 ppb. Cracking is considered to be an aging effect requiring management due to the need to adhere to chemistry limits for treated water which ensure that these parameters are in a range where this mechanism is not plausible.

Aging Management Program

As discussed in Appendix B the Water Chemistry and Closed-Cycle Cooling Water Program ensures water chemistry limits are maintained.

3.4.2.6 Stainless Steel in Oil

Component Group Description:

This group includes stainless steel items with lubricating oil as an internal environment.

Aging Effects Requiring Management, and Mechanisms:

Loss of Material

If there is a potential for water contamination and water pooling in a lube oil system, loss of material due to pitting & crevice corrosion is a concern. Loss of material due to galvanic corrosion can also be a concern if the stainless steel is in contact with a more cathodic material such as brass/bronze; however, galvanic corrosion is not an issue if there is no water present to provide an electrolytic environment. Loss of material is therefore conservatively identified as an aging effect requiring management due to the need to employ periodic lube oil sampling to ensure that water is not present, thereby confirming that the condition which could potentially cause this aging effect does not exist.

Aging Management Program

As discussed in Appendix B the Periodic Surveillance and Preventive Maintenance ensures water is not present in lubricating oil and that the oil is changed on a refueling frequency.

3.4.2.7 Aluminum in Plant Indoor Air

Component Group Description:

This group includes aluminum and aluminum alloy items with an external environment of plant indoor air.

Aging Effects Requiring Management, and Mechanisms:

None

No aging effects were identified for aluminum in an air environment. Aluminum in an indoor air environment is not susceptible to galvanic corrosion due to absence of significant electrolyte in plant indoor air. Items in this group are not susceptible to a wetted environment.

3.4.2.8 Copper Alloy in Plant Indoor Air

Component Group Description:

This group includes copper and copper alloy items (e.g., brass, bronze) with an external environment of plant indoor air.

Aging Effects Requiring Management, and Mechanisms:

None

No aging effects for copper alloy in an indoor air environment were identified. Galvanic corrosion is not a concern because plant indoor air is not a significant electrolytic environment. Copper alloy is not susceptible to a wetted (water) external environment.

3.4.2.9 Stainless Steel in Plant Indoor Air

Component Group Description:

This group includes all 300 series, stainless steel items exposed only to plant indoor air (i.e., valve bodies, bolts,etc.).

Aging Effects Requiring Management, and Mechanisms:

None

No aging effects were identified for stainless steel in plant indoor air. Other chemicals must also be present (i.e., halide ions, bromides, chlorides, etc.) which are not present in sufficient quantity to justify aging effects for this material/environment.

3.4.2.10 Glass in Plant Indoor Air

Component Group Description:

This group includes glass items (e.g., sight glasses, level glasses) with an external environment of plant indoor air.

Aging Effects Requiring Management, and Mechanisms:

None

The glass is not exposed to conditions that may degrade it. Glass is unaffected by aging mechanisms and is not subject to any aging effects requiring management.

3.4.3 Conclusion

The aging effects requiring management are adequately managed by the following programs:

Water Chemistry and Closed-Cycle Cooling Water Program
General Corrosion of External Surfaces Program
Age Related Degradation Inspection Program
Periodic Surveillance and Preventive Maintenance Program

These programs are described in Appendix B.

Table 3.4.2
Steam and Power Conversion System Component Types Subject to Aging Management

Component Types	Material	Environment	AERMs	Program/Activity
Pipes, Fittings and Valves	Stainless Steel	Treated Water (greater than 200 deg F)	Loss of Material	Water Chemistry and Closed-Cycle Cooling Water Program
Bolting	Stainless Steel	Containment Air/Plant Indoor Air	None	None Required
Pipes, Fittings, Valves Filter/Strainer, Heat Exchanger, Flow Element/Orifice, Transmitter Element	Stainless Steel	Containment Air/Plant Indoor Air	None	None Required
Pipes, Fittings and Valves	Stainless Steel	Saturated Steam	Cracking	Water Chemistry and Closed-Cycle Cooling Water Program
Pipes, Fittings and Valves	Stainless Steel	Saturated Steam	Loss of Material	Water Chemistry and Closed-Cycle Cooling Water Program
Pump	Aluminum	Lubricating Oil possibly contaminated with water	Loss of Material	Periodic Surveillance and PM Program
Pump	Aluminum	Plant Indoor Air	None	None Required
Heat Exchanger	Copper Alloy	<90°C(194°F) Treated Water	Loss of Material - Selective Leaching	Age-Related Degradation Inspection (ARDI)
Heat Exchanger	Copper Alloy	<90°C(194°F) Treated Water	Loss of Material - Wear	Age-Related Degradation Inspection (ARDI)
Pipes, Fittings, Valves Filter/Strainer, Heat Exchanger	Copper Alloy	Lubricating Oil possibly contaminated with water	Loss of Material	Periodic Surveillance and PM Program
Pipes, Fittings, Valves Filter/Strainer, Heat Exchanger	Copper Alloy	Plant Indoor Air	None	None Required

Table 3.4.2
Steam and Power Conversion System Component Types Subject to Aging Management

Component Types	Material	Environment	AERMs	Program/Activity
Indicator/Recorder	Glass	<90°C(194°F) Treated Water	None	None Required
Indicator/Recorder	Glass	Lubricating Oil possibly contaminated with water	None	None Required
Indicator/Recorder	Glass	Plant Indoor Air	None	None Required
Pipes, Fittings, Valves Filter/Strainer, Heat Exchanger, Flow Element/Orifice, Transmitter Element	Stainless Steel	<90°C(194°F) Treated Water	Cracking	Water Chemistry and Closed-Cycle Cooling Water Program Age-Related Degradation Inspection (ARDI)
Pipes, Fittings, Valves Filter/Strainer, Heat Exchanger, Flow Element/Orifice, Transmitter Element	Stainless Steel	<90°C(194°F) Treated Water	Loss of Material	Water Chemistry and Closed-Cycle Cooling Water Program Age-Related Degradation Inspection (ARDI)
Filter/Strainer	Stainless Steel	Lubricating Oil possibly contaminated with water	Cracking	Water Chemistry and Closed-Cycle Cooling Water Program

3.5 Aging Management of Containment, Structures and Component Supports

The structures and components for Plant X evaluated in this section of the application consist of the containment, Class 1 structures and associated component supports.

The Containment structure is a domed cylinder 140'-4 3/4" high with an outside radius of 58'-10 3/4". The structure is a partially prestressed, reinforced concrete Class I structure composed of cylindrical walls, domed roof and a bottom mat. The mat is common to both the Containment structure and the Auxiliary Building and is supported on steel piles driven to bedrock. The mat incorporates a depressed center portion for the reactor vessel. The Containment has a 1/4" internal carbon steel liner that maintains an essentially leak-tight boundary. The unbonded tendons are in conduits filled with waterproof grease. The tendon anchors are accessible for inspection, testing, and re-tensioning via the tendon access gallery located directly beneath the cylinder walls and at the dome roof.

The reinforced concrete internal structure consists of several levels/compartments supported on the mat by concrete columns. The internal structure is isolated from the Containment shell by a shake space that also permits the distribution and dissipation of any internal differential pressure during postulated accident events. The various floors are at elevations 1060'-0" (concrete), 1056'-8" (steel), 1045'-0" (concrete), and 1013'-0" (concrete). There are several compartments that house mechanical equipment. They are the steam generator and reactor coolant pump compartments, pressurizer compartment, and the reactor cavity.

The Class 1 Structures at Plant X consist of the auxiliary building, turbine building, and intake structure. The control room is located within the auxiliary building.

The Turbine Building is a multi-floored Class II structure with an operating floor at elevation 1036'. From the basement floor elevation of 990' to elevation 1007'-6", the structure is a box-type, reinforced concrete structure with internal bracing provided by concrete walls, floor slabs and structural steel. The mat foundation is supported on steel piles driven to bedrock. From elevation 1007'-6" to the roof elevation of 1095'-5", the structure is braced steel frame clad with aggregate resin panels. The multi-layered built-up roof is supported by metal decking spanning between open web steel joists. The turbine generator is located on the operating floor. It is supported by a mass concrete structure referred to as the turbine pedestal. The turbine pedestal is independent from the Turbine Building structure. The Turbine Building houses both Limited CQE and non-CQE systems and components.

The Intake Structure is a multi-floored Class 1 structure with an operating floor at elevation 1007'-6". From elevation 960'-10" (bottom of the foundation mat) to elevation

1014'-6", the structure is a box-type reinforced concrete structure with internal bracing provided by concrete walls and floor slabs. The mat foundation is supported on steel pipe piles driven to bedrock. From elevation 1014'-6" to elevation 1035'-7 1/2" (roof elevation), the structure is a braced steel frame clad with aggregate resin panels. The multi-layered built-up roof is supported by metal decking spanning between open web steel joists. The Intake Structure houses and protects both CQE and non-CQE systems and components. The diesel driven fire pump fuel tank enclosure is included in the Intake Structure.

OPERATING EXPERIENCE:

Site: Searches were conducted of pertinent site records, including the Condition Report (CR) system, and discussions were held with appropriate site personnel. These efforts revealed no evidence of additional aging effects requiring management.

Industry: Searches were conducted of industry records. These reviews revealed no evidence of additional aging effects requiring management.

3.5.1 Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Table 3.5.1 shows the component groups (combinations of materials and environments), and aging management programs evaluated in the GALL Report that are relied on for license renewal of the Structures and Component Supports for Plant X.

Table 3.5.1
Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Component Group	Aging Effect / Mechanism	Aging Management Program	GALL Further evaluation recommended	Discussion
Containment				
Penetration sleeves, bellows, and dissimilar metal welds	Cracking for cyclic loading & crack initiation and growth from SCC	Containment inservice inspection and containment leak rate test	Yes, detection of aging effects should be further evaluated	See Section 3.5.1.1.1
Penetration sleeves, penetration bellows, and dissimilar metal welds	Loss of material from corrosion	Containment inservice inspection and containment leak rate test	No	The information in the GALL report bounds Plant X.
Personnel airlock and equipment hatch	Loss of material from corrosion	Containment inservice inspection and containment leak rate test	No	The information in the GALL report bounds Plant X.
Personnel airlock and equipment hatch	Mechanical Wear of Locks, Hinges and Closure Mechanisms required to maintain the airlock/hatch in the closed position	Containment inservice inspection	No	The information in the GALL report bounds Plant X

Table 3.5.1
Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Component Group	Aging Effect / Mechanism	Aging Management Program	GALL Further evaluation recommended	Discussion
Equipment hatch gasket	Loss of sealant and leakage through containment from deterioration of seals, gaskets, and moisture barriers	Containment inservice inspection and containment leak rate test	No	The information in the GALL report bounds Plant X
Concrete elements: Basemat, exterior walls below grade.	Aging of inaccessible concrete areas due to leaching of calcium hydroxide, aggressive chemical attack, and corrosion of embedded steel	Containment inservice inspection	Yes, for inaccessible areas	Aging evaluation different from that described in GALL – see Section 3.5.1.2.1
Concrete elements: Basemat	Cracks, distortion, and increases in components stress level from settlement	Containment structure settlement monitoring	Yes. if applicable, proper functioning of de-watering system should be evaluated	Aging evaluation different from that described in GALL – see Section 3.5.1.2.2
Concrete elements: Foundation	Reduction in foundation strength from erosion of porous concrete	Containment structure settlement monitoring	Yes. if applicable, proper functioning of de-watering system should be evaluated	Aging evaluation different from that described in GALL – see Section

Table 3.5.1
Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Component Group	Aging Effect / Mechanism	Aging Management Program	GALL Further evaluation recommended	Discussion
	subfoundation			3.5.1.2.2
Concrete elements: Basemat, dome, and wall	Loss of strength and modulus from elevated temperature	Plant-specific	Yes, for any portions of concrete containment that exceed specified temperature limits	Aging evaluation different from that described in GALL – see Section 3.5.1.2.3
Steel elements: Liner plates and steel structures	Aging of inaccessible steel areas: Loss of material from corrosion	Containment inservice inspection and containment leak rate test	Yes, for inaccessible areas	See Section 3.5.1.1.2
Prestressed containment: Tendons and anchorage components	Loss of material from corrosion of prestressing tendons, anchorage components	Containment inservice inspection	No	The information in the GALL report bounds Plant X
Concrete elements Basemat, dome, and wall	Scaling, cracking, and spalling from freeze-thaw; expansion and cracking from reaction with aggregates	Containment inservice inspection	No	Aging evaluation different from that described in GALL – see Section 3.5.1.2.4
Liners	Crack initiation and	Monitoring of the leak	No	The information in

Table 3.5.1
Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Component Group	Aging Effect / Mechanism	Aging Management Program	GALL Further evaluation recommended	Discussion
	growth from SCC and loss of material from crevice corrosion	in fuel storage facility		the GALL report bounds Plant X
Turbine and Auxiliary Buildings				
Accessible interior and exterior concrete & steel components.	All types of aging effects	Structures monitoring	No – All Class 1 structures are within the scope of the Plant X structures monitoring program.	Aging evaluation different from that described in GALL – see Sections 3.5.1.2.1 through 3.5.1.2.4. The information in the GALL report bounds Plant X for steel components
Liners	Crack initiation and growth from SCC and loss of material from crevice corrosion	Monitoring of the leak in fuel storage facility	No	The information in the GALL report bounds Plant X

Table 3.5.1
Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Component Group	Aging Effect / Mechanism	Aging Management Program	GALL Further evaluation recommended	Discussion
Intake Structure				
All accessible/inaccessible concrete & steel components	All types of aging effects including loss of material from abrasion; cavitation & corrosion	Inspection of water-controlled structures	No	Aging evaluation different from that described in GALL – see Sections 3.5.1.2.1 through 3.5.1.2.5. The information in the GALL report bounds Plant X for steel components
Component Supports				
Support members, anchor bolts, and welds, Concrete surrounding anchor bolts, grout pad, Bolted friction connections etc.	Aging of component supports	Structures monitoring	No, all component supports are within the scope of the applicant's structures monitoring program	The information in the GALL report bounds Plant X
Support members,	Loss of material	Boric acid corrosion	No	The information in

Table 3.5.1
Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Component Group	Aging Effect / Mechanism	Aging Management Program	GALL Further evaluation recommended	Discussion
anchor bolts, and welds	from boric acid corrosion			the GALL report bounds Plant X
Support members, anchor bolts, welds, Spring hangers, guides, stops, and vibration isolators	Loss of material from environ-mental corrosion; Loss of mechanical function; and Cracking from cyclic loading	Inservice inspection	No	The information in the GALL report bounds Plant X

3.5.1.1 Further Evaluation of Aging Management as Recommended by GALL

3.5.1.1.1 Containment Penetrations with Carbon Steel Bellows

GALL Report Section II.A.3.1 indicates that the in-service inspection program be augmented when stress corrosion cracking is a concern for dissimilar welds. No dissimilar welds were identified for the Containment Penetrations with Carbon Steel Bellows Component Group. Therefore, the information in the GALL report bounds Plant X.

