2.3.3.3 Control Rod Drive Hydraulic System

System Purpose

The control rod drive hydraulic (CRDH) system controls changes in reactivity by incrementally positioning the control rods in response to signals from the reactor manual control system. The system is also used to shut down the reactor quickly by rapidly inserting control rods into the core in response to a manual or automatic signal.

System Operation

The CRDH system is made up of supply pumps, filters, strainers, control valves, and associated instrumentation and controllers. It provides water at the required pressures to the hydraulic control units (HCUs) for cooling and all types of required control rod (evaluated with control blades) motion. The CRDH system allows control rod withdrawal or insertion at a limited rate, one rod at a time, for power level control and flux shaping during reactor operation. Stored energy available from gas (nitrogen) charged accumulators and from reactor pressure provides hydraulic power for rapid simultaneous insertion (scram) of all control rods for reactor shutdown. The hydraulic system is arranged so that the equipment common to each control rod drive (CRD) is packaged in modular form into HCUs, one HCU module to each drive. The HCUs are arranged into two banks, each of which has its own scram discharge volume (SDV), which consists of a scram discharge header and an instrument volume. The SDV is used to limit the loss of and contain the reactor vessel water from all the drives during a scram. Each CRD has its own separate control and scram devices. Alternate rod insertion (ARI) valves are supplied to provide an alternate means of initiating control rod insertion during an ATWS scram event (evaluated with the anticipated transients without scram system). Under normal operation, the CRDH system supplies unheated condensate by one of two system pumps to hydraulically position the control rods. These pumps take their suction from the condensate system (evaluated with the condensate and condensate storage system) at low pressure and direct it through the drive water filters. The discharge from the filters supply the reactor recirculation pump seal water supply header, the accumulators via the charging header, the HCUs via the drive water header, and the CRDs via the cooling water header. The pumps are provided with a minimum flow line to the contaminated condensate storage tank (CCST). The reactor recirculation pump seal water supply header supplies filtered and cooled water to the purge the reactor recirculation pump seals. The reactor recirculation pump seal water supply isolation check valves provide a pressure retaining boundary for the reactor coolant system. The charging header supplies pressurized water to maintain the accumulators charged and ready for service in the event of a scram. The drive water header provides the CRDs with motive force for moving the control rods. This header also supplies a continuous low flow to the reactor vessel water level instrumentation system (RVWLIS) backfill system (evaluated with the nuclear boiler instrumentation system). Filtered control air is provided to CRDH system air operated valves from the instrument air system. Provision is also made (at Dresden) to supply system flow to the reactor recirculation pump seals for hydro purposes.

System Evaluation Boundary

The CRDH system suction side evaluation boundary begins with the connection to the condensate reject line to the CCST. The boundary continues through the CRD pumps, the drive water filters, and branches to the reactor recirculation pump seal supply header, to the accumulators via the charging header, to the HCUs via the drive water header, and to the CRDs via the cooling water header. The evaluation boundary includes the suction piping, discharge piping, minimum flow line, filters, CRD pumps, HCUs, HCU manifolds, and the CRDs. Included within the boundary are the reactor recirculation pump seal water supply isolation check valves, the scram discharge header and instrument volume and the supply lines to the RVWLIS backfill system. The air supply evaluation boundary starts at the parallel instrument air supply lines to the CRD air filters and includes the filters and all piping, instrumentation, and valves necessary to supply air to the CRD air operated valves. Included within the evaluation boundary is the accumulator nitrogen charging system, which includes the nitrogen cylinders, header piping, piping, instrumentation, and valves from the cylinders to the HCU accumulators. At Dresden, the RVLIS backfill system supply header isolation valves, and the system valves on the CRD hydro supply line to the reactor recirculation pump seals are included in the evaluation boundary. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the control rod drive hydraulic system boundary.

UFSAR References

Dresden Station UFSAR Section(s): 4.6.3

Quad Cities Station UFSAR Section(s): 4.6.3

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-26-2, LR-DRE-M-26-3, LR-DRE-M-34-1, LR-DRE-M-34-2, LR-DRE-M-35-1, LR-DRE-M-39, LR-DRE-M-177-4, LR-DRE-M-357-2, LR-DRE-M-357-3, LR-DRE-M-365-1, LR-DRE-M-365-2, LR-DRE-M-366, LR-DRE-M-369, and LR-DRE-M-419-4.

Quad Cities Station:

LR-QDC-M-41-1, LR-QDC-M-41-2, LR-QDC-M-41-3, LR-QDC-M-41-4, LR-QDC-M-83-1, LR-QDC-M-83-2, LR-QDC-M-83-3, and LR-QDC-M-83-4.

System Intended Functions

Reactivity control – provides a rapid shutdown (scram) of the reactor under appropriate conditions.

Pressure boundary - maintains pressure boundary to support integrity of the reactor coolant pressure boundary and to support in-scope pressure boundaries at interfaces with other in-scope systems.

Credited in regulated event(s) – provides scram discharge volume vent and drain isolation valves which are credited to remain closed in the Appendix R fire event and

provides alternate rod insertion capability which is credited in the anticipated transient without scram event. At Dresden only, CRDH system water supply to the vessel is credited in the Appendix R fire event. Also at Dresden only, the system contains components that are relied upon for compliance with 10 CFR 50.49, (EQ).

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.3-3 Component Groups Requiring Aging Management Review - Control Rod Drive Hydraulic System

Component Group	Component Intended Function	Aging Management Ref
Accumulators	Pressure Boundary	3.3.1.5, 3.3.2.1, 3.3.2.5, 3.3.2.40
Closure Bolting	Pressure Boundary	3.3.1.22
Dampeners (Quad Cities only)	Pressure Boundary	3.3.1.5, 3.3.1.8, 3.3.1.25, 3.3.2.40
Dampeners (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.3.1.5, 3.3.1.8, 3.3.1.25, 3.3.2.40
Filters/Strainers	Pressure Boundary	3.3.1.25, 3.1.2.10, 3.1.2.11, 3.3.2.40
Filters/Strainers	Filter	3.3.1.25, 3.1.2.10, 3.1.2.11
Flow Elements (spatial interaction)	Leakage Boundary (spatial)	3.3.1.5, 3.3.1.8, 3.3.1.25, 3.3.2.40
Flow Elements (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.8, 3.3.1.25, 3.3.2.40
NSR Vents or Drains, Piping and Valves (attached support)	Structural Integrity (attached)	3.3.2.130
Piping and Fittings (includes dampeners and tubing)	Pressure Boundary	3.3.1.5, 3.3.1.8, 3.3.1.17, 3.3.1.25, 3.1.2.25, 3.1.2.26, 3.3.2.40, 3.3.2.42, 3.3.2.146, 3.3.2.164, 3.3.2.167
Piping and Fittings (spatial interaction)	Leakage Boundary (spatial)	3.3.1.5, 3.3.1.8, 3.3.1.25, 3.3.2.40
Piping and Fittings (attached support)	Structural Integrity (attached)	3.3.1.5, 3.3.1.8, 3.3.1.25, 3.3.2.40
Pumps (Dresden only)	Pressure Boundary	3.3.1.25, 3.3.2.40
Restricting Orifices (Dresden only)	Pressure Boundary	3.3.1.8, 3.3.1.25, 3.3.2.40
Rupture Discs	Pressure Boundary	3.3.2.40, 3.3.2.194
Tanks (includes accumulators)	Pressure Boundary	3.3.1.5, 3.3.1.8, 3.1.2.34, 3.1.2.35, 3.3.2.40, 3.3.2.216
Tubing	Pressure Boundary	3.3.1.5, 3.3.1.8, 3.3.1.17, 3.3.1.25, 3.3.2.40, 3.3.2.242, 3.3.2.248

Table 2.3.3-3 Component Groups Requiring Aging Management Review - Control Rod Drive Hydraulic System (Continued)

Component Group	Component Intended Function	Aging Management Ref
Valves	Pressure Boundary	3.1.2.52, 3.1.2.53, 3.3.1.5, 3.3.1.8, 3.3.1.17, 3.3.1.25, 3.3.2.23, 3.3.2.40, 3.3.2.42, 3.3.2.260, 3.3.2.262, 3.3.2.274, 3.3.2.293, 3.3.2.296
Valves (spatial interaction)	Leakage Boundary (spatial)	3.3.1.8, 3.3.1.25, 3.3.2.40
Valves (attached support)	Structural Integrity (attached)	3.3.1.25, 3.3.2.40, 3.3.2.296

Aging management review results for the control rod drive hydraulic system are provided in Section 3.1 for the reactor coolant pressure boundary functions and Section 3.3 for the additional control rod drive hydraulic system functions.

2.3.3.4 Reactor Water Cleanup System

System Purpose

The purpose of the reactor water cleanup system is to: remove insoluble, waterborne activation products from reactor coolant; prevent soluble inorganic impurities (i.e., chlorides) from concentrating in the reactor coolant and exceeding specified water quality limits; reduce beta and gamma radiation sources in the reactor coolant resulting from the presence of corrosion and fission products; and remove water from the reactor coolant system at reduced activity levels during startup and shutdown.

System Operation

The RWCU system consists of pumps, regenerative and non-regenerative heat exchangers, demineralizers, filters (Quad Cities only), containment isolation valves, and associated piping, valves, instrumentation and controls. The system takes suction from the reactor recirculation system at the shutdown cooling system connection at Dresden (evaluated with the shutdown cooling system) and the reactor recirculation pump suction connection at Quad Cities (evaluated with the reactor recirculation system) and the reactor vessel bottom drain connection (evaluated with the nuclear boiler instrumentation system). From these two suction sources, reactor water impurities are removed by directing the flow through the system's major components, piping and supporting components back to the reactor vessel via the feedwater system at Dresden (evaluated with the feedwater system) and RCIC system at Quad Cities (evaluated with the reactor core isolation cooling system) connections. The regenerative heat exchangers transfer heat from the water leaving the reactor to the water returning to the reactor. The non-regenerative heat exchangers are cooled by water from the reactor building closed cooling water system (evaluated with reactor building closed cooling water system). At Dresden, the portion of the system downstream of the pressure reducing valve is at low pressure. Flow through the entire system at Quad Cities is at reactor pressure. Isolation valves are provided for system process lines that penetrate primary containment. The system has automatic isolation features that respond to indications of a system high energy line break (HELB), actuation of the standby liquid control system (evaluated with the standby liquid control system), upon receipt of a low reactor water level signal, or high temperature downstream of the non-regenerative heat exchangers (to prevent resin damage). At Dresden, the system will also automatically isolate on a system high pressure condition, or an auxiliary pump high cooling water outlet temperature condition.

System Evaluation Boundary

The RWCU system evaluation boundary begins with suction from the shutdown cooling system connection (at Dresden) and the reactor recirculation pump suction connection (at Quad Cities) and the reactor vessel bottom drain connection. The boundary continues through containment isolation valves, the regenerative and non-regenerative heat exchangers, the pressure reducing valve (Dresden only), the demineralizer pumps, filters (Quad Cities only), and demineralizers, then back through the regenerative heat exchanger and through the return to reactor check valve to the feedwater system (at Dresden) and RCIC system (at Quad Cities) connections. All associated piping,

components and instrumentation contained within the flow paths and systems described above are included in the RWCU system boundary.

UFSAR References

Dresden Station UFSAR Section(s): 5.4.8

Quad Cities Station UFSAR Section(s): 5.4.8

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-14, LR-DRE-M-20, LR-DRE-M-26-2, LR-DRE-M-30, LR-DRE-M-32, LR-DRE-M-48, LR-DRE-M-347, LR-DRE-M-353, LR-DRE-M-357-2, LR-DRE-M-361, LR-DRE-M-363, and LR-DRE-M-372.

Quad Cities Station:
LR-QDC-M-35-1, LR-QDC-M-35-2, LR-QDC-M-47-1, LR-QDC-M-47-2, LR-QDC-M-77-1, LR-QDC-M-77-2, LR-QDC-M-88-1, and LR-QDC-M-88-2.

System Intended Functions

Pressure boundary - maintains the integrity of the reactor coolant pressure boundary.

Primary containment isolation – provides containment isolation for those portions of the system that interface with the Primary Containment.

Supports ESF function(s) – supports the ESF function of the standby liquid control system by shutdown of RWCU pumps and closure of RWCU valves to prevent dilution or removal of the injected boron.

Credited in regulated event(s) – credited in evaluation of the Appendix R fire and in the anticipated transient without scram events. The system also contains components relied upon for compliance with 10CFR50.49 (EQ).

Preclude adverse effects on safety-related SSCs – non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.3-4 Component Groups Requiring Aging Management Review - Reactor Water Cleanup System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.1.1.1, 3.3.1.22
NSR Vents or Drains, Piping and Valves (attached support)	Structural Integrity (attached)	3.3.2.130
Piping and Fittings	Pressure Boundary	3.1.1.1, 3.1.1.15, 3.3.1.3, 3.3.1.5, 3.3.1.24, 3.3.2.40, 3.3.2.42, 3.3.2.140
Piping and Fittings (attached support)	Structural Integrity (attached)	3.3.1.5, 3.3.1.8, 3.3.2.40, 3.3.1.25
Piping and Fittings (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.3.1.5, 3.3.1.8, 3.3.1.25, 3.3.2.40
Piping and Fittings (small bore)	Pressure Boundary	3.1.1.5, 3.3.2.40, 3.3.2.42
Sight Glasses (attached support) (Dresden only)	Structural Integrity (attached)	3.3.2.204
Valves	Pressure Boundary	3.1.1.1, 3.1.1.9, 3.1.1.15, 3.3.1.5, 3.3.2.40, 3.3.2.42, 3.3.2.270
Valves (attached support)	Structural Integrity (attached)	3.3.2.292, 3.3.2.40
Valves (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.3.2.292, 3.3.2.40

Aging management review results for the reactor water cleanup system are provided in Section 3.1 for the reactor coolant pressure boundary functions and 3.3 for the additional RWCU functions.