3.5.1.1.2 Containment Steel Liner

The seal between the containment floor and the containment steel liner is inspected as part of the Containment Inservice Inspection Program. If this seal were determined to be damaged then appropriate portion of the liner would be accessed and inspected.

3.5.1.2 Aging Management Programs or Evaluations that Are Different from those Described in the GALL Report

3.5.1.2.1 Concrete Below Grade

Concrete that is below grade is exposed to the chemicals in the groundwater or untreated water. The concrete is Class A (compressive strength of 5000 psi, water-to-cement ratio is 4.25 gallons/sack or 0.38, minimum cement is 6.25 sacks/cubic yard, water reducing admixture is 4.75% ± 0.75%) or Class B (compressive strength of 4000 psi, water-to-cement ratio is 5.0 gallons/sack or 0.44, minimum cement is 5.50 sacks/cubic yard, water reducing admixture is 5.0% ± 1.0%).

<u>Leaching of calcium hydroxide</u>
Per NUREG-1557[1], leaching of calcium hydroxide from reinforced concrete becomes significant only if the concrete is exposed to flowing water. The reinforced concrete at Plant X is not exposed to flowing water. Even if reinforced concrete is exposed to flowing water, such leaching is not significant if the concrete is constructed to ensure that it is dense, well-cured, has low permeability, and that cracking is well controlled. Cracking is controlled through proper arrangement and distribution of reinforcing bars. The concrete at Plant X was designed in accordance with ACI 318-63 (per USAR Section 5.3.1 and USAR Section 5.11.3.1) and has these characteristics. Therefore, aging management is not required.

<u>Corrosion of Embedded Steel</u>
Per NUREG-1557[1], corrosion of embedded steel is not significant for concrete structures above or below grade not exposed to an aggressive environment (pH

[1] NUREG-1557, "Summary of Technical Information and Agreements from Nuclear Management and Resoures Council Industry Reports Addressing License Renewal", October 1996.

less than 11.5 or chlorides greater than 500 ppm) or for concrete structures exposed to an aggressive environment but have a low water-to-cement ratio (0.35 to 0.45), adequate air entrainment (3 to 6%), and designed in accordance with ACI 318-63 or ACI 349-85. Therefore, if these conditions are satisfied, aging management is not required. The concrete at Plant X is not exposed to aggressive river water or groundwater. There is no heavy industry in area whose emissions would cause degradation to concrete. The concrete at Plant X has been designed in accordance with ACI 201.2R that provides a low water-to-cement ratio and adequate air entrainment. The concrete mix design specified a water-to-cement ratio of 0.38 and air entrainment of 4.75% ± 0.75% for Class A concrete. It specified a water-to-cement ratio of 0.44 and air entrainment of 5.00% ± 1.00% for Class B concrete. Class C concrete was only used for radiation shields; therefore, it would not be exposed to an environment that would promote corrosion of embedded steel. The concrete at Plant X was designed in accordance with ACI 318-63 (per USAR Section 5.3.1 and USAR Section 5.11.3.1). The conditions specified above have been satisfied; therefore, aging management is not required.

Aggressive Chemical Attack

Aggressive chemical attack on reinforced concrete is not significant if the concrete is not exposed to an aggressive environment (pH less than 5.5), or to chloride or sulfate solutions beyond defined limits (greater than 500 ppm chloride, or greater than 1500 ppm sulfate). Therefore, if these conditions are satisfied, aging management is not required. The concrete at Plant X is not exposed to aggressive river water or groundwater. There is no heavy industry in area whose emissions would cause degradation to concrete or steel. The conditions specified above have been satisfied; therefore, aging management is not required.

3.5.1.2.2 Settlement and Erosion of Porous Concrete

The structures at Plant X are supported on end-bearing steel pipe piles driven to bedrock. Settlement and erosion of porous concrete subfoundation are not plausible aging mechanisms; therefore, aging management is not required.

3.5.1.2.3 Elevated Temperatures

The temperatures shall not exceed 150 deg F except for local areas that are allowed to have increased temperatures not to exceed 200 deg F. Therefore, if these conditions are satisfied, aging management is not required. Per USAR Section 2.5.2.3, the record high temperature in the vicinity of Plant X was 114 deg F in July 1936. This is below the temperature limit of 150 deg F. USAR Table 9.10-1 provides maximum building/room temperatures for the Auxiliary Building, Turbine Building, Containment, Control Room, Engine Driven Auxiliary Feedwater Pump Room, Radioactive Waste Processing Building, Chemistry and Radiation Protection Building, and Office/Cafeteria Addition. The maximum indoor plant temperature in Table 9.10-1 is 120 deg F inside the main area of Containment. This is below the temperature limit of 150 deg F. Per USAR Section 5.5.4, sleeve radiation fins and thermal sleeves (in conjunction with pipe insulation) were used to limit maximum temperature at the containment penetration sleeves to 150 deg F under operating conditions. The conditions specified above have been satisfied; therefore, aging management is not required.

3.5.1.2.4 Scaling, cracking, and spalling from freeze-thaw; expansion and cracking from reaction with aggregates

As described in NUREG-1557, freeze/thaw does not cause loss of material from reinforced concrete in foundations, and in above and below grade exterior concrete, for plants located in a geographic region of negligible weathering conditions (weathering index <100 day-inch/yr). Loss of material from such concrete is not significant at plants located in areas in which weathering conditions are severe (weathering index >500 day-inch/yr) or moderate (100-500 day-inch/yr), provided that the concrete mix design meets the air content (entrained air 3-6%) and water-to-cement ratio (0.35-0.45) specified in ACI 318-63 or ACI 349-85. These conditions are satisfied for Plant X and aging management is not required.

3.5.1.2.5 Abrasion/Cavitation

Abrasion/cavitation occurs only in concrete structures that are continuously exposed to flowing water. Abrasion/cavitation damage is not common if velocities are less than 40 fps. In closed conduits, however, degradation due to abrasion/cavitation can occur at a velocity as low as 25 fps when abrupt changes in slope or curvature exists. Therefore, if these conditions are satisfied, aging management is not required. The concrete at Plant X is not exposed to flowing water greater than 40 fps for open channel flow or 25 fps for closed conduits. The area of the plant that has the highest water velocity for open channel flow is through the circulator suction sluice gate at 5.5 fps. The area of the plant that has the highest water velocity for a closed conduit is in the warm water recirculation tunnel at 12.6 fps. Therefore, abrasion/cavitation is not a plausible aging mechanism for concrete at Plant X. Aging management is not required.

3.5.2 Components or Aging Effects that Are Not Addressed in the GALL Report

Table 3.5.2 contains Structures and Component Supports aging management review results for internal and external environments. These tables include the component types, materials, environments, aging effects requiring management, and the programs and activities for managing aging.

The following combinations of materials and environments exist for the components subject to aging management in the Structures and Component Supports.

- Structural Stainless Steel Inside Containment

- Structural Stainless Steel In Ambient Air
- Neoprene in Plant Indoor Air

3.5.2.1 Structural Stainless Steel Inside Containment

Stainless steel inside buildings is protected from the atmosphere/weather. It may be exposed to temperatures up to 120 deg F and 100% humidity. The stainless steel may be exposed to borated water during refueling.

Aging Effects Requiring Management, and Mechanisms:

Cracking

Due to stress corrosion cracking (SCC): SCC is an aging effect requiring management due to the exposure of stainless steel to halogens, sulfates, and stress.

Due to fatigue/cyclic loading: Cracking due to fatigue is an aging effect requiring management due to the progressive, localized structural change in materials subjected to fluctuating stresses and strains.

Loss of Material

Due to crevice corrosion: Loss of material due to crevice corrosion is an aging effect requiring management due to the exposure of stainless steel to dissolved oxygen.

Due to Pitting Corrosion: Loss of material due to pitting corrosion is an aging effect requiring management due to the exposure of stainless steel to halogens and sulfates.

3.5.2.2 Structural Stainless Steel In Ambient Air

This group includes stainless steel items with an external environment of plant indoor air or containment air.

Aging Effects Requiring Management, and Mechanisms:

No Aging Effects Requiring Management were identified for stainless steel in ambient air.

3.5.2.3 Neoprene in Plant Indoor Air

Neoprene inside buildings is protected from the atmosphere/weather. It may be exposed to temperatures up to 150 deg F and 100% humidity.

Aging Effects Requiring Management, and Mechanisms:

Cracking

Due to Thermal Exposure: Cracking due to thermal exposure is an aging effect requiring management due to the prolonged exposure of neoprene to temperatures above 95 deg F.

Change in Material Properties

Due to thermal exposure: A change in material properties due to thermal exposure is an aging effect requiring management due to the prolonged exposure of neoprene to temperatures above 95 deg F.

3.5.3 Conclusion

The aging effects requiring management are adequately managed by the following programs:

Chemistry Program
Containment Leak Rate Program
Structures Monitoring Program
Containment Inservice Inspection Program
Periodic Surveillance and Preventive Maintenance

These programs are described in Appendix B.

Table 3.5.2
Structures and Component Supports or Aging Effects that Are Not Addressed in the GALL Report

Component Types	Material	Environment	AERMs	Program/Activity
Trisodium Phosphate Baskets	Stainless Steel	Containment Air	None	None required
Fuel Transfer Tube	Stainless Steel	Containment Air	None	None required
Fuel Transfer Tube	Stainless Steel	Borated Water	Loss of Material Cracking	Chemistry Program Containment Leak Rate Program
Intake Flood Panel Seals	Neoprene	Plant Indoor Air	Change in Material Properties Cracking	Periodic Surveillance and Preventive Maintenance

3.6 Aging Management of Electrical and Instrumentation and Controls

The components for Plant X evaluated in this section of the application encompasses the passive, long-lived electrical cables and connections which support an intended function as defined by 10 CFR Part 54.21(a)(1)(i). Cables and their associated connectors perform the function of providing electrical energy (either continuously or intermittently) to power various equipment and components throughout the plant to enable them to perform their intended functions. Cables and connectors associated with the 10CFR50.49 program (Environmental Qualification) are addressed either as short lived, replaced periodically, or as long-lived Time Limited Aging Analysis candidates (TLAA), as such those candidates are not included in the set of cables and connectors requiring aging management review.

OPERATING EXPERIENCE:

Site: Searches were conducted of pertinent site records, including the Condition Report (CR) system, and discussions were held with appropriate site personnel. These efforts revealed no evidence of additional aging effects requiring management.

Industry: Searches were conducted of industry records. These reviews revealed no evidence of additional aging effects requiring management.

3.6.2 Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Table 3.6.1 shows the component groups (combinations of materials and environments), and aging management programs evaluated in the GALL Report that are relied on for license renewal of the Structures and Component Supports for Plant X.

Table 3.6.1
Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Component Group	Aging Effect / Mechanism	Aging Management Program	GALL Further evaluation recommended	Discussion
Non-EQ electrical cables and connections	Embrittlement, cracking, melting, discoloration, leading to reduced insulation resistance, electrical failure, caused by thermal/ thermoxidative degradation of organics, radiolysis and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation	Aging management program for Non-EQ electrical cables and connections exposed to an adverse localized environment caused by heat or radiation	No	The information in the GALL report bounds Plant X.
Non-EQ inaccessible medium-voltage (2kV to 15kV) cables (e.g., installed in conduit or direct buried)	Formation of water trees, localized damage, leading to electrical failure (breakdown of insulation), caused by moisture intrusion, water trees	Aging management program for Non-EQ inaccessible medium-voltage cables exposed to an adverse localized environment caused by moisture and voltage exposure	No	Aging management program is different from that described in GALL – see Section 3.6.1.2.1

Table 3.6.1
Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

Component Group	Aging Effect / Mechanism	Aging Management Program	GALL Further evaluation recommended	Discussion
Non-EQ electrical connectors exposed to borated water leakage	Corrosion of connector contact surfaces caused by intrusion of borated water	Borated water leakage surveillance program for Non-EQ electrical connectors	No	Aging management program is different from that described in GALL – see Section 3.6.1.2.2

3.6.2.1 Further Evaluation of Aging Management as Recommended by GALL

No items requiring further evaluation were identified.

3.6.2.2 Aging Management Programs or Evaluations that Are Different from those Described in the GALL Report

3.6.2.2.1 Non-EQ inaccessible medium-voltage (2kV to 15kV) cables potentially exposed to wetting

The duct banks in which non-EQ inaccessible medium-voltage (2kV to 15kV) cables are enclosed at Plant X have been sealed to prevent water intrusion. A one-time inspection will be performed prior to the end of the current license period to ensure these duct banks remain effectively sealed.

3.6.2.2.2 Non-EQ electrical connectors exposed to borated water leakage

The inspection of electrical components at Plant X is included in the Boric Acid Corrosion Program.

3.6.3 Components or Aging Effects that Are Not Addressed in the GALL Report

No components or aging effects that are not addressed in the GALL Report were identified.

3.6.4 Conclusion

The following programs adequately manage the aging effects requiring management:

Non-EQ Electrical Cables and Connections Program
One Time Inspection Program
Boric Acid Corrosion Program

These programs are described in Appendix B.

Appendix B Program Descriptions And FSAR Sections

Table of Contents

Appendix B Program Descriptions And FSAR Sections

Consistent With GALL

FLOW ACCELERATED CORROSION PROGRAM

The Flow Accelerated Corrosion (FAC) Program is credited for aging management of selected piping and components in the following systems:

Main Steam System
Feedwater System
Steam Generator Blowdown System

The Flow Accelerated Corrosion (FAC) Program is consistent with the ten attributes of aging management program XI.M6, Flow Accelerated Corrosion, specified in GALL (August 2000 – DRAFT) Chapter XI.

Operating Experience:

Various sections of the Main Steam, Feedwater, and Blowdown system piping are periodically examined using nondestructive examination to determine the effects of flow accelerated corrosion. Indications of FAC are evaluated and piping may be either repaired or replaced if sufficient wall thinning is identified.

Ultrasonic examinations have identified pipe wall thinning below established screening criteria. On occasion, visual observations have identified through wall erosion on piping components. These deficiencies were documented in accordance with the corrective action program and resulted in repair or replacement of the marginal areas.

A rupture occurred on an auxiliary steam line in 1997 that resulted in significant upgrades to the FAC program to bring it up to current industry standards. Internal audits of the program since the 1997 event show the program has been maintained in accordance with NSAC–202L–R2 .

Based on the program enhancements which have been implemented, the continued implementation of the Flow Accelerated Corrosion (FAC) Program provides reasonable assurance that the aging effects of flow accelerated corrosion will be managed such that Main Steam, Feedwater, and Blowdown system components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

FSAR Revision:

The Flow Accelerated Corrosion (FAC) program manages the aging effects of wall loss due to FAC for the Main Steam, Feedwater, and Blowdown Systems. The FAC program relies primarily on monitoring and inspection of piping/components to preclude failure of high and low energy carbon steel piping. The Program Basis Document for FAC clearly defines the actions, procedures and steps required to prevent primary pressure boundary failure of the piping/components in scope. All inspection locations must satisfy specified evaluation criteria in order for a component to remain in service.

The program will be enhanced to address valve body erosion by visual inspections prior to the end of the initial operating license terms for Plant X.

STRUCTURES MONITORING PROGRAM

As identified in Chapter 3, the Structures Monitoring Program is credited for aging management of specific component groups in the following structures:

Auxiliary Building	Containment
Intake Structure	Turbine Building

The Structures Monitoring Program is credited for managing the effects of Loss of Material for selected structures within the scope of license renewal. The program provides for visual inspection and examination of accessible surfaces of specific structures and components, including welds and bolting.

Aging management of structural components that are inaccessible for inspection is accomplished by inspecting accessible structural components with similar materials and environments for aging effects that may be indicative of aging effects for inaccessible structural components.

With identified enhancements, the Structures Monitoring Programs is consistent with the ten attributes identified in the NRC GALL Report (August 2000 DRAFT) for Structures Monitoring Program XI.S6.

Operating Experience

Inspections have been performed in the Auxiliary Building, Containment, Intake Structure, and Turbine Building in 1996/1997 and 1999/2000. No significant deterioration has been identified in the inspections performed.

FSAR Revision

The Structures Monitoring Program manages the aging effect of loss of material. The program provides for periodic visual inspection and examination for degradation of accessible surfaces in designated structures that fall within the scope of license renewal.

PRIMARY CHEMISTRY MONITORING PROGRAM

The Primary Chemistry Monitoring Program is credited for managing the aging affects applicable to the passive component/item groupings exposed to contact with the reactor coolant. The concentration of chemical impurities and chemical additions are controlled through monitoring requirements and compliance with specifications which contain chemistry limits. Section 3 of this LRA provides matrices of the affected components/item groupings and the aging effects mitigated by the monitoring program. The Primary Chemistry Monitoring Program is consistent with the ten criteria of aging management program XI.M11, Water Chemistry, specified in GALL (August 2000 – DRAFT) Chapter XI.

Operating Experience and Demonstation

Operating experience on the primary systems demonstrates the effectiveness of the Primary Water Chemistry Monitoring program. No significant chemistry related degradation for primary components/item groupings has been experienced. Experience has shown that implementation of a primary chemistry program in accordance with accepted industry standards is effective in managing the effects of aging. Based on this experience, the continued implementation of the Primary Chemistry Monitoring program provides reasonable assurance that aging effects will be managed so that primary system components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

FSAR Revison

The Primary Chemistry Monitoring Program maximizes long-term availability of primary systems by minimizing system corrosion, fuel corrosion, and radiation field build-up. The scope of the Primary Chemistry Monitoring Program includes sampling activities and analysis on the following systems: RCS, borated water storage tanks, spent fuel pool system, letdown purification demineralizers, and reactor makeup water. The Primary Chemistry Monitoring Program provides assurance that an elevated level of contaminants and oxygen does not exist in the systems covered by the program. This prevents or minimizes the occurrence of cracking and other aging effects.

CONTAINMENT INSERVICE INSPECTION PROGRAM

As identified in Chapter 3, the Plant X Containment Inservice Inspection Program, which includes the examination requirements needed to comply with both ASME Section XI, Subsection IWE and Subsection IWL, is credited for the aging management of specific structural component/commodity groups, including the post-tensioning system, for the Containment Structure.

As background, the NRC amended 10 CFR §50.55a to incorporate by reference the ASME Boiler and Pressure Vessel Code, Section XI Subsections IWE and IWL 1992 Edition with the 1992 Addenda, with specified modifications and limitations.

The 10 Year Containment (IWE & IWL) Inservice Inspection Program Plan and Basis for Plant X, incorporating Subsection IWE and Subsection IWL examination requirements is currently under development to meet the expedited examination date of September 9, 2001.

The Plant X Containment Inservice Inspection Program effectively manages the aging effects identified in Section 3.5 of this application and is consistent with GALL Chapter XI.S1 "ASME Section XI, Subsection IWE, and Chapter XI.S2, " ASME Section XI, Subsection IWL" as identified in the Draft - August 2000 version of the GALL, with the following clarifications:

For Examination Category E-D Inspection components, a Request for Relief (IWE-001) has been requested for the Visual VT-3 examination requirements.

For Examination Category E-A Inspection requirements, a Request for Relief (IWE-006) has been requested for the requisite Visual VT-3 examinations.

A Request for Relief (IWE-003) has been requested for the specific requirement of re-examining areas of degradation or repairs during the next inspection period, in accordance with Examination Category E-C.

As discussed in Section 3.5 of this application there are no aging effects requiring management related to the concrete portion of the containment structure.

OPERATING EXPERIENCE AND DEMONSTRATION

The past inspections of the Containment Liner have been conducted in accordance with the Containment Leak Rate Testing Program and the Maintenance Rule Implementation Program. The inspections performed under these programs were previously documented and evaluated for any degraded conditions associated with the containment liner.

Previous inspections of the tendons and tendon anchorages were conducted in accordance with Technical Specifications, the USAR, and plant procedures. The inspections performed under these programs documented and evaluated any degraded conditions associated with the post-tensioning system. The ASME Section XI, Subsection IWL Inservice Inspection Program incorporates all of the inspection criteria and guidelines of the previous tendon inspection program attributes and is implemented using existing plant procedures.

The containment tendon examination program has been conducted since initial unit startup at 5-year intervals. The containment tendon surveillance examination requirements incorporated the general criteria and requirements of Regulatory Guide 1.35, "Inservice Inspection of Ungrouted Tendons in Prestressed Concrete Containments".

No significant age related deterioration has been identified in the inspections performed.

Appendix B Program Descriptions And FSAR Sections

Consistent With GALL With Exceptions

PRIMARY CHEMISTRY MONITORING PROGRAM

The Primary Chemistry Monitoring Program is credited for managing the aging affects applicable to the passive component/item groupings exposed to contact with the reactor coolant. The concentration of chemical impurities and chemical additions are controlled through monitoring requirements and compliance with specifications which contain chemistry limits. Section 3 of this LRA provides matrices of the affected components/item groupings and the aging effects mitigated by the monitoring program. The Primary Chemistry Monitoring Program is consistent with the ten attributes of aging management program XI.M11, Water Chemistry, specified in GALL (August 2000 – DRAFT) Chapter XI, except as discussed below.

Exception to GALL Requirements

The program description for Water Chemistry, XI.M11, specified in GALL (August 2000 – DRAFT) Chapter XI, requires a one-time inspection for use in conjunction with existing program requirements to be developed and reviewed on a plant specific basis. [*plant name*] takes exception to the one-time inspection requirement. Operating experience at [*plant name*] has not identified any problems that would warrant a one-time inspection to confirm the adequacy of the chemistry programs. This experience includes inspections of systems and components during maintenance activities that occur routinely. [*specific examples would be provided here*] These inspections have not identified aging effects other than those identified in the LRA and the adequacy of the chemistry programs has been confirmed by these maintenance-related inspections.

Operating Experience and Demonstration

Operating experience on the primary systems demonstrates the effectiveness of the Primary Water Chemistry Monitoring program. No significant chemistry related degradation for primary components/item groupings has been experienced. Experience has shown that implementation of a primary chemistry program in accordance with accepted industry standards is effective in managing the effects of aging. Based on this experience, the continued implementation of the Primary Chemistry Monitoring program provides reasonable assurance that aging effects will be managed so that primary system components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

FSAR Revision

The Primary Chemistry Monitoring Program maximizes long-term availability of primary systems by minimizing system corrosion, fuel corrosion, and radiation field build-up. The scope of the Primary Chemistry Monitoring Program includes sampling activities and analysis on the following systems: RCS, borated water storage tanks, spent fuel pool system, letdown purification demineralizers, and reactor makeup water. The Primary Chemistry Monitoring Program provides assurance that an elevated level of contaminants and oxygen does not exist in the systems covered by the program. This prevents or minimizes the occurrence of cracking and other aging effects.

ELECTRICAL COMPONENT INSPECTION PROGRAM

The Electrical Component Inspection Program is credited for managing aging effects that apply to Non-EQ Inaccessible Medium-Voltage Cables, which are exposed to condensation and wetting in inaccessible locations. The Plant X] Electrical Component Inspection Program will use visual inspections of selected samples of the accessible portion of medium voltage cables to detect aging effects for Non-EQ Inaccessible Medium Voltage Cables. The Electrical Component Inspection Program is consistent with the ten attributes of an aging management program for XI.E3, Non-EQ Inaccessible Medium-Voltage Cables, specified in GALL (August 2000 – DRAFT) Chapter XI, except as discussed below.

Exception to GALL Requirements

Plant X takes exception to the recommended ten year testing frequency requirement identified in GALL (August 2000 – DRAFT) Chapter XI.M8. The Plant X inspection program does not include scheduled testing since Plant X has determined that these Non-EQ Inaccessible Medium-Voltage Cables were designed for the applications where they are installed. The moisture and voltage exposures described as significant within the GALL program description are not significant at Plant X since the design criteria for cables used in these applications assures the cables will continue to perform their intended function. Engineering review determined the expected life of these cables extends beyond the extended period of operation.

Operating Experience and Demonstration

Operating experience has shown Non-EQ Inaccessible Medium-Voltage Cables continue to perform their intended function. The operational environments for these cables have not affected their intended function. Based on this experience, implementation of the visual inspection requirments for accessible Non-EQ Medium-Voltage Cables will provide reasonable assurance that aging effects will be managed so that all medium voltage cables will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. If an uacceptable condition is identified, the current program requires determination of whether the same conditon or situation is applicable to other accessible or inaccessible cables and connections.

FSAR Revision

ELECTRICAL COMPONENT INSPECTION

The Electrical Component Inspection Program will inspect splices, connectors, and cables within the scope of license renewal that are located in areas that may be conducive to accelerated aging. The scope of the inspection program includes cables exposed to elevated temperatures, wet environments, or corrosive chemicals. The scope also includes cables that can experience elevated temperatures due to the current they are carrying, connectors used in impedance-sensitive circuits, and cable splices subject to aging-related stressors. The aging effect for cables and cable splices is a change of material properties, as evidenced by cracking or discoloration of the insulation or by degradation of a tested parameter. The aging effect for connectors in impedance-sensitive circuits is a change of material due to corrosion of connector pins. The Electrical Component Inspection Program will be formally implemented and the first inspection of in-scope cables, splices, and connectors will be completed prior to the expiration of the initial 40-year licensing term.

Appendix B Program Descriptions And FSAR Sections

Plant Specific Programs

GENERAL CORROSION OF EXTERNAL SURFACES FOR LICENSE RENEWAL PROGRAM

The General Corrosion of External Surfaces for License Renewal Program is credited for aging management of specific non-structural components/commodity groups in the following systems:

Systems:
Auxiliary Feedwater (AFW)
Diesel Fuel Oil and Diesel Lube Oil (DFO & DLO)
Main Steam (MS)
Component Cooling Water (CCW)

Scope

The General Corrosion of External Surfaces for License Renewal Program consists of several activities that manage the aging effects of loss of material for selected systems and non-structural components within the scope of license renewal. The program provides for visual inspection and observation of accessible external surfaces of certain carbon and low-alloy steel components, including piping, valves, supports, tanks, and bolting.

Preventive Actions

External surfaces of most carbons steel and cast iron components are coated to minimize corrosion. Although coatings minimize corrosion by limiting exposure to the environment, they are not credited in the determination of the aging effects that require management.

Parameters Monitored or Inspected

Surface conditions of components are monitored through visual observation and inspection to detect signs of external corrosion and to detect conditions that can result in external corrosion, such as fluid leakage.

Detection of Aging Effects

The aging effect of concern is loss of material which is detected by visual observation and inspection of external surfaces for evidence of leaking fluids, significant coating damage, or significant corrosion. Inspection for evidence of leaking fluids also provides indirect monitoring of certain components that are not routinely accessible.