2.3.3.5 Fire Protection System

System Purpose

The fire protection system detects and suppresses fires and provides an alternate source of makeup water to various critical locations. Fire barriers prevent the spread of fire from one space to another.

System Operation

The fire protection system includes the diesel driven fire pumps, the fire protection headers to the various wet pipe, preaction and deluge systems as well as associated valves, instruments, hose reels and hydrants. Two fire pumps are provided in the 1/2 intake structure (cribhouse) at Quad Cities. One fire pump each is provided in the 2/3 cribhouse and the Unit 1 cribhouse at Dresden. The system takes suction from the associated cribhouse suction bays and provides water to its various components for fire suppression. Provisions are also made for the system to serve as an alternate makeup water source to the isolation condenser (at Dresden, evaluated with the isolation condenser) and the safe shutdown makeup pump system (at Quad Cities, evaluated with the safe shutdown makeup pump system). The system also includes fire dampers, the halon suppression system and the fire computer system, which includes smoke detectors, heat sensors, pressure/flow sensors, and actuation devices for preaction systems, and fire doors (evaluated with the associated structures). These systems detect, suppress, and prevent the spread of fires in various critical locations.

System Evaluation Boundary

The fire protection system evaluation boundary begins with the suction of the diesel driven fire pumps from the associated cribhouse suction bays. It continues through the common fire protection header to the various wet pipe, preaction and deluge systems as well as hose reels, hydrants, and sprinkler heads. The evaluation boundary extends to include its interface with the service water system, the isolation condenser system (at Dresden) and the safe shutdown makeup pump system (at Quad Cities). The evaluation boundary also includes fire dampers, the halon suppression system and the fire computer system, which includes smoke detectors, heat sensors, pressure/flow sensors, and actuation devices for preaction systems. The fire dampers of the in-scope HVAC systems are evaluated with those systems. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the fire protection system boundary..

UFSAR References

Dresden Station UFSAR Section(s): 9.5.1

Quad Cities Station UFSAR Section(s): 9.5.1

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-23-1, LR-DRE-M-23-2, LR-DRE-M-23-3, LR-DRE-M-23-4, LR-DRE-M-23-5, LR-DRE-M-28, LR-DRE-M-359, LR-DRE-M-375-2, LR-DRE-M-375-3, LR-DRE-M-787, LR-DRE-M-1305, and LR-DRE-M-4204.

Quad Cities Station:
LR-QDC-M-27-1, LR-QDC-M-27-2, LR-QDC-M-27-3, LR-QDC-M-27-4, LR-QDC-M-27-5, LR-QDC-M-29-1, and LR-QDC-M-3030.

System Intended Functions

Credited in regulated events - provides methods to detect, suppress, contain, and monitor fire events in compliance with the requirements of 10CFR50.48. For Dresden only, the fire protection system provides a backup source of makeup water to the isolation condenser. For Quad Cities only, the fire protection system provides a backup source of makeup water for reactor pressure vessel level control and drywell flooding and a backup cooling water supply to the safe shutdown makeup pump room coolers in event of a fire.

Component Groups Requiring Aging Management Review

Table 2.3.3-5 Component Groups Requiring Aging Management Review - Fire Protection System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22, 3.3.2.17, 3.3.2.18, 3.3.2.19, 3.3.2.20
Filters/Strainers	Pressure Boundary	3.3.1.5, 3.3.1.17, 3.3.1.19, 3.3.2.23, 3.3.2.56, 3.3.2.300
Filters/Strainers	Filter	3.3.1.5, 3.3.1.17, 3.3.1.19, 3.3.2.56
Fire Dampers	Pressure Boundary	3.3.1.18
Fire Dampers	Fire Barrier	3.3.1.18
Fire Hydrants	Pressure Boundary	3.3.1.19, 3.3.2.61, 3.3.2.32
Fire Wrap	Fire Barrier	3.3.2.63
Mufflers	Pressure Boundary	3.3.1.5
Penetration Seals	Fire Barrier	3.3.1.18
Penetration Seals	Flood Barrier	3.3.1.18

Table 2.3.3-5 Component Groups Requiring Aging Management Review - Fire Protection System (Continued)

Component Group	Component Intended Function	Aging Management Ref
Piping and Fittings (includes flex hoses, hose reels, hoses, nozzles, tubing, sprinklers, and gaskets of buried fire mains)	Pressure Boundary	3.3.1.5, 3.3.1.16, 3.3.1.19, 3.3.1.20, 3.3.2.26, 3.3.2.30, 3.3.2.33, 3.3.2.34, 3.3.2.38, 3.3.2.39, 3.3.2.40, 3.3.2.131, 3.3.2.138, 3.3.2.144, 3.3.2.150, 3.3.2.153, 3.3.2.154, 3.3.2.157, 3.3.2.158, 3.3.2.300
Piping and Fittings (Quad Cities only) (includes orifices)	Throttle	3.3.1.19
Pumps	Pressure Boundary	3.3.1.19, 3.3.2.170, 3.3.2.171, 3.3.2.178
Sprinklers (includes nozzles)	Pressure Boundary	3.3.1.5, 3.3.1.19, 3.3.2.26, 3.3.2.205, 3.3.2.206
Tanks (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.20
Valves (Fire Protection) (includes hydrants, and nozzles)	Pressure Boundary	3.3.1.19, 3.3.2.301
Valves (includes nozzles)	Pressure Boundary	3.3.1.5, 3.3.1.19, 3.3.1.20, 3.3.2.23, 3.3.2.31, 3.3.2.32, 3.3.2.300, 3.3.2.260, 3.3.2.262, 3.3.2.265, 3.3.2.283, 3.3.2.301

Aging management review results for the fire protection system are provided in Section 3.3.

2.3.3.6 Emergency Diesel Generator and Auxiliaries

System Purpose

The emergency diesel generator (EDG) system provides an emergency source of AC power to the emergency core cooling system or safe shutdown equipment for each unit in the event off-site power supply is not available. The system consists of three emergency diesel generators per site: one unit per reactor and a shared unit. The emergency diesel generator produces power at a voltage and frequency compatible with normal bus requirements. The auxiliaries associated with this system include the jacket water system, the starting air system, the lubrication system, the ventilation system and the combustion air intake and exhaust.

System Operation

Each EDG is an assembly consisting of a diesel engine and a generator. Each assembly is located in a separate diesel generator room. Included in this assembly are directly attached piping, valves, manifolds, starters, turbochargers, internal coolers, instrumentation, and other equipment. The diesel engine is provided with fuel oil from the diesel oil system (evaluated with the diesel fuel oil system).

Each diesel generator room has an independent ventilation system, which maintains the associated room within equipment temperature limits. Each ventilation system has a supply fan which auto starts when the EDG starts. The fan draws in either outside air or turbine building air through temperature-controlled modulation dampers, isolation dampers, and fire dampers. The air exhausts the room through pneumatically operated dampers. Each ventilation system is used only when its respective diesel generator is operating.

The EDG jacket water system provides cooling to the lube oil cooler, and other diesel subcomponents, and maintains the diesel at an acceptable starting temperature during standby. The system is a closed loop system that starts with the EDG jacket water heat exchangers, passes through the diesel engine and lube oil cooler, and returns to the heat exchanger. It includes engine-driven pumps, an immersion heater, expansion tank, piping, valves, controls and instrumentation. The EDG jacket water heat exchangers are provided with cooling water from the diesel generator cooling water system (evaluated with the diesel generator cooling water system).

The EDG starting air system provides a motive force to start the EDG. The system starts with the EDG starting air compressors, then passes through the receiver tanks, and moisture separators, to the EDG start motors. It includes piping, valves, controls and instrumentation.

The lubrication system provides lubrication to the EDG and subcomponents and maintains the diesel at an acceptable starting temperature during standby. The system includes five pumping circuits for each EDG. Each circuit starts from the engine sump, then passes through strainers, pumps, filters, and coolers, to the supplied service. It includes piping, valves, controls and instrumentation. Also included is the oil pumping circuit for the governor drive assembly.

The EDG combustion air intake and exhaust system provides filtered air for engine combustion and provides a flow path to drive the turbocharger, and to remove exhaust gases to the outside. The system starts from the air intake hood, then passes through intake filters, to the engine, to the exhaust manifold, and through the exhaust silencer and the outlet screen.

System Evaluation Boundary

The EDG assembly system evaluation boundary includes directly attached piping, valves, manifolds, starters, turbochargers, internal coolers, instrumentation, and other equipment. The EDG ventilation system evaluation boundary begins with the room's air intake and continues through the associated temperature-controlled modulation dampers, isolation dampers, and fire dampers and supply fan, and the air return through the pneumatically operated damper. The EDG jacket water system evaluation boundary begins with the EDG cooling water heat exchangers, continues through the diesel engine and lube oil cooler, and returns to the heat exchanger. The EDG starting air system evaluation boundary begins with the EDG starting air compressors, continues through the receiver tanks and moisture separators, to the EDG start motors. The EDG lubrication system evaluation boundary for each EDG begins with the engine sump, continues through the strainers, pumps, filters, and coolers, to the supplied service for each of the five circuits. Also included is the oil pumping circuit for the governor drive assembly. The EDG combustion air intake and exhaust system evaluation boundary begins with the air intake hood, continues through the intake filters, the engine, the exhaust manifold, through the exhaust silencer and to the outlet screen. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the emergency diesel generator system boundary.

UFSAR References

Dresden Station UFSAR Section(s): 8.3.1 and 9.4.7

Quad Cities Station UFSAR Section(s): 8.3.1 and 9.4.5

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-173, LR-DRE-M-40, LR-DRE-M-478-1, LR-DRE-M-478-2, LR-DRE-M-478-3, LR-DRE-M-517-1, LR-DRE-M-517-2, LR-DRE-M-517-3, and LR-DRE-M-974.

Quad Cities Station:
LR-QDC-M-22-3, LR-QDC-M-25-2, LR-QDC-M-69-3, LR-QDC-M-72-2, LR-QDC-M-813-1, LR-QDC-M-813-2, LR-QDC-M-813-3, LR-QDC-M-943-1, LR-QDC-M-943-2, and LR-QDC-M-943-3.

System Intended Functions

Provide emergency AC power - provides independent power source to assure safe reactor shutdown under emergency conditions on a total loss of offsite power concurrent with a design basis accident.

Credited in regulated event(s) – credited in support of fire protection (10CFR50.48). The system contains components that are relied upon for compliance with 10 CFR 50.49, (EQ).

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.3-6 Component Groups Requiring Aging Management Review - Emergency Diesel Generator and Auxiliaries

Component Group	Component Intended Function	Aging Management Ref
Air Accumulator Vessels (includes tanks)	Pressure Boundary	3.3.1.5, 3.3.2.6
Closure Bolting	Pressure Boundary	3.3.1.22, 3.3.2.18
Debris Screens (Quad Cities only)	Filter	3.3.2.59
Doors, Closure Bolts, Equip Frames (includes dampers, duct, and housings)	Pressure Boundary	3.3.1.5
Duct Fittings, Hinges, Latches (includes anchors, bolts, and fasteners)	Pressure Boundary	3.3.2.49
Filters/Strainers	Pressure Boundary	3.3.1.5, 3.3.2.29, 3.3.2.55, 3.3.2.58, 3.3.2.60
Filters/Strainers	Filter	3.3.1.5, 3.3.2.55, 3.3.2.58, 3.3.2.60
Flex Collars, Doors and Damper Seals	Pressure Boundary	3.3.1.2
Flexible Hoses	Pressure Boundary	3.3.2.65, 3.3.2.66
Heat Exchangers (includes coolers)	Pressure Boundary	3.3.1.5, 3.3.2.34, 3.3.2.94, 3.3.2.95, 3.3.2.100, 3.3.2.101, 3.3.2.108, 3.3.2.109, 3.3.2.110, 3.3.2.111
Heat Exchangers (includes coolers)	Heat Transfer	3.3.2.93, 3.3.2.96, 3.3.2.99
Lubricators	Pressure Boundary	3.3.1.5

Table 2.3.3-6 Component Groups Requiring Aging Management Review - Emergency Diesel Generator and Auxiliaries (Continued)

Component Group	Component Intended Function	Aging Management Ref
Mufflers	Pressure Boundary	3.3.1.5, 3.3.2.29
NSR Vents or Drains, Piping and Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.2.130
Piping and Fittings (Includes dryers, heaters and tubing)	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.21, 3.3.2.23, 3.3.2.29, 3.3.2.132, 3.3.2.133, 3.3.2.134, 3.3.2.137, 3.3.2.139, 3.3.2.147, 3.3.2.159, 3.3.2.300
Piping and Fittings (attached support)	Structural Integrity (attached)	3.3.1.5, 3.3.1.7, 3.3.1.13, 3.3.2.23, 3.3.2.139
Pumps (includes governors)	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.174, 3.3.2.175, 3.3.2.177, 3.3.2.300
Restricting Orifices	Pressure Boundary	3.3.1.5, 3.3.2.40, 3.3.2.187
Restricting Orifices	Throttle	3.3.2.187
Sight Glasses	Pressure Boundary	3.3.2.36, 3.3.2.200, 3.3.2.202
Tanks	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.211
Thermowells	Pressure Boundary	3.3.1.5, 3.3.2.23, 3.3.2.40, 3.3.2.220, 3.3.2.221, 3.3.2.224, 3.3.2.225
Tubes (Quad Cities only) (includes heat exchangers)	Heat Transfer	3.3.1.15
Tubing	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.2.34, 3.3.2.40, 3.3.2.232, 3.3.2.233, 3.3.2.235, 3.3.2.236, 3.3.2.237, 3.3.2.240, 3.3.2.241, 3.3.2.245, 3.3.2.249, 3.3.2.250
Tubing (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.2.40, 3.3.2.245, 3.3.2.250
Turbochargers	Pressure Boundary	3.3.2.256, 3.3.2.300
Valves	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.23, 3.3.2.40, 3.3.2.258, 3.3.2.260, 3.3.2.261, 3.3.2.262, 3.3.2.267, 3.3.2.269, 3.3.2.275, 3.3.2.286, 3.3.2.290, 3.3.2.291, 3.3.2.300
Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.5, 3.3.1.7, 3.3.2.269

Aging management review results for the emergency diesel generator and auxiliaries are provided in Section 3.3.

2.3.3.7 HVAC - Main Control Room

System Purpose

The control room HVAC system provides: (1) a suitable environment during normal operation for the control room operators and equipment, (2) a habitable environment after a design basis accident in which the operators can safely shutdown and maintain the plant for the duration of the accident, (3) an environment from which the operators can safely occupy and operate the plant during an onsite or offsite toxic chemical accident, and (4) fire protection to the operators with fire dampers, for fires outside the control room, and a smoke purge function mode for fires inside the control room.

System Operation

The control room HVAC system consists of the train A HVAC system (a multizone unit), the train B HVAC system (a single zone unit), the emergency air filtration unit (AFU), the toxic gas analyzer system, and the smoke detection system. Each system train includes manual and air-operated dampers, an air handling unit (AHU), and distribution air ducts to and from the control room (including the cable spreading room and the auxiliary electric equipment room for Quad Cities) and the train B HVAC equipment room. The train A HVAC system also includes an exhaust fan and the smoke detection system. The train B HVAC system also includes the AFU, associated booster fans, a refrigeration condensing unit (RCU), the toxic gas analyzer system, and associated valves, instrumentation and controls. A sprinkler system is also provided to the AFU from the fire protection system (evaluated with the fire protection system). The train A AHU is the primary unit to provide the temperature control and air distribution for the control room. The train B AHU serves as a backup to the train A AHU and provides the source of cooling for the control room in the event the train A AHU is lost. During normal operation, outside air is mixed with return air to maintain the control room emergency zone at a positive pressure. In the event of a design basis accident, the normal outside air intakes are isolated, and the AFU provides filtered makeup air to maintain pressurization of the control room emergency zone. In the event smoke is detected in the intake air ducts, the train A HVAC system outdoor air intake is automatically isolated and the system air is recirculated. In the event smoke is detected in the return air ducts, the train A HVAC system is automatically switched to the purge mode and the system is supplied with 100% outdoor air. The train B RCU is normally cooled with service water (evaluated with the service water system). However, upon loss of service water, the RCU may be cooled by containment cooling service water (evaluated with the containment cooling service water system) at Dresden and by residual heat removal service water (evaluated with the residual heat removal service water system) at Quad Cities. The toxic gas analyzer (at Quad Cities) continuously monitors the outside air intake of the operating AHU, and automatically isolates outdoor air intakes in the event specified toxic gas limits are approached. The toxic gas analyzer at Dresden has been determined to not be needed, and has been abandoned in place. The outdoor air intakes can still be manually isolated, if required.

System Evaluation Boundary

The train A control room HVAC system evaluation boundary starts with the outside air intake isolation damper, includes the train A AHU, distribution air ducts to the control

room and the train B HVAC equipment room, and associated dampers. The boundary continues through the rooms' exhaust ducts, dampers, and the exhaust fan, to the exhaust isolation dampers, and the train A AHU return ducts and isolation damper. The boundary also includes the train B control room HVAC system which starts with the outside air intake isolation damper, continues through the AFU, associated booster fans, the train B AHU, and the distribution ducts to the control room and the train B HVAC equipment room. The evaluation boundary also includes the RCU, the AFU sprinkler system and toxic gas analyzer for the train B AHU and associated valves, instrumentation and controls. The toxic gas analyzer at Dresden has been removed from service, but its components remain in place. Thus it is included in the evaluation boundary. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the control room HVAC system boundary.

UFSAR References

Dresden Station UFSAR Section(s): 6.4 and 9.4.1

Quad Cities Station UFSAR Section(s): 6.4 and 9.4.1

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-273-1, LR-DRE-M-273-2, LR-DRE-M-1013-2, and LR-DRE-M-3121.

Quad Cities Station:

LR-QDC-M-725-1, LR-QDC-M-725-2, and LR-QDC-M-725-3.

System Intended Functions

Isolation and filtration - provides isolation and filtration for the control room during accident conditions.

Environmental control - provides habitable environment for the control room during normal, abnormal, accident, and post-accident conditions.

Credited in regulated event(s) – demonstrates compliance with NRC regulations regarding SBO (10CFR50.63) and fire protection (10CFR50.48).

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.3-7 Component Groups Requiring Aging Management Review – HVAC – Main Control Room

Component Group	Component Intended Function	Aging Management Ref
Air Handlers Heating/Cooling (CR HVAC)	Pressure Boundary	3.3.1.5, 3.3.2.11
Air Handlers Heating/Cooling (CR HVAC)	Heat Transfer	3.3.2.10
Dampeners (Quad Cities only)	Pressure Boundary	3.3.2.23, 3.3.2.46
Debris Screens	Filter	3.3.2.59
Diffusers	Pressure Boundary	3.3.1.5, 3.3.2.48
Doors, Closure Bolts, Equip Frames (includes dampers, duct, housings, and silencers)	Pressure Boundary	3.3.1.5
Duct Fittings, Hinges, Latches	Pressure Boundary	3.3.2.49
Filters/Strainers	Pressure Boundary	3.3.1.5, 3.3.2.53
Filters/Strainers	Filter	3.3.2.53
Flex Collars, Doors and Damper Seals (includes duct)	Pressure Boundary	3.3.1.2
Flow Elements (Dresden only)	Throttle	3.3.2.73
Heat Exchangers	Pressure Boundary	3.3.1.5, 3.3.2.84, 3.3.2.85
Heat Exchangers	Heat Transfer	3.3.2.82
Housings and Supports	Pressure Boundary	3.3.1.5, 3.3.2.40
NSR Vents or Drains, Piping and Valves (attached support) (Dresden only)	Structural Integrity (attached)	3.3.2.130
Piping and Fittings	Pressure Boundary	3.3.1.5, 3.3.2.34, 3.3.2.145, 3.3.2.152
Piping and Fittings (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.5, 3.3.1.15, 3.3.2.34, 3.3.2.152
Seals	Pressure Boundary	3.3.1.2
Sight Glasses	Pressure Boundary	3.3.2.34, 3.3.2.196, 3.3.2.198
Tubing (Dresden only)	Pressure Boundary	3.3.2.244

Table 2.3.3-7 Component Groups Requiring Aging Management Review – HVAC – Main Control Room (Continued)

Component Group	Component Intended Function	Aging Management Ref
Valves (includes dampers)	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.2.23, 3.3.2.37, 3.3.2.40, 3.3.2.260, 3.3.2.264, 3.3.2.279, 3.3.2.280, 3.3.2.284, 3.3.2.293, 3.3.2.300

Aging management review results for the HVAC – main control room system are provided in Section 3.3.

2.3.3.8 HVAC – Reactor Building

System Purpose

The reactor building ventilation system provides conditioned air to the reactor building and primary containment structures to remove the heat remaining from the primary process and operating equipment, minimize the level of airborne contaminants, make the plant atmosphere adequate to support the presence of personnel and maintain the reactor building at a negative pressure to minimize the release of radioactive contaminants to the environment. Emergency isolation dampers are provided to isolate the reactor building in the event of high radiation. The reactor building ventilation system also removes exhaust air from the drywell and suppression chamber purge system when the reactor is shutdown and/or whenever primary containment access is required.

System Operation

Using supply fans, outside air is drawn into the reactor building ventilation system, filtered, tempered and discharged into the supply system ducts. The supply air ducts distribute air throughout the building via air registers. The system also uses two emergency isolation dampers in series in the main supply duct upstream of all branch ducts. The exhaust fans draw building air into exhaust vents located throughout the building and discharge it through the reactor building vent stack. The normal ventilation exhaust duct for the spent fuel, reactor cavity and dryer/separator pool area is arranged to take suction through multiple inlets around the periphery of the pools above the water line. Two emergency isolation dampers are installed in series in the main exhaust duct upstream of the exhaust fan air intake and downstream of any branch connections to the exhaust duct. The reactor building ventilation system also removes exhaust air from the drywell and suppression chamber purge system when the reactor is shutdown for maintenance or whenever primary containment access is required.

System Evaluation Boundary

The reactor building ventilation system evaluation boundary begins with an air filter, steam heating coil, air wash/evaporative cooler (Quad Cities only, but no longer in use), chilled water coil (Dresden only), and three supply fans. Outside air is drawn into the reactor building ventilation system through the aforementioned components, filtered, temperature controlled and discharged into the supply system ducts. The supply air ducts distribute the air through the building to the air registers. In addition, the system uses two emergency isolation dampers, installed in series, in the main supply duct. Three exhaust fans draw building air into exhaust vents located throughout the building and discharge it through the reactor building vent stack. The normal ventilation exhaust duct for the spent fuel, reactor cavity and dryer/separator pool area is arranged to take suction through multiple inlets around the periphery of the pools above the water line. Two more emergency isolation dampers are installed in series in the main exhaust duct upstream of the exhaust fan air intake and downstream of any branch connections to the exhaust duct. The drywell and suppression chamber purge system is used for purging, deinerting and ventilating the primary containment. This system consists of two prefilters, two absolute filters and two exhaust fans. Air is drawn through the system through associated piping connected to the drywell and suppression chamber and

discharged to the reactor building main exhaust duct. At Quad Cities, the parts of the RB ventilation system that are within the scope of the rule include (a) the emergency isolation dampers in the main supply duct and main exhaust duct, and (b) the fire damper in the exhaust duct from the main steam pipe area in the turbine building. The remaining parts of the system are not within the scope of the Rule.

At Dresden, all associated piping, components, and instrumentation contained within the flow paths and systems described above are a requirement for design basis as described in Section 15.7.3 of the Dresden UFSAR (Design basis fuel handling accident during refueling) and are included in the RB ventilation system evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): 6.2.3, 9.4.2, 9.4.5, 9.4.6

Quad Cities Station UFSAR Section(s): 6.2.3, 9.4.2, 9.4.7

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-269-1, LR-DRE-M-269-2, LR-DRE-M-269-3, LR-DRE-M-422-1, LR-DRE-M-529-1, LR-DRE-M-529-2, LR-DRE-M-529-3 and LR-DRE-M-973

Quad Cities Station:

LR-QDC-M-371, LR-QDC-M-373-1 and LR-QDC-M-457

System Intended Functions

Support ESF function(s) – provides instrumentation to trip automatically on a secondary containment isolation signal.

Containment isolation – isolation dampers help ensure that adequate secondary containment is maintained during and after an accident by minimizing potential paths to the environment.

Credited in regulated event(s) – fire dampers provide isolation to prevent spread of a fire credited in mitigation of the Appendix R fire.

Flow path – (Dresden only) conducts effluent directly to the reactor building stack or the standby gas treatment system.

Pressure control – (Dresden only) maintains a negative pressure of at least ¼" H_2O between the reactor building and the environment.

Radioactivity control – (Dresden only) collects radioactivity released from a fuel handling accident in the openings located on the periphery of the refueling pools, and provide timely removal to the reactor building exhaust plenum providing sufficient level to isolate secondary containment.

Component Groups Requiring Aging Management Review

Table 2.3.3-8 Component Groups Requiring Aging Management Review – HVAC – Reactor Building

Component Group	Component Intended Function	Aging Management Ref
Debris Screens (Dresden only)	Filter	3.3.2.59
Doors, Closure Bolts, Equip Frames (includes dampers, duct, housings, piping, and valves)	Pressure Boundary	3.3.1.5
Duct Fittings, Hinges, Latches	Pressure Boundary	3.3.2.49
Filters/Strainers (Dresden only)	Pressure Boundary	3.3.2.23, 3.3.2.52
Flex Collars, Doors, Duct, and Damper Seals (Dresden only)	Pressure Boundary	3.3.1.2
Housings and Supports (Dresden only)	Pressure Boundary	3.3.1.5
Piping and Fittings (Dresden only)	Pressure Boundary	3.3.2.166
Seals (Dresden only)	Pressure Boundary	3.3.1.2
Tubing	Pressure Boundary	3.3.2.34, 3.3.2.40, 3.3.2.242, 3.3.2.251
Valves (Dresden only) (includes dampers)	Pressure Boundary	3.3.1.5, 3.3.2.23, 3.3.2.40, 3.3.2.262, 3.3.2.273, 3.3.2.295

Aging management review results for the HVAC – Reactor Building is provided in Section 3.3.

2.3.3.9 ECCS Corner Room HVAC

System Purpose

The ECCS corner room HVAC room coolers maintain the compartment temperature below the qualification temperature of the components that are required for safe shutdown of the plant. Each of the rooms has a water-cooled heat exchanger and fan unit that functions as a room cooler.