Monitoring and Trending

Various plant personnel including operators and system engineers perform periodic material condition inspections outside containment. These inspections are performed in accordance with approved plant procedures. Evidence of fluid leaks, significant coating damage, or significant corrosion is documented.

Inspections and observations are performed at intervals based on previous inspections and industry experience. Operator rounds occur several times daily and System Engineer walkdowns occur at least quarterly. Inspections inside containment are conducted each refueling outage by a team that includes knowledgeable subject matter experts from Design Engineering and Quality Control. The in-containment inspections for corrosion are part of the containment coatings inspections established in response to Reg Guide 1.54 (1973) and reviewed by NRC under Generic Letter 98-04.

Acceptance Criteria

Plant procedures provide criteria for determining the acceptability of as-found conditions and for initiating the appropriate corrective action. The acceptance criteria and guidance are related to avoiding unacceptable degradation of the component intended functions, and include existence of leakage, presence of corrosion products, coating defects, and the presence of boric acid crystals. Appropriate provisions of NRC and industry guidance are incorporated.

Confirmation Process

Unacceptable inspection and observation results are evaluated and addressed in the site corrective action process.

Corrective Action

The corrective action process provides measures to verify completion and effectiveness of corrective action.

Administrative Controls

The procedures governing inspections and observations for external corrosion are included in the population of site procedures that are subject to systematic control of changes.

Operating Experience

The activities relied on to detect corrosion of accessible carbon and low-alloy steel and cast iron external surfaces and the precursors thereof are a subset of a larger number of inspection activities that result in redundant inspections. The activities credited for license renewal were selected based on their effectiveness as indicated by a review of site corrective action documents.

The activities are elements of established programs that have been ongoing for years. They have been enhanced over the years based on site and industry experience and are relied on to support implementation of Reg Guide 1.54 for coatings inside containment and the Maintenance Rule (10 CFR 50.65). Review of plant records indicates they are effective in detecting loss of material due to corrosion and its precursors for accessible external surfaces. These findings are consistent with the findings of recent internal and external assessments of these activities, such as audits and NRC inspections.

Demonstration

Loss of material due to corrosion of carbon steel, low allow steel, and cast iron is readily observable for accessible external surfaces. The effect is minimal for coated and uncoated components that are not routinely wetted by humidity, condensation, precipitation, spray, or leakage.

Prompt identification and correction of leakage will minimize the effect for accessible and inaccessible components that are potentially exposed to the leakage. Operator rounds occur several times daily and provide discovery and correction of significant corrosion and of conditions that cause it for components in accessible areas. Periodic system engineer walkdowns augment the operator rounds and provide an independent assessment. Refueling interval inspections provide for discovery of corrosion and of conditions that can cause it for components inside containment.

The effectiveness of these inspection and observation activities is supported by the excellent plant material condition and by site records that show high sensitivity to material condition, housekeeping, and to fluid leakage in particular.

Based on the above, the continued implementation of the existing inspections and observations for signs of external corrosion and for conditions that can cause it provide reasonable assurance that loss of material due to corrosion of external surfaces will be managed such that systems and components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

FSAR Revision

General Corrosion of External Surfaces Program

The General Corrosion of External Surfaces for License Renewal Program manages loss of material due to general corrosion of external surfaces of non-structural carbon steel, low alloy steel, and cast iron components that are (1) inside containment or (2) in normally accessible areas outside containment. The program uses systematic inspections and observations to detect corrosion of external surfaces and conditions that can result in corrosion such as damaged coatings and fluid leaks. Inspections and observations include (1) rounds by operators, (2) system engineer walkdowns, and (3) refueling interval inspections inside containment in accordance with Reg Guide 1.54.

2.3.4 STEAM AND POWER CONVERSION SYSTEMS

The Steam and Power Conversion Systems act as a heat sink to remove heat from the reactor and convert the heat generated in the reactor to the plant's electrical output. The following systems are included in this subsection:

- Main Steam and Turbine Generators
- Feedwater, Blowdown and Chemical Addition
- Auxiliary Feedwater and Condensate Storage

Extraction Steam, which is included in the GALL Report, is not within scope at Plant Y.

2.3.4.1 MAIN STEAM AND TURBINE GENERATORS

Main Steam transports saturated steam from the steam generators to the main turbine and other secondary steam system components. Main Steam provides the principal heat sink for the Reactor Coolant System protecting the Reactor Coolant System and the steam generators from overpressurization, provides isolation of the steam generators during a postulated steam line break, and provides steam supply to the Auxiliary Feedwater pump turbines.

Turbine Generators convert the steam input from Main Steam to the plant's electrical output, provide first-stage pressure input to the reactor protection system, and provide isolation under certain postulated steam line break scenarios. Main Steam and Turbine Generators are described in UFSAR Section 10.2.2.

The flow diagrams listed in Table 2.3-6 show the evaluation boundaries for the mechanical portions of Main Steam and Turbine Generators that are within the scope of license renewal.

Main Steam is in the scope of license renewal because it contains:

- SCs that are safety related and are relied upon to remain functional during and following design basis events
- SCs that are non-safety related whose failure could prevent satisfactory accomplishment of the safety-related functions
- SCs that are part of the Environmental Qualification Program

- SCs that are relied on during postulated fires, anticipated transients without scram, and station blackout events

Turbine Generators are in the scope of license renewal because they contain:

- SCs that are non-safety related whose failure could prevent satisfactory accomplishment of the safety-related functions
- SCs that are relied on during anticipated transients without scram events

Main Steam and Turbine Generators components subject to an aging management review include: valves (pressure boundary only), steam traps, flow elements, piping, tubing, and fittings. The intended functions for Main Steam and Turbine Generators components subject to an aging management review are pressure boundary integrity and throttling. For a complete list of Main Steam and Turbine Generators components that require aging management review and the component intended functions, see Table 3.4-1. The aging management review for Main Steam and Turbine Generators is discussed in Section 3.4.

2.3.4.2 FEEDWATER, BLOWDOWN AND CHEMICAL ADDITION

Feedwater, Blowdown and Chemical Addition provide sufficient water flow to the steam generators to maintain an adequate heat sink for the Reactor Coolant System, provide for Feedwater, Blowdown and Chemical Addition isolation following a postulated loss-of-coolant accident or steam line break event, and assist in maintaining steam generator water chemistry. Feedwater, Blowdown and Chemical Addition consists of four subsystems: Main Feedwater; Steam Generator Blowdown; Standby Steam Generator Feedwater and Chemical Addition.

Main Feedwater supplies pre-heated, high-pressure feedwater to the steam generators at a rate equal to main steam and the steam generator blowdown flows. The feedwater flow rate is controlled by the Steam Generator Level Control System which determines the desired feedwater flow by comparing the feed flow, steam flow, and steam generator level. Main Feedwater is described in UFSAR Section 10.2.2.

Steam Generator Blowdown assists in maintaining required steam generator chemistry by providing a means for removal of foreign matter that concentrates in the evaporator section of the steam generator. Steam Generator Blowdown is fed by three independent blowdown lines (one per steam generator), which tie to a common blowdown flask. Steam generator blowdown is continuously monitored for radioactivity during plant operation. Steam Generator Blowdown is described in UFSAR Section 10.2.4.3.

Chemistry Addition provides a means to add chemicals to the secondary loop.

Standby Steam Generator Feedwater is common to Plant Y. Standby Steam Generator Feedwater supplies steam generator feedwater during normal startup, shutdown, and hot standby conditions. Standby Steam Generator Feedwater delivers sufficient feedwater to maintain one unit at hot standby while providing makeup for maximum blowdown. The Standby Steam Generator Feedwater pumps take suction from the demineralized water storage tank and discharge to a common header upstream of the feedwater regulating valves. Standby Steam Generator Feedwater is described in UFSAR Section 9.11.

The flow diagrams listed in Table 2.3-6 show the evaluation boundaries for the portions of Feedwater, Blowdown and Chemical Addition that are within the scope of license renewal.

Main Feedwater is in the scope of license renewal because it contains:

- SCs that are safety related and are relied upon to remain functional during and following design basis events
- SCs that are non-safety related whose failure could prevent satisfactory accomplishment of the safety-related functions
- SCs that are relied on during postulated fires, anticipated transients without scram, and station blackout events

Steam Generator Blowdown is in the scope of license renewal because it contains:

- SCs that are safety related and are relied upon to remain functional during and following design basis events
- SCs that are non-safety related whose failure could prevent satisfactory accomplishment of the safety-related functions
- SCs that are part of the Environmental Qualification Program
- SCs that are relied on during postulated fires, anticipated transients without scram, and station blackout events

Standby Steam Generator Feedwater is in the scope of license renewal because it contains:

- SCs that are non-safety related whose failure could prevent satisfactory accomplishment of the safety-related functions
- SCs that are relied on during postulated fires

Chemistry Addition is in the scope of license renewal because it contains:

- SCs that are safety related and are relied upon to remain functional during and following design basis events (forms part of Feedwater pressure boundary)

Feedwater, Blowdown and Chemical Addition components subject to an aging management review include the Demineralized Water Storage Tank, pumps and valves (pressure boundary only), orifices, piping, tubing, and fittings. The intended functions for the Feedwater, Blowdown and Chemical Addition components subject to an aging management review are pressure boundary integrity and throttling. For a complete list of Feedwater, Blowdown and Chemical Addition components that require aging management review and the component intended functions, see Table 3.5-2. The aging management review for Feedwater, Blowdown and Chemical Addition is discussed in Section 3.5.

2.3.4.3 AUXILIARY FEEDWATER AND CONDENSATE STORAGE

Auxiliary Feedwater supplies feedwater to the steam generators when normal feedwater sources are not available, provides for auxiliary feedwater steam and feedwater isolation during a postulated steam generator tube rupture event, and provides for auxiliary feedwater isolation to the faulted steam generator and limits feedwater flow to the steam generators to limit positive reactivity insertion during a postulated steam line break event. Auxiliary Feedwater is a shared system between Plant Y.

Auxiliary Feedwater contains three steam turbine driven pumps. The pumps can be supplied steam from the steam generators in either unit. The pumps take suction from either condensate storage tank and discharge to one of two redundant headers. Each header can supply each steam generator. Auxiliary Feedwater is normally maintained in standby with one pump aligned to one discharge header and two pumps aligned to the other header. Upon initiation, all three pumps start to supply the affected steam generator with feedwater. Auxiliary Feedwater is described in UFSAR Section 9.11.

Condensate Storage stores water for use by Auxiliary Feedwater to support safe shutdown of the plant. Condensate Storage consists of a condensate storage tank on each unit with piping that feeds all three auxiliary feedwater pumps. The tank outlet piping is cross-connected between the units so that either tank can supply the water required by Auxiliary Feedwater. Condensate Storage is described in UFSAR Section 9.11.3.

The flow diagrams listed in Table 2.3-6 show the evaluation boundaries for the portions of Auxiliary Feedwater and Condensate Storage that are within the scope of license renewal.

Auxiliary Feedwater is in the scope of license renewal because it contains:

- SCs that are safety related and are relied upon to remain functional during and following design basis events
- SCs that are non-safety related whose failure could prevent satisfactory accomplishment of the safety-related functions
- SCs that are part of the Environmental Qualification Program
- SCs that are relied on during postulated fires, anticipated transients without scram, and station blackout events

Condensate Storage is in the scope of license renewal because it contains:

- SCs that are safety related and are relied upon to remain functional during and following design basis events
- SCs that are relied on during postulated fires, anticipated transients without scram, and station blackout events

Auxiliary Feedwater and Condensate Storage components subject to an aging management review include: Condensate Storage Tanks, pumps and valves (pressure boundary only), coolers, orifices, piping, tubing, and fittings. The intended functions for Auxiliary Feedwater and Condensate Storage components subject to an aging management review are pressure boundary integrity, heat transfer, and throttling. For a complete list of Auxiliary Feedwater and Condensate Storage components that require aging management review and the component intended functions, see Table 3.5-3. The aging management review for Auxiliary Feedwater and Condensate Storage is discussed in Section 3.5.

2.3.5 REFERENCES

3.0 AGING MANAGEMENT REVIEW RESULTS

For those structures and components that are identified as being subject to an aging management review, 10 CFR 54.21(a)(3) requires demonstration that the effects of aging will be adequately managed so that their intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. The information provided in this chapter provides essential input to the required aging management review as it identifies and discusses the aging effects requiring management.

This chapter describes the results of the aging management reviews of the components and structures, identified in Chapter 2, "Structures and Components Subject to Aging Management Review." This chapter:

- provides references to the descriptions of common aging management programs
- identifies the components and structural components subject to aging management review, and their intended functions
- discusses the materials and internal and external environments
- describes or references the processes used to identify aging effects
- describes industry and plant-specific operating experiences with respect to the aging effects
- identifies the aging effects requiring management
- lists the aging management programs for aging effects requiring management.

Common aging management programs are contained in Section 3.1. For those structures and components identified as being subject to an aging management review, the results are contained in Section 3.2 for Reactor Coolant Systems, Section 3.3 for Engineered Safety Features Systems, Section 3.4 for Auxiliary Systems, Section 3.5 for Steam And Power Conversion Systems, Section 3.6 for structures and structural components (Subsection 3.6.1 for Containment and Subsection 3.6.2 for other structures), and Section 3.7 for electrical and instrumentation and controls. Aging management program descriptions are contained in Appendix B.

Tables 3.0-1 and 3.0-2 contain descriptions of the internal and external service environments at Plant Y, which will be used in subsequent sections of this chapter. The environments used in the aging management reviews are listed in the "Environment" column in Tables 3.0-1 and 3.0-2. Within this Application, some of the internal environments have been subdivided into groups based on the fluid chemistry. The subgroups are identified in the "Description" column in Table 3.0-1.