System Operation

At Dresden, the ECCS corner room HVAC includes the HPCI and LPCI room coolers. The core spray pumps are located in the LPCI rooms. There are two LPCI room coolers and one HPCI room cooler per unit. During normal plant operating conditions, the cooling water for the room coolers is provided by the service water system. For Dresden, the containment cooling service water system provides backup cooling water to all three room coolers. At Quad Cities, the ECCS corner room HVAC includes one HPCI, two core spray, and two RHR room coolers per unit. The Quad Cities Unit 1 and Unit 2 DG cooling water pumps (evaluated with the diesel generator service water system) provide cooling water to the room coolers in their respective units. The service water system can also provide a non-safety related alternate supply of cooling water to the HPCI room emergency coolers.

System Evaluation Boundary

The ECCS corner room HVAC evaluation boundary for room cooling begins at the cooling water inlet and ends at the discharge nozzle for each individual room cooler. The ECCS corner room coolers include the following: At Dresden, the LPCI room coolers and HPCI room cooler. At Quad Cities, the core spray room coolers, RHR room coolers and HPCI room cooler. Each room cooler is fin and coil type and is provided with a dedicated fan, enclosure and cooling coil. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the ECCS corner room HVAC system evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): 9.2.1, 9.2.2, 9.4.6

Quad Cities Station UFSAR Section(s): 6.3.2, 9.2.2, 9.5.5

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-22, LR-DRE-M-269-2, LR-DRE-M-355, LR-DRE-M-529-2 and LR-DRE-M-973

Quad Cities Station:

LR-QDC-M-22-5 and LR-QDC-M-69-5

System Intended Functions

Environmental control- provides ventilation to maintain an acceptable environment to support proper ECCS pump operation during normal plant operating conditions and following design basis events.

Credited in regulated event(s) – (Dresden) The system contains components that are relied upon to demonstrate compliance with 10 CFR Part 50.49 (EQ).

Credited in regulated event(s) – (Quad Cities) provides ventilation and cooling credited in mitigation of the Appendix R fire. The system also contains components that are relied upon to demonstrate compliance with 10 CFR Part 50.49 (EQ).

Component Groups Requiring Aging Management Review

Table 2.3.3-9 Component Groups Requiring Aging Management Review – ECCS Corner Room HVAC

Component Group	Component Intended Function	Aging Management Ref
Air Handlers Heating/Cooling (Aux&RW HVAC)	Pressure Boundary	3.3.2.8, 3.3.2.9, 3.3.2.21
Air Handlers Heating/Cooling (Aux&RW HVAC)	Heat Transfer	3.3.2.7
Ducts & Fittings, Access Doors, Closure Bolts, Equip Frames	Pressure Boundary	3.3.1.5

Aging management review results for the ECCS corner room HVAC is provided in Section 3.3.

2.3.3.10 Station Blackout Building HVAC

System Purpose

The SBO HVAC system maintains the SBO diesel generator and support equipment ambient temperatures within an acceptable range for diesel readiness, provides annunciation of temperature abnormalities, reacts to fire alarm actuation, and removes hydrogen gas and diesel fumes from the building.

System Operation

The station blackout building HVAC system provides heating and ventilation for the SBO diesel generator rooms, the electrical equipment rooms, and the battery rooms. The ventilation system for each diesel generator is capable of maintaining the design room conditions, with the diesel generators running at full load and maintaining design room conditions in winter with the SBO diesel generators in the standby mode. The ventilation system for each electrical equipment room is capable of maintaining the design room conditions with the diesel generators running at full load. The heating systems for these rooms will maintain room conditions in winter. The ventilation systems for the battery rooms have an air-cooled condensing unit, an air handling unit, and an electric heater capable of maintaining the battery room at nominal design conditions. The exhaust fans in the battery rooms and the day tank rooms are interlocked with the fire system to shut down on fire alarm actuation.

System Evaluation Boundary

Quad Cities

The SBO building HVAC system starts at the outside air intake dampers to the electrical equipment and diesel generator rooms. It includes all the HVAC components in the electrical equipment, diesel generator, battery and day tank rooms, plus a limited amount of ductwork associated with the battery and day tank rooms. Equipment and diesel generator room exhaust fans equipped with discharge dampers draw air out of the rooms, allowing outside air to enter through the intake dampers and filters. Separate exhaust fans draw air from the day tank and battery rooms, and discharge through ductwork to the outside. Intake louvers between the day tank room and the diesel generator room, and between the battery room and the electrical equipment room, allow air to enter the rooms. Additionally, electric heaters heat the air spaces within the electrical equipment and diesel generator rooms, and an air handling unit and associated air-cooled condenser cool the battery room when needed.

Dresden

The SBO building HVAC system starts at the outside air intake dampers and intake ductwork to the electrical equipment and diesel generator rooms. It includes all the ductwork and HVAC components in the electrical equipment, diesel generator, and day tank rooms. The system continues through fans that supply the building. The day tank rooms have independent exhaust fans and ductwork within the evaluation boundary. The mechanical/electrical equipment room HVAC supply and exhaust fans, ductwork, dampers and components are also included within the evaluation boundary. The

system ends at the exhaust dampers/ductwork to the outside air. The SBO building structure forms an integral part of the HVAC system (evaluated with the Unit 2/3 SBO Building).

UFSAR References

Dresden Station UFSAR Section(s): 9.5.9

Quad Cities Station UFSAR Section(s): 8.3.1.9

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-4356-1, LR-DRE-M-4356-2, LR-DRE-M-4356-3, LR-DRE-M-4356-4 and LR-DRE-M-4356-5

Quad Cities Station:

LR-QDC-M-3033-1 and LR-QDC-M-3033-2

System Intended Functions

Environmental control – supports SBO diesel generators in providing AC power during a loss of offsite power and station blackout by supplying the necessary HVAC to required SBO diesel generators and auxiliaries, i.e., equipment rooms, battery rooms, and day tank rooms.

Credited in regulated event(s) – (Quad Cities only) system functions to prevent spread of a fire credited in mitigation of the Appendix R fire.

Component Groups Requiring Aging Management Review

Table 2.3.3-10Component Groups Requiring Aging Management Review – SBO Building HVAC

Component Group	Component Intended Function	Aging Management Ref
Air Handlers Heating/Cooling (DGB HVAC) (Quad Cities only)	Pressure Boundary	3.3.2.14, 3.3.2.21
Air Handlers Heating/Cooling (DGB HVAC) (Quad Cities only)	Heat Transfer	3.3.2.13
Debris Screens	Filter	3.3.2.59
Doors, Closure Bolts, Equip Frames	Pressure Boundary	3.3.1.5
Duct Fittings, Hinges, Latches	Pressure Boundary	3.3.2.49
Flex Collars, Doors and Damper Seals	Pressure Boundary	3.3.1.2
Flow Elements (Dresden only)	Pressure Boundary	3.3.2.40, 3.3.2.73
Tubing	Pressure Boundary	3.3.2.34, 3.3.2.40, 3.3.2.244, 3.3.2.254

Aging management review results for the SBO Building HVAC are provided in Section 3.3.

2.3.3.11 Station Blackout System (diesels and auxiliaries)

System Purpose

Station blackout (SBO) diesel generators and auxiliaries provide an additional, independent AC power source as a backup to the emergency diesel generators.

System Operation

The system consists of two diesel generator (DG) sets. Each SBO DG set is an assembly consisting of two diesel engines and a generator arranged in tandem. Each assembly is located in a separate diesel generator room. Included in this assembly are directly attached piping, valves, manifolds, starters, turbochargers, internal coolers, instrumentation, and other equipment. The diesel engines are provided with fuel oil from the SBO diesel oil system. Each diesel generator room has an independent ventilation system (evaluated with the station blackout building HVAC system), which maintains the associated room at or below equipment temperature limits. Each generator is connectable to the safe shutdown equipment on one nuclear unit and can also be connected to the opposite unit via the 4 kV cross-tie. The SBO DGs must be manually started and manually connected to the appropriate safe shutdown loads. Under conditions of total or partial loss of offsite power, the SBO DG can be remotely or locally started, and dead bus connections can be made to allow the SBO DGs to provide power to safe shutdown plant loads. The auxiliary systems associated with the station blackout system include the SBO DG engine jacket water system, the SBO engine exhaust/combustion air system, the SBO DG engine air start system, the SBO DG engine lube oil system, and the SBO DG fuel oil system.

System Evaluation Boundary

SBO diesel generators and auxiliaries system evaluation boundary starts with the two diesel generator sets and continues with the auxiliary systems. The auxiliary systems included in the station blackout system evaluation boundary are the SBO DG engine jacket water system, SBO engine exhaust/combustion air system, SBO DG engine air start system, SBO DG engine lube oil system, and SBO DG fuel oil system . All associated cabling, piping, components and instrumentation contained within the flow paths and systems described above are included in the station blackout (diesels and auxiliaries) evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): 9.5.9

Quad Cities Station UFSAR Section(s): 8.3.1.9

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-4305, LR-DRE-M-4305A, LR-DRE-M-4305B, LR-DRE-M-4306-1, LR-DRE-M-4306-2, LR-DRE-M-4307, LR-DRE-M-4308,
LR-DRE-M-4308A, LR-DRE-M-4308B, LR-DRE-M-4308C, LR-DRE-M-4308D,

LR-DRE-M-4308E, LR-DRE-M-4308F, LR-DRE-M-4359-1, LR-DRE-M-4359-2, LR-DRE-M-4359-3, LR-DRE-M-4359-4, LR-DRE-M-4360-1, LR-DRE-M-4360-2, LR-DRE-M-4360-3, LR-DRE-M-4360-4, LR-DRE-M-4361-1, LR-DRE-M-4361-2, LR-DRE-M-4361-3 and LR-DRE-M-4361-4

Quad Cities Station:
LR-QDC-M-3028-1, LR-QDC-M-3028-2, LR-QDC-M-3029-1, LR-QDC-M-3029-2, LR-QDC-M-3029-3, LR-QDC-M-3029-4, LR-QDC-M-3031-1, LR-QDC-M-3031-2, LR-QDC-M-3032-1, LR-QDC-M-3032-2, LR-QDC-M-3034-1 and LR-QDC-M-3034-2

System Intended Functions

Credited in regulated event(s) – provides an alternate source of AC electrical power to plant equipment in the event of a station blackout (10 CFR Part 50.63).

Credited in regulated event(s) – (Quad Cities only) provides an alternate power source credited in mitigation of the Appendix R fire.

Component Groups Requiring Aging Management Review

Table 2.3.3-11 Component Groups Requiring Aging Management Review – Station Blackout (diesels and auxiliaries)

Component Group	Component Intended Function	Aging Management Ref
Air Accumulator Vessels	Pressure Boundary	3.3.1.5
Closure Bolting	Pressure Boundary	3.3.1.22, 3.3.2.18
Filters/Strainers	Pressure Boundary	3.3.1.5, 3.3.1.7, 3.3.2.21, 3.3.2.50, 3.3.2.54, 3.3.2.55, 3.3.2.60, 3.3.2.300
Filters/Strainers (includes separators)	Filter	3.3.1.5, 3.3.1.7, 3.3.2.55, 3.3.2.60
Flexible Hoses	Pressure Boundary	3.3.2.64, 3.3.2.66
Flow Elements	Pressure Boundary	3.3.2.40, 3.3.2.70
Heat Exchangers (includes coolers and heat exchangers)	Pressure Boundary	3.3.1.5, 3.3.2.21, 3.3.2.29, 3.3.2.102, 3.3.2.103, 3.3.2.104, 3.3.2.105, 3.3.2.106, 3.3.2.107
Heat Exchangers (includes coolers and heat exchangers)	Heat Transfer	3.3.2.97, 3.3.2.98
Lubricators	Pressure Boundary	3.3.1.5, 3.3.2.21, 3.3.2.126, 3.3.2.127
Muffiers	Pressure Boundary	3.3.1.5, 3.3.2.29

Table 2.3.3-11 Component Groups Requiring Aging Management Review – Station Blackout (diesels and auxiliaries) (Continued)

Component Group	Component Intended Function	Aging Management Ref
Piping and Fittings (includes heaters, orifices, and thermowells)	Pressure Boundary	3.3.1.5, 3.3.1.7, 3.3.1.13, 3.3.2.23, 3.3.2.29, 3.3.2.34, 3.3.2.38, 3.3.2.40, 3.3.2.135, 3.3.2.136, 3.3.2.139, 3.3.2.148, 3.3.2.149, 3.3.2.151, 3.3.2.155, 3.3.2.156, 3.3.2.160, 3.3.2.162, 3.3.2.163, 3.3.2.300
Piping and Fittings (includes restricting orifices)	Throttle	3.3.1.5
Pumps	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.175, 3.3.2.176, 3.3.2.177, 3.3.2.300
Pumps (Dresden only)	Throttle	3.3.1.13
Restricting Orifices	Pressure Boundary	3.3.1.5, 3.3.2.40, 3.3.2.190, 3.3.2.191, 3.3.2.192
Restricting Orifices	Throttle	3.3.2.190, 3.3.2.192
Sight Glasses	Pressure Boundary	3.3.2.36, 3.3.2.200
Tanks	Pressure Boundary	3.3.1.5, 3.3.1.7, 3.3.1.13
Thermowells	Pressure Boundary	3.3.1.5, 3.3.1.7, 3.3.2.23, 3.3.2.40, 3.3.2.222, 3.3.2.224, 3.3.2.226
Tubing	Pressure Boundary	3.3.2.34, 3.3.2.40, 3.3.2.238, 3.3.2.246, 3.3.2.247, 3.3.2.249
Turbochargers	Pressure Boundary	3.3.2.256, 3.3.2.300
Valves	Pressure Boundary	3.3.1.5, 3.3.1.7, 3.3.1.13, 3.3.2.23, 3.3.2.40, 3.3.2.261, 3.3.2.269, 3.3.2.287, 3.3.2.288, 3.3.2.290, 3.3.2.291

Aging management review results for the station blackout system (diesels and auxiliaries) are provided in Section 3.3.

2.3.3.12 Diesel Generator Cooling Water System

System Purpose

The diesel generator cooling water (DGCW) system provides cooling water to each of the three emergency diesel generators. In addition, the system provides cooling water for the room coolers of the high pressure coolant injection (HPCI) room, residual heat removal (RHR) rooms, core spray rooms and diesel generator cooling water pump cubicle at Quad Cities, and provides an alternate water supply for the containment cooling service water (CCSW) keep fill system at Dresden.

System Operation

At Dresden, three motor driven submersible pumps take suction in the crib-house and provide cooling water to the DGCW heat exchangers (evaluated with emergency diesel generator and Auxiliaries system). The DGCW pumps may be used as the alternate safety related water supply to the CCSW keep fill system (evaluated with the service water system) which is normally supplied by service water (evaluated with the service water system). A connection is provided with cross connection piping between Unit 2 and Unit 3 as well. The DGCW return water is then routed back to the service water discharge pipe (evaluated with the service water system).

At Quad Cities, the DGCW pumps, which are located in separate RHR service water pump vaults, take suction from the RHR service water inlet header (evaluated with the RHR service water system). These pumps provide cooling water to the DG engine heat exchangers (evaluated with emergency diesel generator and auxiliaries system), to the HPCI, RHR and core spray room coolers (evaluated with ECCS corner room HVAC system), to the diesel generator cooling water pump cubicle cooler, and ultimately discharge into the service water discharge pipe (evaluated with service water system).

System Evaluation Boundary

At Dresden, the DGCW system starts at the pump suction piping in the crib house. Three motor driven submersible pumps provide cooling water to the DGCW heat exchangers. A connection is provided to the CCSW keep fill system by the emergency core cooling system (ECCS) room cooler cross-tie header to backup the normal supply of service water and act as an alternate safety related water supply. Cross connection piping between Unit 2 and Unit 3 exists. The return water is then routed to the service water system where the system ends.

At Quad Cities, the DGCW system starts at the DGCW pumps which are located in a separate RHR service water pump vault and take suction from the RHR service water inlet header. These pumps provide cooling water to the heat exchangers of DG engines and to the room coolers of the HPCI room, the RHR rooms, the core spray rooms, and the diesel generator cooling water pump cubicle, and ultimately discharge into the service water discharge pipe.

UFSAR References

Dresden Station UFSAR Section(s): 7.4.2, 9.5.5

Quad Cities Station UFSAR Section(s): 3.4.1.2, 6.3.2, 9.5.5

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-22, LR-DRE-M-29-2, LR-DRE-M-36, LR-DRE-M-355, LR-DRE-M-360-2, LR-DRE-M-517-1, LR-DRE-M-517-2, LR-DRE-M-517-3

Quad Cities Station:
LR-QDC-M-22-1, LR-QDC-M-22-3, LR-QDC-M-22-5, LR-QDC-M-69-1, LR-QDC-M-69-3, LR-QDC-M-69-5

System Intended Functions

Supports emergency supply of AC power – provides cooling water to emergency diesel generator heat exchangers and engine jacket cooling.

Support ESF function(s) – (Quad Cities only) provides cooling water to ECCS room coolers to ensure proper environment for ECCS pump operation.

Structural support – non-safety related portions of this system provide structural support to attached safety related piping.

Credited in regulated event(s) – provides cooling water to safe shutdown equipment credited in mitigation of the Appendix R fire.

Component Groups Requiring Aging Management Review

Table 2.3.3-12Component Groups Requiring Aging Management Review –Diesel Generator Cooling Water System

Component Group	Component Intended Function	Aging Management Ref
Air Handlers Heating/Cooling (DGB HVAC) (Quad Cities only) (includes DGCW pump cubicle coolers)	Pressure Boundary	3.3.2.15, 3.3.2.16
Air Handlers Heating/Cooling (DGB HVAC) (Quad Cities only) (includes DGCW pump cubicle coolers)	Heat Transfer	3.3.2.12
Closure Bolting	Pressure Boundary	3.3.1.22, 3.3.2.18
Doors, Closure Bolts, Equip Frames (Quad Cities only)	Pressure Boundary	3.3.1.5
NSR Vents or Drains, Piping and Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.2.130
Orifice Bodies	Pressure Boundary	3.3.1.15, 3.3.2.40, 3.3.2.41
Orifice Bodies	Throttle	3.3.1.15
Orifice Bodies (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.15, 3.3.2.40

Table 2.3.3-12Component Groups Requiring Aging Management Review –Diesel Generator Cooling Water System (Continued)

Component Group	Component Intended Function	Aging Management Ref
Piping and Fittings (includes flow elements)	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.2.26, 3.3.2.45, 3.3.2.141, 3.3.2.169
Piping and Fittings (attached support)	Structural Integrity (attached)	3.3.1.5, 3.3.1.15
Pulsation Dampeners (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.15, 3.3.2.41
Pumps	Pressure Boundary	3.3.1.15, 3.3.2.26, 3.3.2.173, 3.3.2.183, 3.3.2.184
Strainer Bodies (Dresden only)	Pressure Boundary	3.3.2.31, 3.3.2.208
Strainer Screens (Dresden only)	Filter	3.3.1.15
Thermowells	Pressure Boundary	3.3.1.15, 3.3.2.26
Tubing	Pressure Boundary	3.3.1.15, 3.3.2.40, 3.3.2.41
Valves	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.1.27, 3.3.2.23, 3.3.2.24, 3.3.2.26, 3.3.2.31, 3.3.2.40, 3.3.2.41, 3.3.2.45, 3.3.2.279, 3.3.2.280, 3.3.2.298, 3.3.2.300
Valves (attached support)	Structural Integrity (attached)	3.3.1.15, 3.3.1.27, 3.3.2.23, 3.3.2.24, 3.3.2.40, 3.3.2.41, 3.3.2.279, 3.3.2.280, 3.3.2.300

Aging management review results for the diesel generator cooling water system are provided in Section 3.3.

2.3.3.13 Diesel Fuel Oil System

System Purpose

The diesel fuel oil system stores and transfers diesel fuel oil for the emergency diesel generators (EDG's), the station blackout (SBO) diesel generators (DG's), the diesel fire pumps, and (at Dresden only) the isolation condenser makeup pump diesels.

System Operation

The diesel fuel oil system consists of tanks, pumps, filters, strainers, and associated piping, valves, instrumentation and controls necessary to provide fuel oil to the EDG's (evaluated with the emergency diesel generator system), SBO DG's (evaluated with the station blackout diesels and auxiliaries), fire pump diesels (evaluated with the fire protection system), and the isolation condenser makeup pump diesels at Dresden (evaluated with the isolation condenser system). A separate fuel oil storage and transfer system is provided for each EDG. Each storage and transfer system includes a fuel oil storage tank and a fuel oil day tank. Fuel is transferred from the fuel oil storage tank to the fuel oil day tank by the diesel oil transfer pump. Transfer is accomplished automatically by level switches on the day tank. During EDG start up operations, fuel from the fuel oil day tank is drawn through the strainer via the fuel oil priming pump. Once started and running, fuel from the fuel oil day tank is drawn through the engine-driven fuel oil pump and discharged through the duplex fuel oil filter and on to the diesel engine injectors. Any excess fuel is returned to the fuel oil day tank. At Dresden, the Unit 2 EDG fuel oil transfer system also supplies fuel oil to the isolation condenser makeup pump fuel oil day tanks, and the Unit 3 EDG fuel oil transfer system also supplies fuel oil to the Unit 2/3 diesel fire pump day tank. Each operation requires opening a manual isolation valve. At Quad Cities, the Unit 1 and Unit 2 EDG fuel oil transfer systems also supply fuel oil for the diesel fire pump day tanks. Either the Unit 1 or Unit 2 EDG fuel oil transfer pump can be aligned to provide manual fill capability to the diesel fire pump day tanks.

System Evaluation Boundary

The evaluation boundary for each EDG fuel oil system begins with the diesel fuel oil storage tank, passes through the transfer pump to the associated day tank, through the diesel fuel oil priming and supply pumps, to the piping connections on the diesels and back to the day tank. The boundary also includes the day tanks for the diesel fire pump diesels and the isolation condenser makeup pump diesels (at Dresden) and all associated fuel oil system piping. Also included is the 150,000 gallon storage tank for the heating boiler system at Dresden (evaluated with the plant heating system) and supporting components. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the diesel fuel oil system boundary.

UFSAR References

Dresden Station UFSAR Section(s): 9.5.4

Quad Cities UFSAR Section(s): 9.5.4

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-41-1, LR-DRE-M-41-2, LR-DRE-M-518-1, LR-DRE-M-518-2, LR-DRE-M-518-3, LR-DRE-M-4204.

Quad Cities Station:
LR-QDC-29-1 and LR-QDC-29-2.

System Intended Functions

Support ESF function(s) - stores and provides a source of clean diesel fuel oil to the emergency diesel generators which supply on-site AC power to ESF systems.

Credited in regulated events - stores and provides oil to the diesel fire pump (10CFR50.48) and the isolation condenser system (at Dresden only) diesel.

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.3-13Component Groups Requiring Aging Management Review - Diesel Fuel Oil System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22, 3.3.2.18
Filters/Strainers	Pressure Boundary	3.3.1.5, 3.3.1.7, 3.3.1.20, 3.3.2.21, 3.3.2.50, 3.3.2.54, 3.3.2.300
Filters/Strainers	Filter	3.3.1.7, 3.3.1.20
Flame Arrestors	Fire Barrier	3.3.1.5
Piping and Fittings	Pressure Boundary	3.3.1.5, 3.3.1.7, 3.3.2.29, 3.3.2.139
Piping and Fittings (attached support)	Structural Integrity (attached)	3.3.1.5, 3.3.1.7
Pumps	Pressure Boundary	3.3.1.5, 3.3.1.7, 3.3.2.176, 3.3.2.300
Restricting Orifices (Quad Cities only)	Pressure Boundary	3.3.2.40, 3.3.2.191
Sight Glasses	Pressure Boundary	3.3.2.36, 3.3.2.201
Tanks	Pressure Boundary	3.3.1.5, 3.3.1.7, 3.3.1.20, 3.3.2.215, 3.3.2.217, 3.3.2.218
Tubing	Pressure Boundary	3.3.2.40, 3.3.2.247
Valves	Pressure Boundary	3.3.1.5, 3.3.1.7, 3.3.1.20, 3.3.2.40, 3.3.2.259, 3.3.2.288, 3.3.2.300
Valves (attached support)	Structural Integrity (attached)	3.3.1.5, 3.3.1.7, 3.3.1.20

Aging management review results for the diesel fuel oil system are provided in Section 3.3.

2.3.3.14 Process Sampling System

System Purpose

The process sampling systems/subsystems are used to monitor process parameters from various systems.

System Operation

Samples are taken and analyzed on a continuous and/or laboratory basis. Selected parameters are recorded and/or alarmed. At Dresden, the process sampling systems include nitrogen inerting and drywell oxygen sampling, turbine building and radwaste air particulate sampling, drywell air particulate sampling, and off-gas building air particulate sampling. At Quad Cities, the process sampling systems include the drywell oxygen analysis, the drywell air particulate, and the turbine building particulate sampling. Sample lines that penetrate the primary containment are provided with isolation valves.

System Evaluation Boundary

At Dresden, the evaluation boundary includes the process sampling systems for nitrogen inerting and drywell oxygen sampling, drywell air particulate sampling, turbine building and radwaste air particulate sampling, and off-gas building air particulate sampling. These systems are either unitized or common and include the following subsystems:

- Air sample manifold system (unitized)
- Containment oxygen sampling system (unitized)
- Drywell (primary containment) air particulate sampling system (unitized)
- Turbine building air particulate sampling system (unitized)
- Off-gas filter building air particulate sampling system (common)
- Off-gas sampling system (unitized)
- Turbine building sample panel (unitized)
- Reactor building sampling system (unitized)
- Feedwater particulate sampling system (unitized)
- Radwaste building sampling system (common)
- Off-gas filter building constant air monitoring (common)
- Reactor building crane monitor (common).

At Quad Cities, the evaluation boundary includes the process sampling systems for the drywell oxygen analysis, the drywell air particulate, turbine building particulate sampling and off-gas filter building continuous air monitor. These systems are either unitized or common and include the following subsystems:

- Primary containment sampling systems (unitized)
- Turbine building air particulate sampling (unitized)
- Reactor building vent particulate sampling (unitized)
- Turbine building sample panel (unitized)
- Reactor building sample panel (unitized)
- Off gas sampling (unitized)
- Off gas filter building sample racks (unitized)
- Radwaste building sample system (common)
- Off gas filter building continuous air monitor (common)

UFSAR References

Dresden Station UFSAR Section(s): 1.2.2.4, 5.2.5.6.1, 6.2.1, 7.3.2, 9.3.2

Quad Cities Station UFSAR Section(s): 1.2, 5.2, 6.2, 7.3, 9.3.2,

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-25, LR-DRE-M-178, LR-DRE-M-356, LR-DRE-M-421

Quad Cities Station: LR-QDC-M-461-1, LR-QDC-M-463-1

System Intended Functions

Primary containment isolation – provides isolation of air sampling system piping penetrating primary containment.