TABLE 3.0-1
INTERNAL SERVICE ENVIRONMENTS

Environment	Description
Air/Gas	Includes atmospheric air, dry/filtered instrument air, nitrogen, hydrogen, carbon dioxide, and Halon
Treated water	Base water for all clean systems. Demineralized water that can be deaerated, or include corrosion inhibitors, biocides, and boric acid, or any combination of these treatments Within this Application, treated water has been subdivided into groups based on the chemistry of the water: <u>Treated water – primary</u> – Normal operating Reactor Coolant System chemistry <u>Treated water – secondary</u> – Normal operating secondary chemistry, including Main Steam, Feedwater, and Blowdown Systems <u>Treated water – borated</u> – Systems that contain borated water except those included in treated water – primary, including Chemical and Volume Control, Spent Fuel Cooling, and Emergency Core Cooling Systems <u>Treated water</u> – All other treated water systems, including Component Cooling Water, Emergency Diesel Generator Cooling, and Chilled Water Systems
Raw water	Water that enters the plant from the cooling water canals, ocean, bay, or city water source that has not been demineralized. In general, the water has been rough filtered to remove large particles and may contain a biocide for control of micro-organisms and macro-organisms. Although city water is purified for drinking purposes, it is conservatively classified as raw water for the purposes of aging management review. Within this Application, raw water has been subdivided into groups based on the chemistry of the water: <u>Raw water – cooling canals</u> – Salt water used as the ultimate heat sink <u>Raw water – city water</u> – Potable water supplied to the water treatment plant and the Fire Protection System <u>Raw water – floor drainage</u> – Fluids collected in building drains. The fluids can be treated water (primary, secondary, borated, or other), raw water (cooling water canals or city water), fuel oil, or lubricating oil

Fuel oil	Emergency diesel generator, diesel fire pump, and standby steam generator feedwater pump fuel oil
Lubricating oil	Lubricating oil for emergency diesel generators, pumps, and other components
Ohmic heating	Thermal stress on power cable materials can be due to ohmic heating resulting from electrical current

TABLE 3.0-2
EXTERNAL SERVICE ENVIRONMENTS

Environment [1]	Description
Outdoor [2]	Moist, salt-laden atmospheric air, temperature 30°F-95°F, humidity 5%-95%, exposed to weather, including precipitation and wind
Indoor – not air conditioned[2]	Atmospheric air, temperature 104°F (40°C) maximum, humidity 5%-95°F%, not exposed to weather
Indoor – air conditioned[2]	Atmospheric air, specific temperature/humidity range dependent on building/room. Typically, temperature 70°F-79°F, humidity 60%-80%, not exposed to weather
Containment air [2]	Atmospheric air, temperature 120°F maximum, humidity 5%-95%, total integrated dose rate – 1 rad/hour (excluding equipment located inside the reactor cavity), not exposed to weather Note: Safety-related equipment in the containment has been analyzed to 122°F (50°C) continuous and 125°F for 2 weeks/year
Borated water leaks	Exposed to leakage from borated water systems
Buried	Above groundwater elevation, exposed to soil/fill. Below groundwater elevation, exposed to soil/fill and groundwater. Groundwater contains aggressive chemicals that can attack susceptible materials
Embedded/Encased	Reinforcing or embedded steel or piping in concrete

NOTES: 1. For certain components and structural components that are submerged, the applicable environment in Table 3.0-1 is specified.
2. Where wetted conditions exist (e.g., condensation), the item is annotated with the applicable external environment in Chapter 3 system and structures tables.

3.4 STEAM AND POWER CONVERSION SYSTEMS

The following systems are included in this section:

- Main Steam and Turbine Generators
- Feedwater, Blowdown and Chemical Addition
- Auxiliary Feedwater and Condensate Storage

Extraction steam, which is included in the GALL Report, was not identified as a system requiring an aging management review at Plant Y.

Subsection 2.3.4 provides a description of these systems and identifies the components requiring an aging management review for license renewal. Appendix C contains the process that identified the aging effects requiring management for non-Class 1 components.

3.4.1 MATERIALS AND ENVIRONMENT

The Steam and Power Conversion Systems are exposed to internal environments of treated water - secondary, treated water, lubricating oil, and air/gas; and external environments of outdoor, containment air, buried, and potential borated water leaks (see Tables 3.0-1 and 3.0-2). The identified environments are consistent with the GALL Report.

The only parts of systems or components considered to be inaccessible for inspection are those that are buried or embedded/encased in concrete. These environments are addressed as part of the aging management review process; see Table 3.0-2, "External Service Environments." Potential aging effects associated with these environments are reviewed and those aging effects requiring management are identified along with the credited aging management program(s). All other parts of systems and components can be accessed, if required. The only Steam and Power Conversion System containing inaccessible piping parts is the Standby Steam Generator Feedwater System, which contains sections of buried stainless steel piping.

The tanks, pumps, heat exchangers, piping, tubing, valves, and associated components and commodity groups for these systems are constructed of carbon steel, stainless steel, low alloy steel, cast iron, and brass. Low alloy steel, cast iron, and brass are plant specific materials that were not included in the Steam and Power Conversion Section of the GALL Report. The components and commodity groups, their intended functions, the materials, and environments for the Steam and Power Conversion Systems are summarized in Tables 3.4-1 through 3.4-3.

3.4.2 AGING EFFECTS REQUIRING MANAGEMENT

The aging effects requiring management and the programs and activities that manage the aging effects for each applicable environment and material combination are provided in Tables 3.4-1 through 3.4.-3. The aging effects requiring management for each system are summarized in the following paragraphs.

Main Steam and Turbine Generators - The aging effects requiring management are loss of material for carbon steel and stainless steel components, and cracking for certain stainless steel components and heat exchanger tubing. The aging effect requiring management for carbon steel mechanical closure bolting is loss of mechanical closure integrity. Fatigue, which is identified as aging effect requiring management in the GALL Report, is addressed as a time-limited aging analysis in Section 4.3.

Feedwater, Blowdown and Chemical Addition - The aging effects requiring management are loss of material for carbon steel and stainless steel components, and cracking for certain stainless steel components. The aging effect requiring management for carbon steel mechanical closure bolting is loss of mechanical closure integrity. Fatigue, which is identified as aging effect requiring management in the GALL Report, is addressed as a time-limited aging analysis in Section 4.3. Note that the Chemical Addition system aging effects are the same as identified in the Feedwater and Blowdown systems.

Auxiliary Feedwater and Condensate Storage - The aging effect requiring management is loss of material for cast iron, admiralty brass, carbon steel, low alloy steel, and stainless steel components.

3.4.3 OPERATING EXPERIENCE

3.4.3.1 INDUSTRY EXPERIENCE

A review of industry operating history and a review of NRC generic communications were performed to validate the set of aging effects that require management. The industry correspondence that was reviewed for operating experience related to Steam and Power Conversion Systems includes the following:

- NRC Bulletin 79-03, "Longitudinal Weld Defects in ASME SA-312 Type 304 Stainless Steel Pipe"
- NRC Bulletin 79-13, "Cracking in Feedwater System Piping"
- NRC Bulletin 82-02, "Degradation of Threaded Fasteners in the Reactor Coolant Pressure Boundary of PWR Plants"
- NRC Bulletin 87-01, "Thinning of Pipe Walls in Nuclear Power Plants"
- NRC Bulletin 89-02, "Stress Corrosion Cracking of High Hardness Type 410 Stainless Steel Internal Preloaded Bolting In Anchor Darling Model S530W Swing Check Valves or Valves of Similar Design"
- NRC Generic Letter 79-20, "Information Requested on PWR Feedwater Lines"
- NRC Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants"
- NRC Generic Letter 88-14, "Instrument Air Supply System Problems Affecting Safety Related Equipment"
- NRC Generic Letter 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning"
- NRC Generic Letter 91-17, "Generic Safety Issue 29, Bolting Degradation or Failure in Nuclear Power Plants"
- NRC Information Notice 80-05, "Chloride Contamination of Safety Related Piping and Components"
- NRC Information Notice 80-29, "Broken Studs on Terry Turbine Steam Inlet Flanges"
- NRC Information Notice 81-04, "Cracking in Main Steam Lines"

- NRC Information Notice 84-32, "Auxiliary Feedwater Sparger and Pipe Hanger Damage"
- NRC Information Notice 84-87, "Piping Thermal Deflection Induced by Stratified Flow"
- NRC Information Notice 85-56, "Inadequate Environment Control for Components and Systems in Extended Storage"
- NRC Information Notice 86-106, "Feedwater Line Break"
- NRC Information Notice 87-28, "Air Systems Problems at U.S. Light Water Reactors"
- NRC Information Notice 87-36, "Significant Unexpected Erosion of Feedwater Lines"
- NRC Information Notice 88-17, "Summary of Responses to NRC Bulletin 87-01, Thinning of Pipe Walls in Nuclear Power Plants"
- NRC Information Notice 88-37, Flow Blockage of Cooling Water to Safety System Components"
- NRC Information Notice 89-01, "Valve Body Erosion"
- NRC Information Notice 89-53, "Rupture of Extraction Steam Line on High Pressure Turbine"
- NRC Information Notice 89-76, "Biofouling Agent: Zebra Mussel"
- NRC Information Notice 89-80, "Potential for Water Hammer, Thermal Stratification, and Steam Binding in High-Pressure Coolant Injection Piping"
- NRC Information Notice 90-65, "Recent Orifice Plate Problems"
- NRC Information Notice 91-18, "High-Energy Piping Failures Caused by Wall Thinning"
- NRC Information Notice 91-19, "Steam Generators Feedwater Distribution Piping Damage"
- NRC Information Notice 91-28, "Cracking in Feedwater System Piping"
- NRC Information Notice 91-38, "Thermal Stratification in Feedwater System Piping"
- NRC Information Notice 92-07, "Rapid Flow-Induced Erosion/Corrosion of Feedwater Piping"

- NRC Information Notice 93-20, "Thermal Fatigue Cracking of Feedwater Piping to Steam Generators"
- NRC Information Notice 93-21, "Summary of Observations Compiled During Engineering Audits or Inspections of Licensee Erosion/Corrosion Programs"
- NRC Information Notice 94-59, "Accelerated Dealloying of Cast Aluminum-Bronze Valves Caused by Microbiologically Induced Corrosion"
- NRC Information Notice 94-79, "Microbiologically Influenced Corrosion of Emergency Diesel Generator Service Water Piping"
- NRC Information Notice 95-11, "Failure of Condensate Piping Because of Erosion/Corrosion at a Flow-Straightening Device"
- NRC Information Notice 99-19, "Rupture of the Shell Side of a Feedwater Heater at the Point Beach Plant"

No aging effects requiring management were identified from the above documents beyond those already identified in Subsection 3.4.2.

3.4.3.2 PLANT-SPECIFIC EXPERIENCE

Plant Y operating experience was also reviewed to validate the identified aging effects requiring management. This review included a survey of Plant Y non-conformance reports, licensee event reports, and condition reports for any documented instances of Steam and Power Conversion Systems component aging, in addition to interviews with responsible engineering personnel. No aging effects requiring management were identified from this review beyond those identified in Subsection 3.4.2.

3.4.4 CONCLUSION

The review of industry information, NRC generic communications, and Plant Y operating experience identified no additional aging effects beyond those discussed in Subsection 3.4.2. Tables 3.4-1 through 3.4-3 contain the results of the aging management review for the Steam and Power Conversion Systems and summarize the aging effects requiring management.

The aging effects requiring management are adequately managed by the following programs, which agree with the GALL Report except as noted:

- Auxiliary Feedwater Pump Oil Coolers Inspection (GALL Report specifies a plant specific aging management program)
- Auxiliary Feedwater Steam Piping Inspection Program (GALL Report specifies a plant specific aging management program)
- Boric Acid Wastage Surveillance Program
- Secondary Chemistry Monitoring Program (Also for the Chemical Addition System not included in GALL)
- Field Erected Tanks Internal Inspection (aging management program not included in GALL Report)
- Flow Accelerated Corrosion Program
- Galvanic Corrosion Susceptibility Inspection Program (aging management program not included in GALL Report)
- Structure Monitoring Program

Based on the evaluations provided in Appendix B for the programs listed above, aging effects are adequately managed so that the intended functions of the Steam and Power Conversion Systems components listed in Tables 3.4-1 through 3.4-3 are maintained consistent with the current licensing basis for the period of extended operation

TABLE 3.4-1
MAIN STEAM AND TURBINE GENERATORS

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
Internal Environment					
Unit 4 Main Steam Isolation Valve instrument air accumulator tanks	Pressure boundary	Carbon steel	Air/Gas	None	None required
Main process piping: Valves Piping/fittings	Pressure boundary	Carbon steel	Treated water - secondary	Loss of material	Secondary Chemistry Monitoring Program Flow Accelerated Corrosion Program
Steam traps: Valves Piping/fittings Steam traps	Pressure boundary	Carbon steel	Treated water - secondary	Loss of material	Secondary Chemistry Monitoring Program Flow Accelerated Corrosion Program
Valves Piping/fittings Tubing/fittings	Pressure boundary	Stainless steel	Treated water - secondary	Loss of material Cracking	Secondary Chemistry Monitoring Program
Valves Tubing/fittings Filters Flex hoses Rupture disks	Pressure boundary	Stainless steel	Air/Gas	None	None required
Instrument air 3-way valves	Pressure boundary	Brass	Air/Gas	None	None required
Flow elements	Pressure boundary Throttling	Carbon steel	Treated water - secondary	Loss of material	Secondary Chemistry Monitoring Program

LICENSE RENEWAL APPLICATION
LICENSE RENEWAL – TECHNICAL INFORMATION
PLANT Y

TABLE 3.4-1 (continued)
MAIN STEAM AND TURBINE GENERATORS

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
External Environment					
Unit 4 Main Steam Isolation Valve instrument air accumulator tanks	Pressure boundary	Carbon steel	Outdoor	Loss of material	Structures Monitoring Program
Main process piping: Valves Piping/fittings	Pressure boundary	Carbon steel	Containment air Outdoor	None[1]	None required
			Borated water leaks	Loss of material	Boric Acid Wastage Surveillance Program
Steam traps: Valves Steam traps Piping/fittings	Pressure boundary	Carbon steel	Outdoor	Loss of material	Flow Accelerated Corrosion Program[2]
Valves Piping/fittings Tubing/fittings	Pressure boundary	Stainless steel	Containment air	None	None required
Valves Tubing/fittings Filters Flex hoses Rupture disks	Pressure boundary	Stainless steel	Outdoor	None	None required
Instrument air 3-way valves	Pressure boundary	Brass	Outdoor	None	None required

NOTES: 1. Carbon steel components that normally operate at high temperatures are not susceptible to loss of material.
2. Flow Accelerated Corrosion Program addresses external general corrosion via use of radiographic examinations.