Component Groups Requiring Aging Management Review

Table 2.3.3-14 Component Groups Requiring Aging Management Review –Process Sampling System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22
NSR Vents or Drains, Piping and Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.2.130
Piping and Fittings (Quad Cities only)	Pressure Boundary	3.3.1.5, 3.3.2.40, 3.3.2.145, 3.3.2.166
Piping and Fittings (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.2.145
Tubing	Pressure Boundary	3.3.2.34, 3.3.2.40, 3.3.2.42, 3.3.2.244, 3.3.2.254
Valves	Pressure Boundary	3.3.1.5, 3.3.2.23, 3.3.2.40, 3.3.2.264, 3.3.2.273, 3.3.2.293, 3.3.2.295
Valves (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.3.1.5, 3.3.2.40, 3.3.2.266, 3.3.2.285
Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.2.273

Aging management review results for the process sampling system are provided in Section 3.3.

2.3.3.15 Carbon Dioxide System

System Purpose

The carbon dioxide system supplies carbon dioxide for fire suppression and generator purge functions. Carbon dioxide fire suppression systems are installed to quickly detect and suppress fires.

System Operation

The carbon dioxide system consists of a liquid carbon dioxide storage tank with a refrigeration compressor (the Cardox Unit), a steam driven carbon dioxide vaporizer unit, and two headers for fire suppression. The vaporizer unit is supplied with steam from the heating steam system (evaluated with the heating steam system) and provides purge gas to the main generators. One of the fire suppression headers supplies carbon dioxide to manually operated hose reels located throughout the plant. The other supplies the total flooding distribution manifold that services the three emergency diesel generator rooms, the two alternator exciters in the main generator housings and, at Dresden only, the auxiliary equipment room. The system also includes automatic control valves and sensors to provide the automatic initiation of the carbon dioxide fire suppression systems.

System Evaluation Boundary

The carbon dioxide system evaluation boundary begins with the carbon dioxide storage tank and continues through the two headers and automatic control valves to the hose reels and the emergency diesel generator rooms, alternator exciters, and auxiliary equipment room (at Dresden only.) via the flooding distribution manifold. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the carbon dioxide system boundary.

UFSAR References

Dresden Station UFSAR Section(s): None

Quad Cities Station UFSAR Section(s): None

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-42.

Quad Cities Station:

LR-QDC-M-30-1, LR-QDC-M-30-2, and LR-QDC-M-30-3.

System Intended Functions

Credited in regulated event(s) - functions to demonstrate compliance with fire protection requirements of 10 CFR 50.48.

Component Groups Requiring Aging Management Review

Table 2.3.3-15Component Groups Requiring Aging Management Review - Carbon Dioxide System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22
Piping and Fittings (includes thermowells and nozzles)	Pressure Boundary	3.3.1.5, 3.3.2.138
Tanks	Pressure Boundary	3.3.1.5, 3.3.2.212
Tubing	Pressure Boundary	3.3.1.5, 3.3.2.234
Valves (includes nozzles)	Pressure Boundary	3.3.1.5, 3.3.2.23, 3.3.2.260, 3.3.2.268

Aging management review results for carbon dioxide systems are provided in Section 3.3.

2.3.3.16 Service Water System

System Purpose

The service water system provides strained river water to cool various loads in the reactor building, turbine building, and auxiliary building. The service water system is a non-safety related system that provides cooling water to components required for normal operation.

System Operation

The service water system is an open loop system. The system has five pumps, three strainers, and a common distribution header. Two service water pumps are provided per unit and the fifth shared pump is used as a backup. During normal plant operation, four pumps typically operate with the fifth in standby. The system is cross connected between the units. All five pumps take suction from bays within the crib house filled with river water and discharge into a common header. The header supplies the three strainers in parallel, with the strainer output flowing into a common header with branches that supply the loads listed below. The majority of the loads are heat exchangers, coolers, and condensers. Each service water load discharges into one of two standpipes on each unit, which connect to the plant discharge flume. Heat exchangers that can potentially leak radioactively contaminated water into the service water system discharge into the largest of the two discharge standpipes, which is monitored for radioactive contamination by a radiation monitor which will alarm in the control room if high radiation is sensed. The service water loads include the following systems/components :

- Reactor building closed cooling water (RBCCW) heat exchangers
- Turbine building closed cooling water (TBCCW) heat exchangers
- Traveling screen wash spray
- Fire protection system
- Turbine oil coolers
- Reactor recirculation pump M-G set oil coolers
- Generator hydrogen coolers
- Generator stator water coolers
- Standby coolant supply
- Control room air conditioning condensers
- Auxiliary electric equipment room air conditioning condenser (Dresden only)
- Off-gas glycol chillers
- X-area (Dresden)/MSIV room (Quad Cities) coolers (steam tunnel coolers)
- Off-gas filter building sample system heat exchanger
- Control rod drive pump coolers (Dresden only, and only as a backup to TBCCW)

- Radwaste max recycle condensate holding tanks (Dresden only)
- Maximum recycle concentrator condensers (Dresden only)
- Containment cooling service water (CCSW) keep fill (Dresden only)
- Low pressure coolant injection (LPCI) room coolers (normal, non-emergency cooling water supply at Dresden only)
- High pressure coolant injection (HPCI) room coolers (normal, non-emergency cooling water supply)
- 1B instrument air compressor heat exchanger (Quad Cities)
- Station heating system condensate cooler (Quad Cities)
- Service building air conditioning compressors (Quad Cities)
- Safe shutdown makeup pump room cooler (Quad Cities)

System Evaluation Boundary

The service water system evaluation boundary begins with the suction of the service water pumps from the common intake structure (crib house). The boundary continues through the common header through the service water strainers to the distribution header for the plant equipment. After cooling various systems and components, the service water is discharged through one of two discharge headers in each unit. The system evaluation boundary includes the components and piping associated with these flow paths as well as the discharge piping.

UFSAR References

Dresden Station UFSAR Section(s): 9.2.2, Table 9.2-2, 9.2.8, 9.5.5

Quad Cities Station UFSAR Section(s): 6.0, 6.0.1.10, 6.4.2.2, 9.2.2, Table 9.2-2, 9.2.8, 9.3.1, 9.3.5, 9.5.1, 9.5.5

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-21, LR-DRE-M-22, LR-DRE-M-23-1, LR-DRE-M-29-2, LR-DRE-M-354-2, LR-DRE-M-355, LR-DRE-M-360-2, LR-DRE-M-626, LR-DRE-M-722, and LR-DRE-M-3121.

Quad Cities Station:
LR-QDC-M-22-1, LR-QDC-M-22-4, LR-QDC-M-22-5, LR-QDC-M-69-1, LR-QDC-M-69-4, and LR-QDC-M-69-5.

System Intended Functions

Preclude adverse effects on safety-related SSC's – Non-safety related components that could spatially interact and be a hazard to safety related SSC's maintain sufficient integrity so that the intended function of safety related SSC's is not adversely affected.

Structural support – non-safety related portions of this system provide structural support to attached safety related piping. (Quad Cities only)

Pressure boundary –maintain pressure boundary of the CCSW keep fill line. (Dresden only)

Support ESF function(s) –provides cooling water to ECCS room coolers to ensure proper environment for ECCS pump operation. (Dresden only)

Credited in regulated event(s) –provides cooling water to safe shutdown equipment credited in mitigation of the Appendix R fire. (Dresden only)

Emergency makeup – provides an alternate supply of water for makeup to the isolation condenser. (Dresden only)

Plant component cooling – provide strained cooling water RBCCW. (Dresden only)

Component Groups Requiring Aging Management Review

Table 2.3.3-16Component Groups Requiring Aging Management Review – Service Water System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22, 3.3.2.19
Flow Orifices (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.5, 3.3.1.15
Orifice Bodies (Dresden only)	Pressure Boundary	3.3.1.15, 3.3.2.40
Orifice Bodies (Dresden only)	Throttle	3.3.1.15
Piping and Fittings (spatial interaction)	Leakage Boundary (spatial)	3.3.1.5, 3.3.1.15
Piping and Fittings (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.2.26, 3.3.2.29, 3.3.2.40, 3.3.2.45, 3.3.2.169
Piping and Fittings (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.5, 3.3.1.15
Pumps (Dresden only)	Pressure Boundary	3.3.2.170, 3.3.2.171, 3.3.2.179, 3.3.2.180, 3.3.2.300
Strainer Bodies (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.2.208, 3.3.2.300
Strainer Screens (Dresden only)	Filter	3.3.1.15
Thermowells (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.15
Tubing (Dresden only)	Pressure Boundary	3.3.2.34, 3.3.2.242
Valves (spatial interaction)	Leakage Boundary (spatial)	3.3.1.15, 3.3.1.27, 3.3.2.23, 3.3.2.279, 3.3.2.280, 3.3.2.281, 3.3.2.300

Table 2.3.3-16Component Groups Requiring Aging Management Review – Service Water System (Continued)

Component Group	Component Intended Function	Aging Management Ref
Valves (attached support)	Structural Integrity (attached)	3.3.1.15, 3.3.1.27, 3.3.2.23, 3.3.2.279, 3.3.2.280, 3.3.2.300
Valves (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.1.15, 3.3.1.27, 3.3.2.23, 3.3.2.31, 3.3.2.40, 3.3.2.45, 3.3.2.262, 3.3.2.276, 3.3.2.277, 3.3.2.279, 3.3.2.280, 3.3.2.298, 3.3.2,300

Aging management review results for the service water system are provided in Section 3.3.

2.3.3.17 Reactor Building Closed Cooling Water

System Purpose

The purpose of the reactor building closed cooling water (RBCCW) system is to provide cooling for equipment and systems in the reactor building while also minimizing the potential for release of radioactive material from the reactor equipment to the service water. For Dresden only, the system also provides cooling water to the shutdown cooling heat exchangers.

System Operation

The RBCCW system is a closed loop system. An expansion tank is connected to the common RBCCW pump suction header to ensure adequate net positive suction head for the pumps (two for each unit, with one additional shared spare). A level control valve (evaluated with the clean demineralized water and makeup system) provides automatic makeup to the expansion tank. The pumps discharge into a common header from which cooling water is provided to loads arranged in several loops. One loop provides cooling to reactor building auxiliary loads such as the reactor water clean up non-regenerative heat exchangers, the fuel pool heat exchangers, and the reactor building equipment drain tank heat exchanger. A loop inside the primary containment provides cooling to the primary containment coolers, primary containment equipment drain sump heat exchanger, and the reactor recirculation pump seals and motor oil coolers. Primary containment isolation valves are provided for the RBCCW lines penetrating the primary containment. For Dresden only, a loop also provides cooling to the shutdown cooling heat exchangers. The loops all discharge into a common header at the inlet to the RBCCW heat exchangers (also two for each unit with one additional shared spare). The RBCCW discharge from the heat exchangers flows back into the RBCCW pump suction header. The service water system cools the RBCCW heat exchangers. The pressure in the RBCCW system is maintained lower than that of the service water system, ensuring that any heat exchanger leakage would be into the RBCCW and not into the service water. Additionally, the RBCCW discharge radiation monitor (evaluated with the process radiation monitoring system) alarms upon sensing a high radiation condition in the closed cooling water.

System Evaluation Boundary

The RBCCW system evaluation boundary includes loop components in the closed cooling water system such as the RBCCW expansion tank, RBCCW pumps, RBCCW heat exchanger, primary containment penetration, primary containment isolation valves and other equipment isolation and check valves. The cooled loads, such as heat exchangers, pump coolers, cooling coils, compressor coolers, and sample coolers are evaluated with their respective systems. All other associated piping, components and instrumentation contained within the flow paths and systems described above are included in the RBCCW system evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): 9.2.3, Table 9.2-3

Quad Cities Station UFSAR Section(s): 9.2.3, Table 9.2-3

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-20, LR-DRE-M-353, and LR-DRE-M-367-2.

Quad Cities Station:

LR-QDC-M-33-1, LR-QDC-M-33-2, LR-QDC-M-75-1, and LR-QDC-M-75-2

System Intended Functions

Primary containment isolation – provide primary containment isolation for those portions of the system that interface with the primary containment.

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Credited in regulated event(s) – at Dresden only, provides cooling water to the shutdown cooling heat exchangers to achieve and maintain cold shutdown during an Appendix R fire. At Dresden and Quad Cities the system also contains components that are relied upon for compliance with 10 CFR 50.49 (EQ).

Component Groups Requiring Aging Management Review

Table 2.3.3-17 Component Groups Requiring Aging Management Review – Reactor Building Closed Cooling Water System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22
Flow Elements (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.2.68
Heat Exchangers (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.2.116, 3.3.2.117
Heat Exchangers (Dresden only)	Heat Transfer	3.3.2.112
Heat Exchangers (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.3.1.5, 3.3.2.77, 3.3.2.78
Manifolds (Dresden only)	Pressure Boundary	3.3.1.13, 3.3.2.40, 3.3.2.128
NSR Vents or Drains, Piping and Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.2.130
Orifice Bodies (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.13

Table 2.3.3-17 Component Groups Requiring Aging Management Review – Reactor Building Closed Cooling Water System (Continued)

Component Group	Component Intended Function	Aging Management Ref
Piping and Fittings	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.40, 3.3.2.137, 3.3.2.159
Piping and Fittings (spatial interaction) (Quad Cities only) (Includes flow elements)	Leakage Boundary (spatial)	3.3.1.5, 3.3.1.13, 3.3.2.40
Piping and Fittings (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.5, 3.3.1.13, 3.3.2.40
Pumps (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.174
Tanks (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.211
Thermowells (Dresden only)	Pressure Boundary	3.3.1.13, 3.3.2.23, 3.3.2.40, 3.3.2.220, 3.3.2.221, 3.3.2.225
Tubing (Dresden only)	Pressure Boundary	3.3.1.13, 3.3.2.233
Valves	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.40, 3.3.2.267, 3.3.2.286, 3.3.2.293
Valves (spatial interaction)	Leakage Boundary (spatial)	3.3.1.5, 3.3.1.13, 3.3.2.266, 3.3.2.267
Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.5, 3.3.1.13, 3.3.2.267

Aging management review results for the reactor building closed cooling water system are provided in Section 3.3.