TABLE 3.4-1 (continued)
MAIN STEAM AND TURBINE GENERATORS

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
External Environment (continued)					
Flow elements	Pressure boundary Throttling	Carbon steel	Containment air Outdoor	None[1]	None required
			Borated water leaks	Loss of material	Boric Acid Wastage Surveillance Program
Bolting (mechanical closures)	Pressure boundary	Carbon steel	Borated water leaks	Loss of mechanical closure integrity	Boric Acid Wastage Surveillance Program

NOTE: 1. Carbon steel components that normally operate at high temperatures are not susceptible to loss of material.

TABLE 3.4-2
FEEDWATER, BLOWDOWN AND CHEMICAL ADDITION

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
Internal Environment					
Demineralized water storage tank	Pressure boundary	Carbon steel	Air/Gas	Loss of material	Field Erected Tanks Internal Inspection
			Treated water	Loss of material	Primary Chemistry Monitoring Program Field Erected Tanks Internal Inspection
Standby steam generator feedwater pumps	Pressure boundary	Carbon steel	Treated water	Loss of material	Secondary Chemistry Monitoring Program Galvanic Corrosion Susceptibility Inspection Program
#6 Feedwater heater shells, tube sheets, and covers	Pressure boundary	Carbon steel	Treated water - secondary	Loss of material	Secondary Chemistry Monitoring Program Flow Accelerated Corrosion Program Galvanic Corrosion Susceptibility Inspection Program
#6 Feedwater heater tubes[1]	Pressure boundary	Stainless steel	Treated water - secondary (inside and outside diameters)	Loss of material Cracking	Secondary Chemistry Monitoring Program

NOTE: 1. Heat transfer is not a license renewal intended function for this component.

TABLE 3.4-2 (continued)
FEEDWATER, BLOWDOWN AND CHEMICAL ADDITION

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
Internal Environment (continued)					
Valves Piping/fittings (main Feedwater, Blowdown and Chemical Addition)	Pressure boundary	Carbon steel	Treated water - secondary	Loss of material	Secondary Chemistry Monitoring Program Flow Accelerated Corrosion Program Galvanic Corrosion Susceptibility Inspection Program
Tubing/fittings Thermowells (feedwater)	Pressure boundary	Stainless Steel	Treated water – secondary	Loss of material Cracking	Secondary Chemistry Monitoring Program
Valves Piping/fittings Tubing/fittings Thermowells (blowdown)	Pressure boundary	Stainless steel	Treated water - secondary	Loss of material Cracking	Secondary Chemistry Monitoring Program
Instrument air solenoid valves	Pressure boundary	Brass	Air/Gas	None	None required
Orifices	Pressure boundary Throttling	Stainless steel	Treated water - secondary	Loss of material Cracking	Secondary Chemistry Monitoring Program
Strainers	Pressure boundary	Stainless steel	Treated water	Loss of material	Secondary Chemistry Monitoring Program
Valves Piping/fittings Tubing/fittings (standby steam generator feedwater pump suction)	Pressure boundary	Stainless steel	Treated water	Loss of material	Secondary Chemistry Monitoring Program

TABLE 3.4-2 (continued)
FEEDWATER, BLOWDOWN AND CHEMICAL ADDITION

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
Internal Environment (continued)					
Orifices	Pressure boundary	Stainless steel	Treated water	Loss of material	Secondary Chemistry Monitoring Program

TABLE 3.4-2 (continued)
FEEDWATER, BLOWDOWN AND CHEMICAL ADDITION

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
External Environment					
Demineralized water storage tank	Pressure boundary	Carbon steel	Outdoor	Loss of material	Structures Monitoring Program
Standby steam generator feedwater pumps	Pressure boundary	Carbon steel	Outdoor	Loss of material	Structures Monitoring Program
#6 Feedwater heater shells and covers	Pressure boundary	Carbon steel	Outdoor	None[1]	None required
Valves Piping/fittings (main Feedwater, Blowdown and Chemical Addition)	Pressure boundary	Carbon steel	Containment air	None[1]	None required
			Borated water leaks	Loss of material	Boric Acid Wastage Surveillance Program
Tubing/fittings	Pressure boundary	Stainless steel	Containment air	None	None required
Valves Piping/fittings (from standby steam generator feedwater pumps to main feedwater piping)	Pressure boundary	Carbon steel	Outdoor	Loss of material	Structures Monitoring Program

NOTE: 1. Carbon steel components that normally operate at high temperatures are not susceptible to loss of material.

TABLE 3.4-2 (continued)
FEEDWATER, BLOWDOWN AND CHEMICAL ADDITION

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
External Environment (continued)					
Valves Piping/fittings (main Feedwater, Blowdown and Chemical Addition)	Pressure boundary	Carbon steel	Outdoor Indoor – not air-conditioned	None[1]	None required
Valves Piping/fittings Tubing/fittings Thermowells (blowdown)	Pressure boundary	Stainless steel	Outdoor Indoor – not air-conditioned	None	None required
Valves Piping/fittings Tubing/fittings Strainers (standby steam generator feedwater pump suction)	Pressure boundary	Stainless steel	Outdoor	Loss of material Cracking[2]	Structures Monitoring Program
Piping (standby steam generator feedwater pump suction)	Pressure boundary	Stainless steel	Buried	None	None required

NOTES: 1. Carbon steel components that normally operate at high temperatures are not susceptible to loss of material.
2. Plant experience has identified the potential for cracking in non-stress relieved heat affected zones of weld joints for this piping.

TABLE 3.4-2 (continued)
FEEDWATER, BLOWDOWN AND CHEMICAL ADDITION

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
External Environment (continued)					
Instrument air solenoid valves	Pressure boundary	Brass	Outdoor	None	None required
Orifices	Pressure boundary Throttling	Stainless steel	Outdoor	None	None required
Bolting (mechanical closures)	Pressure boundary	Carbon steel	Borated water leaks	Loss of mechanical closure integrity	Boric Acid Wastage Surveillance Program

TABLE 3.4-3
AUXILIARY FEEDWATER AND CONDENSATE STORAGE

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
Internal Environment					
Condensate storage tanks	Pressure boundary	Carbon steel	Air/Gas	Loss of material	Field Erected Tanks Internal Inspection
			Treated water	Loss of material	Secondary Chemistry Monitoring Program Field Erected Tanks Internal Inspection
Auxiliary feedwater pumps	Pressure boundary	Low alloy steel	Treated water	Loss of material	Secondary Chemistry Monitoring Program Galvanic Corrosion Susceptibility Inspection Program[1]
Auxiliary feedwater pump turbine casings	Pressure boundary	Carbon steel	Treated water - secondary Air/Gas	Loss of material	Auxiliary Feedwater Steam Piping Inspection Program
Auxiliary feedwater pump lube oil cooler and governor oil cooler tube sheets	Pressure boundary	Carbon steel	Treated water	Loss of material	Secondary Chemistry Monitoring Program Galvanic Corrosion Susceptibility Inspection Program[1]
			Lubricating oil	None	None required

NOTE: 1. Galvanic corrosion only at carbon steel contact points with stainless steel, brass, and low alloy steel for these components.

TABLE 3.4-3 (continued)
AUXILIARY FEEDWATER AND CONDENSATE STORAGE

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
Internal Environment (continued)					
Auxiliary feedwater pump lube oil cooler and governor oil cooler channels and covers	Pressure boundary	Cast iron	Treated water	Loss of material	Secondary Chemistry Monitoring Program Auxiliary Feedwater Pump Oil Coolers Inspection
Auxiliary feedwater pump lube oil cooler and governor oil cooler shells Lube oil pump casings Lube oil reservoirs Piping/fittings	Pressure boundary	Carbon steel	Lubricating oil	None	None required
Auxiliary feedwater pump lube oil cooler and governor oil cooler tube bundles	Pressure boundary Heat transfer	Admiralty brass Stainless steel	Treated water (inside diameter)	Loss of material	Secondary Chemistry Monitoring Program
			Lubricating oil (outside diameter)	None	None required
Valves Piping/fittings Tubing/fittings	Pressure boundary	Stainless steel	Treated water	Loss of material	Secondary Chemistry Monitoring Program

TABLE 3.4-3 (continued)
AUXILIARY FEEDWATER AND CONDENSATE STORAGE

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
Internal Environment (continued)					
Valves Piping/fittings	Pressure boundary	Carbon steel Low alloy steel	Treated water	Loss of material	Secondary Chemistry Monitoring Program Galvanic Corrosion Susceptibility Inspection Program[1]
Valves Piping/ fittings Steam traps	Pressure boundary	Carbon steel	Treated water - secondary Air/Gas	Loss of material	Auxiliary Feedwater Steam Piping Inspection Program
Valves Piping/fittings (upstream of MOVs 3/4 1403, 1404, and 1405	Pressure boundary	Carbon steel	Treated water - secondary	Loss of material	Secondary Chemistry Monitoring Program
Valves Piping/fittings Tubing/fittings Flex hoses Rupture disks	Pressure boundary	Stainless steel	Air/Gas	None	None required
Orifices	Pressure boundary Throttling	Stainless steel Carbon steel	Treated water	Loss of material	Secondary Chemistry Monitoring Program Galvanic Corrosion Susceptibility Inspection Program[1]

NOTE: 1. Galvanic corrosion only at carbon steel contact points with stainless steel, brass, and low alloy steel for these components.

TABLE 3.4-3 (continued)
AUXILIARY FEEDWATER AND CONDENSATE STORAGE

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
External Environment					
Condensate storage tanks	Pressure boundary	Carbon steel	Outdoor	Loss of material	Structures Monitoring Program
Auxiliary feedwater pumps	Pressure boundary	Low alloy steel	Outdoor	Loss of material	Structures Monitoring Program
Auxiliary feedwater pump turbine casings	Pressure boundary	Carbon steel	Outdoor	Loss of material	Auxiliary Feedwater Steam Piping Inspection Program
Auxiliary feedwater pump lube oil cooler and governor oil cooler shells and channels	Pressure boundary	Carbon steel Cast iron	Outdoor	Loss of material	Structures Monitoring Program
Valves Piping/fittings Steam traps (non-insulated)	Pressure boundary	Carbon steel	Outdoor	Loss of material	Structures Monitoring Program
Valves Piping/fittings (insulated)	Pressure boundary	Carbon steel	Outdoor	Loss of material	Auxiliary Feedwater Steam Piping Inspection Program

TABLE 3.4-3 (continued)
AUXILIARY FEEDWATER AND CONDENSATE STORAGE

Component / Commodity Group	Intended Function	Material	Environment	Aging Effects Requiring Management	Program/Activity
External Environment (continued)					
Valves Piping/fittings Tubing/fittings Orifices Rupture disks Flex hoses	Pressure boundary	Stainless steel	Outdoor	None	None required
Orifices	Pressure boundary Throttling	Carbon steel	Outdoor	Loss of material	Structures Monitoring Program
		Stainless steel	Outdoor	None	None required
Bolting (mechanical closures)	Pressure boundary	Carbon steel	Outdoor	None	None required

3.5 STRUCTURES AND STRUCTURAL COMPONENTS

Structures and their structural components and commodities that are within the scope of license renewal and subject to aging management reviews are discussed in Section 2.4 and summarized in Table 3.5-2.

Determination of the aging effects applicable to structures and their structural components and commodities begins with identification of the aging effects defined in industry literature. From the set of aging effects, the component and commodity materials and operating environments define the aging effects for each structural component or commodity that is subject to an aging management review. These aging effects are validated by a review of industry and Plant Y operating experiences to provide reasonable assurance that the full set of aging effects are established for the aging management review.

Structural components inaccessible for inspection were evaluated for potential aging effects based on their environment as part of the aging management review. Several structural components that are inaccessible for visual inspection require aging management at Plant Y. Examples include buried concrete, embedded steel, and structural components blocked by installed equipment or structures. Structural components inaccessible for inspection are managed by inspecting accessible structures with similar materials and environments for aging effects that may be indicative of aging effects for inaccessible structural components. The programs credited for managing aging effects of inaccessible structural components are the ASME Section XI, Subsection IWE Inservice Inspection Program and the Structures Monitoring Program. These programs are discussed in Appendix B.

3.5.1 CONTAINMENTS

The Westinghouse Generic Topical Report, WCAP-14756, "Aging Management Evaluation for Pressurized Water Reactor Containment Structure," is not credited and is not incorporated by reference in this Application.

The Containments are divided into two structural classifications, Containment structure, and Containment internal structural components. The components of the structural classifications are grouped by material or function. The Containment structure component groupings are concrete, steel, and post-tensioning system. The Containment internal structural components groupings are concrete and steel.

3.5.1.1 CONTAINMENT STRUCTURE CONCRETE COMPONENTS

The Containment structure concrete components are:

- dome
- cylinder wall
- floor
- foundation mat

3.5.1.1.1 MATERIALS AND ENVIRONMENT

The Containment structure concrete components were designed and constructed in accordance with ACI and American Society for Testing and Materials (ASTM) standards to provide good quality, dense, low permeability concrete. The codes and standards used for design and fabrication of the Containment structure concrete components are provided in Plant Y UFSAR Subsections 5.1.2 and 5.1.6. These materials, and the testing of these materials, are consistent with the GALL Report.