2.3.3.18 Turbine Building Closed Cooling Water System (In-Scope for Dresden Only)

System Purpose

The turbine building closed cooling water (TBCCW) system provides the means for heat rejection from systems located in the turbine building and crib house.

System Operation

The TBCCW system is a closed loop system consisting of pumps, heat exchangers, an expansion tank, and necessary control and support equipment. The system removes heat from the following loads: circulating water pumps, feed pump lube oil and mechanical seal coolers, condensate and condensate booster pump seal coolers, CRD pump seal coolers, instrument air compressors, resin transfer air compressors, service air compressors, radwaste sparging air compressors, EHC oil coolers, bus duct coolers, and main generator alternator exciter cooler. Station service water (evaluated with service water system) provides the cooling medium on the tube side of the TBCCW heat exchangers.

System Evaluation Boundary

The evaluation boundary for the TBCCW system encompasses the closed loop cooling system supply and return lines up to the inlet and outlet water connections on the equipment it services. The system consists of pumps, heat exchangers, an expansion tank, piping, valves and necessary control and support equipment. Its loads include circulating water pumps, feed pump lube oil and mechanical seal coolers, condensate and condensate booster pump seal coolers, CRD pump seal coolers; instrument air compressors, resin transfer air compressors, service air compressors, radwaste sparging air compressors, EHC oil coolers, bus duct coolers, and main generator alternator exciter cooler.

UFSAR References

Dresden Station UFSAR Section(s): 9.2.7, Table 9.2-4

Quad Cities Station UFSAR Section(s): Not applicable

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-21, LR-DRE-M-354-1, LR-DRE-M-354-2

Quad Cities Station: Not applicable.

System Intended Functions

Credited in regulated event(s) – (Dresden only) provides flow path for control rod drive pump cooling during an Appendix R fire.

Component Groups Requiring Aging Management Review

Table 2.3.3-18 Component Groups Requiring Aging Management Review – Turbine Building Closed Cooling Water System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting (Dresden only)	Pressure Boundary	3.3.1.22
Heat Exchangers (Dresden only)	Pressure Boundary	3.3.2.91, 3.3.2.92
Piping and Fittings (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.137
Valves (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.13, 3.3.2.267

Aging management review results for the turbine building closed cooling water system are provided in Section 3.3.

2.3.3.19 Demineralized Water Makeup System

System Purpose

The purpose of the demineralized water makeup system is to provide reactor quality water for use in power plant systems, equipment, and service drops.

System Operation

Well water flows from the well water transfer pumps (evaluated with the well water system at Quad Cities) through the makeup demineralizers, to either the clean or contaminated demin water storage tank. While Dresden has permanently installed demineralizers, both Dresden and Quad Cities utilize portable units. The clean demin transfer pumps take suction from the clean demin storage tank and supply clean demin water through a distribution header to plant systems and equipment, such as makeup to the standby liquid control system, the plant heating system, the RBCCW and TBCCW systems. It also supplies various system loop seals, the Unit 1 fuel building (Dresden only), sample panels, and clean demin service drops inside primary containment and throughout the plant. Containment isolation valves are provided for the clean demin lines that penetrate the containment. Additionally, at Dresden, the distribution header provides makeup water to the isolation condenser and emergency makeup water to the fuel pools. Also at Dresden, the isolation condenser makeup pumps take suction from the clean demin water storage tank and discharge into a common header that supplies both isolation condensers.

System Evaluation Boundary

The demineralized water makeup system boundary begins with the suction of the makeup demin well water transfer pumps at Dresden, and with the supply header to the makeup demineralizers at Quad Cities. The boundary ends at the final end uses of the clean demin water, whether it was drawn from either the clean demin water storage tank or the distribution header. Within this boundary certain loops or components were evaluated with other systems. The clean demin water storage tank was evaluated with the isolation condenser system at Dresden and with the condensate and condensate storage system at Quad Cities. At Dresden, the isolation condenser makeup pumps and associated piping were evaluated with the isolation condenser system. Also at Dresden, the safety related clean demin water fill valves for the isolation condenser, located in the common pathway from both the discharge header and the isolation condenser makeup pumps, were evaluated with the isolation condenser system. Valves utilized to provide a cross tie between the two Unit 2/3 contaminated condensate storage tanks at Dresden were evaluated with the condensate and condensate storage system. The safety related primary containment isolation valves for the clean demin water supply lines to the Dresden Unit 2 and Unit 3 fuel pools, that are part of the fuel pool system, were evaluated with the demineralized water makeup system. At Quad Cities, valves in the clean demin water supply lines to certain process samplers, such as the offgas particulate sampler, the chemical equipment rooms, and the containment oxygen analyzers, were evaluated with the process sampling system. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the demineralized water makeup system evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): 9.2.4

Quad Cities Station UFSAR Section(s): 9.2.4

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-20, LR-DRE-M-31, LR-DRE-M-33, LR-DRE-M-35-1, LR-DRE-M-39, LR-DRE-M-177A-1, LR-DRE-M-353, LR-DRE-M-359, LR-DRE-M-362, LR-DRE-M-364, LR-DRE-M-366,LR-DRE-M-369,LR-DRE-M-419A-1,LR-DRE-M-423-1,LR-DRE-M-423-2, LR-DRE-M-423-3, LR-DRE-M-423-4, LR-DRE-M-423-5, LR-DRE-M-1234-3, and LR-DRE-M-1239-3

Quad Cities Station:
LR-QDC-M-58-1, LR-QDC-M-58-3, LR-QDC-M-58-4, LR-QDC-M-459A-2, and LR-QDC-M-462A-2

System Intended Functions

Primary containment isolation – provides containment isolation for those portions of the system that interface with the primary containment.

Isolation condenser alternate make up water (Dresden) – provides alternate makeup water to the isolation condenser.

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.3-19 Component Groups Requiring Aging Management Review - Makeup Demineralizer System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22, 3.3.2.18
Flow Elements (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.3.2.40, 3.3.2.72
NSR Vents or Drains, Piping and Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.2.130
Piping and Fittings	Pressure Boundary	3.3.1.5, 3.3.1.8, 3.3.1.25, 3.3.2.22, 3.3.2.29, 3.3.2.43, 3.3.2.143, 3.3.2.302
Piping and Fittings (spatial interaction)	Leakage Boundary (spatial)	3.3.1.5, 3.3.2.143

Table 2.3.3-19 Component Groups Requiring Aging Management Review - Makeup Demineralizer System (Continued)

Component Group	Component Intended Function	Aging Management Ref
Piping and Fittings (attached support)	Structural Integrity (attached)	3.3.1.5, 3.3.2.143
Pumps (Dresden only)	Pressure Boundary	3.3.2.182, 3.3.2.300
Pumps (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.3.2.182, 3.3.2.300
Restricting Orifices (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.2.188
Restricting Orifices (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.3.2.23, 3.3.2.186
Strainers (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.3.1.5, 3.3.2.209
Valves	Pressure Boundary	3.3.1.5, 3.3.2.23, 3.3.2.29, 3.3.2.272
Valves (spatial interaction)	Leakage Boundary (spatial)	3.3.1.5, 3.3.1.25, 3.3.2.40, 3.3.2.257, 3.3.2.272
Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.5, 3.3.2.272

Aging management review results for makeup demineralizer system are provided in Section 3.3.

2.3.3.20 Residual Heat Removal Service Water (Quad Cities Only)

System Purpose

The residual heat removal service water (RHRSW) system operates in conjunction with the residual heat removal (RHR) system to remove heat from the suppression chamber through the containment cooling mode of RHR or to remove heat from the reactor coolant through the reactor shutdown cooling mode of RHR. Additionally, the RHRSW provides safety related cooling water to the train "B" control room HVAC refrigerant condensing unit as a back-up during a loss of offsite power and provides a cross-tie to the opposite unit to achieve safe shutdown in an Appendix "R" Fire. The RHR system also provides an auxiliary function during refueling to assist in removal of heat from the spent fuel pool.

System Operation

The residual heat removal service water (RHRSW) system at Quad Cities is an open loop cooling water system consisting of four two-stage pump sets, associated valves, piping, and instrumentation and controls, divided into two independent loops. The RHRSW system removes heat from the RHR heat exchangers, which are evaluated as part of the RHRSW system. When RHRSW is flowing, the pressure on the tube side of the RHR heat exchanger is maintained above the shell side to prevent reactor water leakage into the service water and thereby into the discharge bay. Additionally, the RHRSW provides safety related cooling water to the train "B" control room HVAC refrigerant condensing unit (evaluated with control room HVAC) as a back-up during a loss of offsite power and provides a cross tie to the opposite unit to achieve safe shutdown in an Appendix R fire.

System Evaluation Boundary

The RHRSW system starts at the crib house RHRSW intake bay. Suction piping brings the strained river water to two RHRSW pump suction manifolds. The four RHRSW pump sets (two pumps driven by one motor) take suction from the manifolds. The flow continues to the RHRSW pumps. The RHRSW pumps are located in watertight vaults. Each vault has one vault cooler for each pump in the vault. Cooling water for each vault cooler is supplied by its associated pump discharge. In the suction paths are the returns from the RHRSW pump vault coolers and pump seal supplies. The pumps discharge to the RHR heat exchangers, which are evaluated as part of the RHRSW system. A cross-tie to the opposite unit is also provided. The RHRSW system ends with a common discharge to the service water system discharge (evaluated with service water). All associated piping, components (including vents, drains, test taps and relief valves) and instrumentation contained within the flow paths and systems described above are included in the RHRSW system evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): Not applicable.

Quad Cities Station UFSAR Section(s): 3.4.1.2, 5.4.7, 6.2.2, 6.3, 9.1.3.2, 9.2.1, 9.2.5

License Renewal Boundary Diagram References

Dresden Station: Not applicable.

Quad Cities Station: LR-QDC-M-22-1, LR-QDC-M-37, LR-QDC-M-39-3, LR-QDC-M-79, LR-QDC-M-81-3, and LR-QDC-M-725-3.

System Intended Functions

Containment and component cooling - provides a heat sink for the RHR system via the RHR heat exchangers to support containment cooling after a loss of coolant accident (LOCA).

Back-up cooling – provides safety related back-up cooling to the 'B' train of the control room HVAC refrigeration units as a back-up during a loss of offsite power and LOCA.

Credited in regulated events - provides a heat sink for the RHR system via the RHR heat exchangers to support ATWS actions and in the Appendix R fire safe shutdown analysis. The subsystems between the units can be connected by a normally isolated crosstie line that is credited in the plant's fire protection safe shutdown analysis. The system also contains components that are relied upon for compliance with 10 CFR Part 50.49 (EQ).

Preclude adverse effects on safety-related SSC's – Non-safety related components that could be a hazard to safety related SSC's maintain sufficient integrity so that the intended function of safety related SSC's is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.3-20Component Groups Requiring Aging Management Review – Residual Heat Removal Service Water System (Quad Cities only)

Component Group	Component Intended Function	Aging Management Ref
Air Handlers Heating/Cooling (Aux&RW HVAC) (Quad Cities only)	Pressure Boundary	3.3.2.8, 3.3.2.9
Air Handlers Heating/Cooling (Aux&RW HVAC) (Quad Cities only)	Heat Transfer	3.3.2.7
Closure Bolting (Quad Cities only)	Pressure Boundary	3.3.1.22
Dampeners (Quad Cities only)	Pressure Boundary	3.3.1.15, 3.3.1.27, 3.3.2.24
Ducts & Fittings, Access Doors, Closure Bolts, Equip Frames (Quad Cities only)	Pressure Boundary	3.3.1.5
Heat Exchangers (Quad Cities only)	Pressure Boundary	3.3.2.26, 3.3.2.31, 3.3.2.89, 3.3.2.90, 3.3.2.118, 3.3.2.119, 3.3.2.120, 3.3.2.121

Table 2.3.3-20 Component Groups Requiring Aging Management Review – Residual Heat Removal Service Water System (Quad Cities only) (Continued)

Component Group	Component Intended Function	Aging Management Ref
Heat Exchangers (Quad Cities only)	Heat Transfer	3.3.2.88, 3.3.2.113, 3.3.2.115
NSR Vents or Drains, Piping and Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.2.130
Orifice Bodies (Quad Cities only)	Pressure Boundary	3.3.1.15, 3.3.2.40, 3.3.2.41
Orifice Bodies (Quad Cities only)	Throttle	3.3.1.15
Piping and Fittings (Quad Cities only)	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.1.16, 3.3.2.26, 3.3.2.44, 3.3.2.141, 3.3.2.168
Piping and Fittings (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.5, 3.3.1.15, 3.3.2.26
Pulsation Dampeners (Quad Cities only)	Pressure Boundary	3.3.1.15, 3.3.2.24, 3.3.2.41
Pumps (Quad Cities only)	Pressure Boundary	3.3.1.15, 3.3.2.26, 3.3.2.173, 3.3.2.183, 3.3.2.184
Sight Glasses (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.5, 3.3.1.15
Strainer Bodies (Quad Cities only)	Pressure Boundary	3.3.1.5, 3.3.1.15
Strainer Screens (Quad Cities only)	Filter	3.3.1.15
Thermowells (Quad Cities only)	Pressure Boundary	3.3.1.5, 3.3.1.15
Tubing (Quad Cities only)	Pressure Boundary	3.3.1.15, 3.3.2.40, 3.3.2.41
Tubing (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.15, 3.3.2.40, 3.3.2.41
Valves (Quad Cities only)	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.1.27, 3.3.2.23, 3.3.2.24, 3.3.2.26, 3.3.2.31, 3.3.2.40, 3.3.2.41, 3.3.2.279, 3.3.2.280, 3.3.2.297, 3.3.2.300
Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.3.1.5, 3.3.1.15, 3.3.1.27, 3.3.2.23, 3.3.2.24, 3.3.2.26, 3.3.2.31, 3.3.2.276, 3.3.2.277, 3.3.2.300

Aging management review results for the residual heat removal service water system are provided in Section 3.3.