Containment structure concrete components are exposed to several different environments depending on their location. Below grade (buried) Containment structure concrete components can be either above or below the groundwater elevation. Containment structure concrete components that are below grade and above groundwater are exposed to soil/fill. Containment structure concrete components that are below groundwater are exposed to soil/fill and groundwater. The groundwater chemistry is relevant in the determination of the degradation of below groundwater Containment structure concrete components. Based on a review of the Plant Y Final Environmental Statement [Reference 3.5-1], the groundwater parameters for chlorides and sulfates exceed the threshold limits where degradation may occur. Above grade external surfaces of the Containment structure are exposed to indoor – not air conditioned and outdoor environments. Internal components of the Containment structure are exposed to the Containment air environment (see Table 3.0-2). These environments are consistent with the GALL Report except that the environment "Flowing Water Under Foundation" listed in GALL does not exist at Plant Y.

3.5.1.1.2 AGING EFFECTS REQUIRING MANAGEMENT

The following Aging Effects Requiring Management (AERMs) are applicable to Containment concrete components at Plant Y and are consistent with the GALL Report (these AERMs apply to the concrete below groundwater elevation (cylinder walls and foundation mat)):

Loss of Material due to Aggressive Chemical Attack

Loss of Material due to Corrosion of Embedded Steel

Cracking due to Aggressive Chemical Attack

Cracking due to Corrosion of Embedded Steel

Change in Material Properties (Increase in porosity and Permeability) due to Aggressive Chemical Attack

The following AERMs are in the GALL Report but are not applicable to Containment concrete components at Plant Y (reasons are provided):

Loss of Material and Cracking due to Freeze/Thaw are not applicable based on the following reasoning. Freeze-thaw is considered an aging mechanism for concrete structural components that are exposed to severe weather conditions of numerous freeze-thaw cycles with significant amounts of winter rainfall. Plant Y is located in a subtropical climate with long, warm summers accompanied by abundant rainfall and mild, dry winters with negligible freeze-thaw cycles. Therefore, freeze-thaw is not an aging mechanism that can lead to loss of material for Containment structure concrete components.

<u>Change in Material Properties (Increase in porosity and Permeability) due to Leaching of Calcium Hydroxide</u> is not applicable based on the following reasoning. Leaching of calcium hydroxide is observed on concrete that is alternately wetted and dried. White deposits that are left on the surface of the concrete are a solution of water, free lime from the concrete, and carbon dioxide that is readily seen on the surface of the concrete. Plant Y concrete structures and concrete components are constructed of dense, well-cured concrete with an amount of cement suitable for strength development, and achievement of a water-to-cement ratio that is characteristic of concrete having low permeability. This is consistent with the guidance provided by the ACI, and when implemented, degradation caused by leaching of calcium hydroxide is not significant. Therefore, leaching is not an aging mechanism that can lead to change in material properties for Containment structure concrete components.

<u>Expansion and Cracking due to Reaction with Aggregates</u> is not applicable based on the following reasoning. Plant Y concrete components were constructed using non-reactive aggregates whose acceptability was based on established industry standards and ASTM tests. Therefore, reaction with aggregates is not an aging mechanism that can lead to cracking for Containment structure concrete components.

<u>Cracks, Distortion, and Increase in Component Stress Level due to Settlement</u> is not applicable based on the following reasoning. Settlement is based directly on the physical properties of a structure's foundation material. The most pronounced settlement is evidenced in the first several months after construction. Plant Y concrete structures are founded on fossiliferous limestone bedrock with crushed limestone fill. This foundation material is suitable for foundation systems with no significant structural settlement expected. Therefore, settlement is not an aging mechanism that can lead to cracking for Containment structure concrete components.

Reduction in Foundation Strength due to Erosion of Porous Concrete Subfoundation is not applicable because there is no environment with flowing water under the foundation and there are no porous concrete subfoundations at Plant Y.

Loss of Strength and Modulus due to Elevated Temperatures is not applicable based on the following reasoning. The concrete around hot piping penetrations is subject to extended local heat up. The penetrations were designed and constructed to maintain concrete components below the degradation threshold and localized temperature limits of the ACI standards without forced ventilation. No other Containment structure concrete components are exposed to elevated temperature. Therefore, elevated temperature is not an aging mechanism that can lead to loss of material for Containment structure concrete components.

There are no AERMs unique to Containment concrete components at Plant Y.

3.5.1.1.3 OPERATING EXPERIENCE

INDUSTRY EXPERIENCE

A review of industry operating history and a review of NRC generic communications were performed to validate the set of aging effects that require management. The industry correspondence that was reviewed for operating experience related to Containment structural concrete components includes the following:

- NRC Information Notice 97-11, "Cement Erosion from Containment Subfoundations at Nuclear Power Plants"
- NRC Information Notice 98-26, "Settlement Monitoring and Inspection of Plant Structures Affected by Degradation of Porous Concrete Subfoundations"
- NUREG-1522, "Assessment of Inservice Conditions of Safety-Related Nuclear Plant Structures"
- NUREG/CR-4652, "Concrete Component Aging and its Significance Relative to Life Extension of Nuclear Power Plants"

- NUREG/CR-6598, "An Investigation of Tendon Sheathing Filler Migration into Concrete"
- NUREG/CP-0100, Prasad, N., et al., "Concrete Degradation Monitoring and Evaluation," Proceedings of the International Nuclear Power Plant Aging Symposium, August 30 – September 1, 1998

No aging effects requiring management were identified from the above documents beyond those already identified in Subsection 3.6.1.1.2.

PLANT-SPECIFIC EXPERIENCE

Plant Y operating experience was also reviewed to validate the identified aging effects requiring management. This review included a survey of Plant Y non-conformance reports, licensee event reports, and condition reports for any documented instances of Containment structure concrete component aging, in addition to interviews with responsible engineering personnel. No aging effects requiring management were identified from this review beyond those identified in Subsection 3.5.1.1.2.

3.5.1.1.4 CONCLUSION

The review of industry information, NRC generic communications, and Plant Y operating experience identified no additional aging effects beyond those discussed in Subsection 3.5.1.1.2. Table 3.5-2 contains the results of the aging management review for the Containments, and summarizes the aging effects requiring management for Containment structure concrete components.

The aging effects requiring management are adequately managed by the following program:

- Structures Monitoring Program

The Plant Y Structures Monitoring Program is in agreement with the GALL Report in that it is being modified to include a plant specific approach to inspections of inaccessible areas.

Based on the evaluation provided in Appendix B for the program above, aging effects are adequately managed so that the intended functions of the

Containment structure concrete components listed in Table 3.5-2 are maintained consistent with the current licensing basis for the period of extended operation.

3.5.2 REFERENCES

3.5-1 Final Environmental Statement Related to Operation of Plant Y, Test Power and Light Company, Docket No. 50-852, August 1972, United States Atomic Energy Commission Directorate of Engineering.

3.5-2 WCAP-14422, "License Renewal Evaluation: Aging Management for Reactor Coolant System Supports," Revision 2, March 1997.

3.5-3 C. I. Grimes (NRC) letter to R. A. Newton (WOG), "Draft Safety Evaluation Concerning the Westinghouse Owners Group License Renewal Evaluation: Aging Management for Reactor Coolant System Supports, WCAP-14422, Revision 2," February 25, 2000.

TABLE 3.5-1
STRUCTURAL COMPONENT INTENDED FUNCTIONS

1. Provide pressure boundary and/or fission product barrier.
2. Provide structural support to safety-related components.
3. Provide shelter/protection to safety-related components (including radiation shielding).
4. Provide rated fire barrier to retard spreading of a fire.
5. Provide a source of cooling water for plant shutdown.
6. Provide missile barrier.
7. Provide structural support to non-safety related components whose failure could prevent satisfactory accomplishment of any of the required safety-related functions.
8. Provide flood protection barrier.
9. Provide filtration of process fluid to protect downstream equipment.
10. Provide structural support and/or shelter to components required for fire protection, anticipated transients without scram (ATWS), and/or station blackout (SBO) events.

    NOTE: Although not credited in the analyses for these events, these components have been conservatively included in the scope of license renewal.
11. Provide pipe whip restraint and/or jet impingement protection.

TABLE 3.5-2
CONTAINMENTS

Component/ Commodity Group	Intended Function (See Table 3.5-1)	Material	Environment	Aging Effects Requiring Management	Program/Activity
Reinforced concrete Walls above groundwater elevation (dome and cylinder walls)	2, 3, 4, 6, 7, 8, 10	Concrete	Buried Outdoor Indoor – not air conditioned	None	None required
Reinforced concrete Walls below groundwater elevation (cylinder walls and foundation mat)	2, 3, 7, 10	Concrete	Buried	Loss of material Cracking Change in material properties	Structures Monitoring Program
Internal reinforced concrete components: Beams Floor slabs Shield walls Secondary compartment walls Refueling cavity walls Equipment pads Missile shields Curbs Containment sumps Miscellaneous	2, 3, 6, 7, 8, 10	Concrete	Containment air	None	None required

3.6 ELECTRICAL AND INSTRUMENTATION AND CONTROLS

Section 2.5 provides a description of the electrical/I&C components requiring aging management review for license renewal. This section provides the results of the aging management review of the electrical/I&C components. The results of this section are also summarized in Table 3.6-1.

3.6.1 MATERIALS AND ENVIRONMENTS

The cables and connectors are potentially exposed to wetting, borated water, elevated temperatures, and radiation. The cables and connectors are made of various organic polymers (e.g. EPR, SR, EPDM, and XLPE) and various metals used for electrical contacts. The identified materials and environments are consistent with the GALL Report. The components and commodity groups, their intended functions, the materials, and environments for the Electrical and Instrument and Control components are summarized in Tables 3.6-1

3.6.2 AGING EFFECTS REQUIRING MANAGEMENT

The aging effects requiring management (AERMs) and the programs and activities that manage the aging effects for each applicable environment and material combinations are provided in Tables 3.6-1. The AERMs are summarized in the following paragraphs.

The AERM for Non-EQ electrical cables and connections is Reduced insulation resistance caused by embrittlement, cracking, melting and discoloration; and Electrical failure, caused by thermal/ thermoxidative degradation of organics, radiolysis and photolysis (UV sensitive materials only) of organics, and radiation-induced oxidation.

The AERM for Non-EQ inaccessible medium-voltage (2kV to 15kV) cables (e.g., installed in conduit or direct buried) is Electrical failure and localized damage caused by moisture intrusion and water trees.

The AERM for Non-EQ electrical connectors exposed to borated water leakage is Corrosion of connector contact surfaces caused by intrusion of borated water.

The identified AERMs are consistent with the GALL Report.

3.6.3 OPERATING EXPERIENCE

3.6.3.1 INDUSTRY EXPERIENCE

An incident occurred at the Davis-Besse Nuclear Generating Station on October 2, 1999. A component cooling water pump tripped as a result of a phase-to-ground fault on a medium-voltage 3-phase power cable. The cable was installed in a 4-inch polyvinyl chloride (PVC) conduit, which runs partially underground, and had been in service for about 23 years.

All medium-voltage applications (2kV to 15kV) at Plant Y use lead sheath cable to prevent the effects of moisture on the cables. Based on Plant Y's medium-voltage cable design, this incident is not applicable to medium-voltage cables at Plant Y.

3.6.3.2 PLANT-SPECIFIC EXPERIENCE

Plant Y operating experience was reviewed to validate the identified aging effects requiring management. This review included a survey of Plant Y non-conformance reports, licensee event reports, and condition reports for any documented instances of electrical/I&C component aging, in addition to interviews with responsible engineering personnel. No aging effects were identified from this review beyond those identified in Subsection 3.6.1. In particular, the review did not identify any instances where insulated cables or connections have failed due to heat-, radiation-, or moisture-related aging effects.

3.6.4 CONCLUSION

The review of industry information, NRC generic communications, and Plant Y operating experience identified no additional aging effects beyond those discussed in Subsection 3.6.2. The aging effects requiring management are adequately managed by the following programs, which agree with the GALL Report except as noted:

Non-EQ Electrical Cables and Connections Program (aging management program different than that specified in GALL)

One Time Inspection Program (aging management program not included in GALL Report)

Boric Acid Corrosion Program

Based on the evaluations provided in Appendix B for the programs listed above, aging effects are adequately managed so that the intended functions of the Electrical and Instrument and Control components listed in Table 3.6-1 are maintained consistent with the current licensing basis for the period of extended operation.

3.6.5 REFERENCES

TABLE 3.6-1
ELECTRICAL/I&C COMPONENTS AGING MANAGEMENT REVIEW SUMMARY

Component / Commodity Group	Intended Function	Material	Environment [1]	Aging Effect Requiring Management	Program/Activity
Non-EQ electrical cables and connections	To electrically connect specified sections of an electrical circuit to deliver voltage, current, or signal	Various organic polymers (e.g. EPR, SR, EPDM, and XLPE)	Elevated temperatures, and/or radiation	Reduced insulation resistance caused by embrittlement, cracking, melting and discoloration; and Electrical failure, caused by thermal/ thermoxidative degradation of organics, radiolysis and photolysis (UV sensitive materials only) of organics, and radiation-induced oxidation.	Electrical Component Inspection Program
Non-EQ inaccessible medium-voltage (2kV to 15kV) cables (e.g., installed in conduit or direct buried)	To electrically connect specified sections of an electrical circuit to deliver voltage, current, or signal	Various organic polymers (e.g. EPR, SR, EPDM, and XLPE)	Elevated temperatures, and/or radiation	Electrical failure and localized damage caused by moisture intrusion and water trees.	One Time Inspection Program

TABLE 3.6-1
ELECTRICAL/I&C COMPONENTS AGING MANAGEMENT REVIEW SUMMARY

Component / Commodity Group	Intended Function	Material	Environment [1]	Aging Effect Requiring Management	Program/Activity
Non-EQ electrical connectors	To electrically connect specified sections of an electrical circuit to deliver voltage, current, or signal	Various metals used for electrical contacts	Borated water	Corrosion of connector contact surfaces caused by intrusion of borated water	Boric Acid Corrosion Program

NOTE: 1. All environments are external except elevated temperature caused by ohmic heating, which is considered an internal environment.

Appendix B Program Descriptions

And FSAR Sections

Table of Contents

Programs Consistent With GALL

Program	Section Program is Credited
FLOW ACCELERATED CORROSION PROGRAM	3.4
STRUCTURES MONITORING PROGRAM	3.4, 3.5

Programs Consistent With GALL With Exceptions

Program	Section Program is Credited
SECONDARY CHEMISTRY MONITORING PROGRAM	3.4
ELECTRICAL COMPONENT INSPECTION PROGRAM	3.4
PRIMARY CHEMISTRY MONITORING PROGRAM	3.6

Plant Specific Programs

Program	Section Program is Credited
FIELD ERECTED TANKS INTERNAL INSPECTION	3.4

Appendix B Program Descriptions And FSAR Sections

Consistent With GALL

FLOW ACCELERATED CORROSION PROGRAM

The Flow Accelerated Corrosion (FAC) Program is credited for aging management of selected piping and components in the following systems:

Main Steam System
Feedwater System
Steam Generator Blowdown System

The Flow Accelerated Corrosion (FAC) Program is consistent with the ten attributes of aging management program XI.M6, Flow Accelerated Corrosion, specified in GALL (August 2000 – DRAFT) Chapter XI.

Operating Experience:

Various sections of the Main Steam, Feedwater, and Blowdown system piping are periodically examined using nondestructive examination to determine the effects of flow accelerated corrosion. Indications of FAC are evaluated and piping may be either repaired or replaced if sufficient wall thinning is identified.

Ultrasonic examinations have identified pipe wall thinning below established screening criteria. On occasion, visual observations have identified through wall erosion on piping components. These deficiencies were documented in accordance with the corrective action program and resulted in repair or replacement of the marginal areas.

A rupture occurred on an auxiliary steam line in 1997 that resulted in significant upgrades to the FAC program to bring it up to current industry standards. Internal audits of the program since the 1997 event show the program has been maintained in accordance with NSAC–202L–R2 .

Based on the program enhancements which have been implemented, the continued implementation of the Flow Accelerated Corrosion (FAC) Program provides reasonable assurance that the aging effects of flow accelerated corrosion will be managed such that Main Steam, Feedwater, and Blowdown system components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

FSAR Revision:

The Flow Accelerated Corrosion (FAC) program manages the aging effects of wall loss due to FAC for the Main Steam, Feedwater, and Blowdown Systems. The FAC program relies primarily on monitoring and inspection of piping/components to preclude failure of high and low energy carbon steel piping. The Program Basis Document for FAC clearly defines the actions, procedures and steps required to prevent primary pressure boundary failure of the piping/components in scope. All inspection locations must satisfy specified evaluation criteria in order for a component to remain in service.

The program will be enhanced to address valve body erosion by visual inspections prior to the end of the initial operating license terms for Plant Y.

STRUCTURES MONITORING PROGRAM

As identified in Chapter 3, the Structures Monitoring Program is credited for aging management of specific component groups in the following structures:

Auxiliary Building Containment

Intake Structure Turbine Building

The Structures Monitoring Program is credited for managing the effects of Loss of Material for selected structures within the scope of license renewal. The program provides for visual inspection and examination of accessible surfaces of specific structures and components, including welds and bolting.

Aging management of structural components that are inaccessible for inspection is accomplished by inspecting accessible structural components with similar materials and environments for aging effects that may be indicative of aging effects for inaccessible structural components.

With identified enhancements, the Structures Monitoring Programs is consistent with the ten attributes identified in the NRC GALL Report (August 2000 DRAFT) for Structures Monitoring Program XI.S6.

Operating Experience

Inspections have been performed in the Auxiliary Building, Containment, Intake Structure, and Turbine Building in 1996/1997 and 1999/2000. No significant deterioration has been identified in the inspections performed.

FSAR Revision

The Structures Monitoring Program manages the aging effect of loss of material. The program provides for periodic visual inspection and examination for degradation of accessible surfaces in designated structures that fall within the scope of license renewal.

Appendix B Program Descriptions And FSAR Sections

Consistent With GALL With Exceptions

SECONDARY CHEMISTRY MONITORING PROGRAM

The Secondary Chemistry Monitoring Program is credited for managing the aging affects applicable to the passive component/item groupings exposed to contact with the secondary plant fluids. The concentration of chemical impurities and chemical additions are controlled through monitoring requirements and compliance with specifications which contain chemistry limits. Section 3 of this LRA provides matrices of the affected components/item groupings and the aging effects mitigated by the monitoring program. The Secondary Chemistry Monitoring Program is consistent with the ten attributes of aging management program XI.M11, Water Chemistry, specified in GALL (August 2000 – DRAFT) Chapter XI.

Exception to GALL Requirements

The first exception is that Plant Y credits the Secondary Water Chemistry Program for aging management of components in the Chemical Addition System. Note that the materials, environments, and resultant aging effects requiring management are the same as those present in systems for which GALL credits this program.

Also, the program description for Water Chemistry, XI.M11, specified in GALL (August 2000 – DRAFT) Chapter XI, requires a one-time inspection for use in conjunction with existing program requirements to be developed and reviewed on a plant specific basis. [*plant name*] takes exception to the one-time inspection requirement. Operating experience at [*plant name*] has not identified any problems that would warrant a one-time inspection to confirm the adequacy of the chemistry programs. This experience includes inspections of systems and components during maintenance activities that occur routinely. [*specific examples would be provided here*] These inspections have not identified aging effects other than those identified in the LRA and the adequacy of the chemistry programs has been confirmed by these maintenance-related inspections.

Operating Experience and Demonstration

Operating experience on the secondary systems demonstrates the effectiveness of the Secondary Water Chemistry Monitoring program. No significant chemistry related degradation for secondary components/item groupings has been experienced. Experience has shown that implementation of a secondary chemistry program in accordance with accepted industry standards is effective in managing the effects of aging. Based on this experience, the continued implementation of the Secondary Chemistry Monitoring program provides reasonable assurance that aging effects will be managed so that secondary system components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

FSAR Revision

The Secondary Chemistry Monitoring Program maximizes long-term availability of secondary systems by minimizing system corrosion. The scope of the Secondary Chemistry Monitoring Program includes sampling activities and analysis on the following systems: Chemical Addition System, Main Steam System, Feedwater System, Condensate System, Steam Generator Blowdown System, Auxiliary Feedwater System. The Secondary Chemistry Monitoring Program provides assurance that an elevated level of corrosive impurities does not exist in the systems covered by the program. This prevents or minimizes the occurrence of loss of material and other aging effects.

PRIMARY CHEMISTRY MONITORING PROGRAM

The Primary Chemistry Monitoring Program is credited for managing the aging affects applicable to the passive component/item groupings exposed to contact with the reactor coolant. The concentration of chemical impurities and chemical additions are controlled through monitoring requirements and compliance with specifications which contain chemistry limits. Section 3 of this LRA provides matrices of the affected components/item groupings and the aging effects mitigated by the monitoring program. The Primary Chemistry Monitoring Program is consistent with the ten attributes of aging management program XI.M11, Water Chemistry, specified in GALL (August 2000 – DRAFT) Chapter XI, except as discussed below.

Exception to GALL Requirements

The program description for Water Chemistry, XI.M11, specified in GALL (August 2000 – DRAFT) Chapter XI, requires a one-time inspection for use in conjunction with existing program requirements to be developed and reviewed on a plant specific basis. [*plant name*] takes exception to the one-time inspection requirement. Operating experience at [*plant name*] has not identified any problems that would warrant a one-time inspection to confirm the adequacy of the chemistry programs. This experience includes inspections of systems and components during maintenance activities that occur routinely. [*specific examples would be provided here*] These inspections have not identified aging effects other than those identified in the LRA and the adequacy of the chemistry programs has been confirmed by these maintenance-related inspections.

Operating Experience and Demonstration

Operating experience on the primary systems demonstrates the effectiveness of the Primary Water Chemistry Monitoring program. No significant chemistry related degradation for primary components/item groupings has been experienced. Experience has shown that implementation of a primary chemistry program in accordance with accepted industry standards is effective in managing the effects of aging. Based on this experience, the continued implementation of the Primary Chemistry Monitoring program provides reasonable assurance that aging effects will be managed so that primary system components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

FSAR Revision

The Primary Chemistry Monitoring Program maximizes long-term availability of primary systems by minimizing system corrosion, fuel corrosion, and radiation field build-up. The scope of the Primary Chemistry Monitoring Program includes sampling activities and analysis on the following systems: RCS, borated water storage tanks, spent fuel pool system, letdown purification demineralizers, and reactor makeup water. The Primary Chemistry Monitoring Program provides assurance that an elevated level of contaminants and oxygen does not exist in the systems covered by the program. This prevents or minimizes the occurrence of cracking and other aging effects.

ELECTRICAL COMPONENT INSPECTION PROGRAM

The Electrical Component Inspection Program is credited for managing aging effects that apply to Non-EQ Inaccessible Medium-Voltage Cables, which are exposed to condensation and wetting in inaccessible locations. The [*plant name*] Electrical Component Inspection Program will use visual inspections of selected samples of the accessible portion of medium voltage cables to detect aging effects for Non-EQ Inaccessible Medium Voltage Cables. The Electrical Component Inspection Program is consistent with the ten attributes of an aging management program for XI.E3, Non-EQ Inaccessible Medium-Voltage Cables, specified in GALL (August 2000 – DRAFT) Chapter XI, except as discussed below.

Exception to GALL Requirements

[*plant name*] takes exception to the recommended ten year testing frequency requirement identified in GALL (August 2000 – DRAFT) Chapter XI.M8. The [*plant name*] inspection program does not include scheduled testing since [*plant name*] has determined that these Non-EQ Inaccessible Medium-Voltage Cables were designed for the applications where they are installed. The moisture and voltage exposures described as significant within the GALL program description are not significant at [*plant name*] since the design criteria for cables used in these applications assures the cables will continue to perform their intended function. Engineering review determined the expected life of these cables extends beyond the extended period of operation.

Operating Experience and Demonstration

Operating experience has shown Non-EQ Inaccessible Medium-Voltage Cables continue to perform their intended function. The operational environments for these cables have not affected their intended function. Based on this experience, implementation of the visual inspection requirments for accessible Non-EQ Medium-Voltage Cables will provide reasonable assurance that aging effects will be managed so that all medium voltage cables will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. If an uacceptable condition is identified, the current program requires determination of whether the same conditon or situation is applicable to other accessible or inaccessible cables and connections.

FSAR Revision

ELECTRICAL COMPONENT INSPECTION

The Electrical Component Inspection Program will inspect splices, connectors, and cables within the scope of license renewal that are located in areas that may be conducive to accelerated aging. The scope of the inspection program includes cables exposed to elevated temperatures, wet environments, or corrosive chemicals. The scope also includes cables that can experience elevated temperatures due to the current they are carrying, connectors used in impedance-sensitive circuits, and cable splices subject to aging-related stressors. The aging effect for cables and cable splices is a change of material properties, as evidenced by cracking or discoloration of the insulation or by degradation of a tested parameter. The aging effect for connectors in impedance-sensitive circuits is a change of material due to corrosion of connector pins. The Electrical Component Inspection Program will be formally implemented and the first inspection of in-scope cables, splices, and connectors will be completed prior to the expiration of the initial 40-year licensing term.

Appendix B Program Descriptions And FSAR Sections

Plant Specific Programs

FIELD ERECTED TANKS INTERNAL INSPECTION

As discussed in Chapter 3, the Field Erected Tanks Internal Inspection is credited for aging management of field erected tanks in the following systems: Auxiliary Feedwater, Condensate Storage, Feedwater, Blowdown, and Safety Injection

Scope

This is a one-time inspection of the two condensate storage tanks, two refueling water storage tanks, and the shared demineralized water storage tank. The Field Erected Tanks Internal Inspection is credited with managing the aging effect of loss of material due to corrosion of the tanks within the scope. The one-time inspection of selected internal areas, including surface welds, will determine the extent of internal corrosion in the listed tanks. The visual inspection will consist of direct (e.g., divers) or remote (e.g., television cameras, fiber optic scopes, periscopes) means. Commitment dates associated with the implementation of this new program are contained in Appendix A.

Preventive Actions

Internal tank surfaces are coated to reduce corrosion. Coatings minimize corrosion by limiting exposure to the environment. However, coatings are not credited in the determination of the aging effects requiring management.

Parameters Monitored or Inspected

The material condition of the internal surfaces of accessible areas of the tanks will be visually inspected.

Detection of Aging Effects

The presence of corrosion that could lead to loss of material will be determined by visual inspection of the accessible areas of the field erected tanks. Internal surfaces will be examined for evidence of flaking, blistering, peeling, discoloration, pitting, or excessive corrosion.

Monitoring and Trending

As noted above, this is a one-time inspection, therefore, monitoring or trending is not anticipated. Results of the inspection will be evaluated to determine if additional actions are required.

Acceptance Criteria

The results of the one-time inspection will be evaluated. Specific acceptance criteria will be provided in the implementing procedure.

Confirmation Process

Any follow-up inspection required will be based on the evaluation of the inspection results and will be documented in accordance with the corrective action program.

Operating Experience and Demonstration

Visual inspections have been performed at Pant X for several years. This technique has proven successful for identifying material defects on the surface of field erected tanks.
This inspection is a new activity that will use techniques with demonstrated capability and a proven industry record to detect corrosion. This inspection will be performed utilizing approved procedures and qualified personnel.

Based upon the above, the implementation of the Field Erected Tanks Internal Inspection will provide reasonable assurance that loss of material due to corrosion will be managed such that the structures and components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

FSAR Revision

FIELD ERECTED TANKS INTERNAL INSPECTION

A one-time visual inspection to determine the extent of corrosion on the internal surfaces of the field erected tanks for both units -- including the Condensate Storage Tanks, the Demineralized Water Storage Tank, and the Refueling Water Storage Tanks -- will be performed. The results of these inspections will be evaluated to determine the need for additional inspections/programmatic corrective actions. These inspections will be implemented prior to the end of the initial operating license terms for Plant Y.