2.3.3.21 Containment Cooling Service Water System (Dresden Only)

System Purpose

The containment cooling service water (CCSW) System removes heat from the primary containment by providing cooling water to the low pressure coolant injection (LPCI) heat exchangers. CCSW, working with LPCI, limits suppression chamber bulk water temperature assuring: 1) Suppression chamber hydrodynamic loads during blowdown are limited maintaining structure and equipment integrity; 2) Complete steam condensation during a loss of coolant accident limiting long term primary containment pressure; and 3) Adequate NPSH for ECCS pumps maintaining long term primary containment pressure control. The Unit 2 CCSW loops provide a safety related source of service water to the control room air conditioning condensers. The CCSW system also supplies a safety related source of river water to the LPCI and HPCI room coolers as a backup to the service water system.

System Operation

The containment cooling service water (CCSW) system is an open loop system consisting of four pumps, associated valves, piping, and instrumentation and controls. The system removes heat from the low pressure coolant injection (LPCI) system (evaluated with LPCI system) through the LPCI heat exchangers. The CCSW pumps develop sufficient head to maintain the cooling water heat exchanger tube side outlet pressure greater than the LPCI subsystem pressure on the shell side (evaluated with LPCI system). Maintaining this pressure differential prevents reactor water leakage into the service water and thereby into the river. The Unit 2 CCSW loops provide a safety related source of service water to the control room air conditioning condensers (evaluated with control room HVAC). The CCSW system also supplies a safety related source of river water to the LPCI and HPCI room coolers (evaluated with ECCS corner room HVAC) as a backup to the service water system.

System Evaluation Boundary

The evaluation boundary for the CCSW system begins with each pair of CCSW pumps taking suction from the crib house via separate supply piping. Two CCSW pumps discharge into a common header that routes the cooling water to that loop's associated heat exchanger. At the heat exchanger, heat is transferred from the LPCI subsystem (evaluated with LPCI system) to the CCSW system, and subsequently to the river. System piping is arranged to form two separate, two-pump flow networks (loops) to the piping downstream of the differential pressure control valve on the discharge of the heat exchanger. At this point, both piping loops merge into a common discharge line to the service water discharge header (evaluated with service water system).

UFSAR References

Dresden Station UFSAR Section(s): 3.4.1.2, 6.2.2, 6.3.1.2, 6.4, 9.2.1

Quad Cities Station UFSAR Section(s): Not applicable.

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-22, LR-DRE-M-29-1, LR-DRE-M-29-2,

LR-DRE-M-360-1, LR-DRE-M-360-2, and LR-DRE-M-3121

Quad Cities Station: Not applicable.

System Intended Functions

Containment and component cooling - provides containment cooling function, cooling to the ECCS room coolers and the containment cooling service water vault coolers to maintain room temperatures.

Back-up cooling – (Dresden Unit 2 only) containment cooling service water provides safety related back-up cooling to the 'B' train of the control room HVAC refrigeration units.

Credited in regulated events - provides redundancy in suppression chamber cooling during an ATWS event, operates without reliance upon external sources of power (SBO), is credited in the Appendix R fire safe shutdown analysis and the system contains components that are relied upon for compliance with 10 CFR Part 50.49 (EQ).

Preclude adverse effects on safety-related SSC's – Non-safety related components that could be a hazard to safety related SSC's maintain sufficient integrity so that the intended function of safety related SSC's is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.3-21 Component Groups Requiring Aging Management Review – Containment Cooling Service Water System (Dresden only)

Component Group	Component Intended Function	Aging Management Ref
Air Handlers Heating/Cooling (Aux&RW HVAC) (Dresden only)	Pressure Boundary	3.3.2.8, 3.3.2.9
Air Handlers Heating/Cooling (Aux&RW HVAC) (Dresden only)	Heat Transfer	3.3.2.7
Closure Bolting (Dresden only)	Pressure Boundary	3.3.1.22
Ducts & Fittings, Access Doors, Closure Bolts, Equip Frames (Dresden only)	Pressure Boundary	3.3.1.5
Flow Elements (Dresden only)	Pressure Boundary	3.3.1.15, 3.3.2.40, 3.3.2.41
Heat Exchangers (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.2.80, 3.3.2.81
Heat Exchangers (Dresden only)	Heat Transfer	3.3.2.79

Table 2.3.3-21 Component Groups Requiring Aging Management Review – Containment Cooling Service Water System (Dresden only) (Continued)

Component Group	Component Intended Function	Aging Management Ref
Orifice Bodies (Dresden only)	Pressure Boundary	3.3.1.15, 3.3.2.40, 3.3.2.41
Piping and Fittings (Dresden only) (includes manifolds, tubes, and thermowells)	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.1.16, 3.3.2.26, 3.3.2.40, 3.3.2.141
Piping and Fittings (attached support) (Dresden only)	Structural Integrity (attached)	3.3.1.5, 3.3.1.15, 3.3.2.26
Pumps (Dresden only)	Pressure Boundary	3.3.2.31, 3.3.2.179, 3.3.2.180
Strainer Bodies (Dresden only)	Pressure Boundary	3.3.2.208, 3.3.2.300
Strainer Screens (Dresden only)	Filter	3.3.1.15
Thermowells (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.15
Tubing (Dresden only)	Pressure Boundary	3.3.1.15, 3.3.2.40, 3.3.2.41
Valves (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.1.27, 3.3.2.23, 3.3.2.24, 3.3.2.26, 3.3.2.31, 3.3.2.40, 3.3.2.41, 3.3.2.279, 3.3.2.280, 3.3.2.300
Valves (attached support) (Dresden only)	Structural Integrity (attached)	3.3.2.279, 3.3.2.280, 3.3.2.300

Aging management review results for the containment cooling service water system are provided in Section 3.3.

2.3.3.22 Ultimate Heat Sink

System Purpose

The purpose of the ultimate heat sink (UHS) system is to provide sufficient cooling water to the station, when the normal heat sink (the river) is unavailable, to permit operation of the containment cooling service water (CCSW) system at Dresden, the residual heat removal service water (RHRSW) at Quad Cities, and the diesel generator cooling water (DGCW) pumps at both stations.

System Operation

With the failure of the Dresden Island Lock and Dam on the Illinois River, or Lock and Dam No.14 on the Mississippi River, the corresponding river (Kankakee or Mississippi) level would fall below the high point of the intake flume. In the event of a loss of this water source, there is a limited supply of water (the UHS) trapped, by design, in the intake and discharge canals.

At Dresden, the natural topography forms the UHS basin with the level stabilizing at elevation 495'-0," the high point of the intake flume. The CCSW pumps take suction from the center compartment of the crib house at elevation 498'-0," above the UHS basin level. This necessitates isolating the compartment and raising its water level. To accomplish this the wire mesh screens in the compartment openings are replaced with stop logs. The dewatering valves are opened to allow water from the crib house forebay to flood the trash rake refuge pit, the refuge pumps are lined up to discharge to the center compartment, and the pumps are operated to flood the compartment above the CCSW pump suction. A CCSW pump (evaluated with the CCSW system) is placed in service, discharging to the containment cooling heat exchanger, and then to the discharge canal. The deicing valve is opened, allowing flow from the discharge canal back to the forebay. A portable, low-head, high-volume engine-driven pump could makeup the loss of the impounded river water due to evaporation.

At Quad Cities, the natural topography of the intake flume, along with the weir gate located in the discharge canal, forms the UHS basin. The level in the basin stabilizes at elevation 565'-0," the high point of the intake flume. The RHRSW (evaluated with the RHR SW system) and DGCW pumps (evaluated with the diesel generator service water system) take suction from the center compartment of the crib house at elevation 456'-6," below the UHS basin level. The pumps discharge to their assigned loads, and then to the discharge flume upstream of the weir. The gate on the ice-melt line is opened, allowing flow from the discharge flume back to the intake flume. The water impounded in the intake and discharge flumes is then used as an evaporative heat sink. With the loss of the dam, river water backflow would occur from the river, through the 16' diameter discharge piping connecting the river to the discharge flume, to the downstream base of the weir gate. Portable, diesel-driven pumps take suction from downstream of the weir and discharge into the center compartment of the crib house to makeup the loss of the impounded river water due to evaporation.

System Evaluation Boundary

The ultimate heat sink evaluation boundary for Dresden consists of the topography basin between the high points of the intake and discharge flumes. It includes the screen wash refuge sump pumps and associated piping (from the screen wash system). And it also includes the stop logs, dewatering valves and associated piping, and the ice melt gate and associated piping (from the circulating water system). The ultimate heat sink evaluation boundary for Quad Cities consists of the topography basin between the high point of the intake flume and the weir gate located in the discharge canal. It also includes (from the circulating water system) the ice melt gate and associated piping, and the discharge piping connecting the discharge flume to the river. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the ultimate heat sink evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): 9.2.5

Quad Cities Station UFSAR Section(s): 9.2.5

License Renewal Boundary Diagram References

Dresden Station:

LR-DR-M-1, and LR-DR-M-36

Quad Cities Station:

LR-QDC-M-1

System Intended Functions

Ultimate cooling water supply – provides sufficient cooling water to the station to permit operation of the containment cooling service water system and the diesel generator cooling water pumps when the normal heat sink (the river) is unavailable. (Dresden)

Ultimate cooling water supply – provides sufficient cooling water to the station to permit operation of the residual heat removal service water pumps and the diesel generator cooling water pumps when the normal heat sink (the river) is unavailable. (Quad Cities)

Component Groups Requiring Aging Management Review

Table 2.3.3-22 Component Groups Requiring Aging Management Review – Ultimate Heat Sink

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting (Dresden only)	Pressure Boundary	3.3.1.22
Piping and Fittings	Pressure Boundary	3.3.1.5, 3.3.1.15, 3.3.2.28, 3.3.2.141
Pump Casings (Dresden only)	Pressure Boundary	3.3.2.172, 3.3.2.300
Valves (Dresden only)	Pressure Boundary	3.3.2.278, 3.3.2.300

Aging management review results for the ultimate heat sink are provided in Section 3.3.

2.3.3.23 Fuel Pool Cooling and Filter Demineralizer System (In-Scope for Dresden Only)

System Purpose

The purpose of the fuel pool cooling and filter demineralizer system is to remove heat from the spent fuel and to maintain fuel storage pool water clarity. During refueling operations the system may be used to maintain the water clarity of the reactor refueling cavity also.

System Operation

Water from the fuel storage pool (evaluated with the reactor building structure) overflows via scuppers and an adjustable weir into two crosstied skimmer surge tanks. The skimmer surge tanks drain into a common suction header for the fuel pool cooling pumps. Two parallel flow paths exist from the header, each with a fuel pool cooling pump taking suction from the header and discharging through a fuel pool cooling heat exchanger. Cooling water to the heat exchangers is supplied from the reactor building closed cooling water system (evaluated with the reactor building closed cooling water system) A crosstie line exists on the pump discharge piping in order to operate either pump with either heat exchanger. The heat exchangers discharge into a common header, that first flows through the fuel pool filter, and then through the fuel pool demineralizer. The fuel pool demineralizer discharges back into the fuel storage pool through two lines and spargers within the pool. The return lines to the fuel storage pool enter near the top and have openings in the piping about six inches below the pool surface to act as anti-siphon devices, to preclude uncontrolled draining of the pool during a pipe break. During refueling operations, the system may be aligned via manual valves to discharge into the reactor refueling cavity. The shutdown cooling system (evaluated with the shutdown cooling system) may be connected in parallel with the fuel pool cooling and filter demineralizer system during periods of extremely high heat loads, such as immediately after refueling or a full core discharge into the fuel storage pool. A clean demineralized water supply (evaluated with the demineralized water makeup system) passes through a safety related primary containment isolation valve that is part of the fuel pool cooling and filter demineralized system, to supply makeup water.

System Evaluation Boundary

The fuel pool cooling and filter demineralizer system boundary begins with the skimmer surge tanks, continues through the fuel pool cooling pumps, fuel pool heat exchangers, fuel pool filter, fuel pool demineralizer, and ends with the fuel storage pool spargers. It also includes the portion of the makeup water to the fuel pool cooling and filter demineralizer system downstream of the safety related primary containment isolation valve that is part of the system (evaluated with the demineralized water makeup system). All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the fuel pool cooling and filter demineralizer system.

UFSAR References

Dresden Station UFSAR Section(s): 9.1.3

Quad Cities Station UFSAR Section(s): Not applicable

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-31, LR-DRE-M-362

Quad Cities Station: Not applicable.

System Intended Functions

Preclude adverse effects on safety-related SSC's – (Dresden only) Components that could be a hazard to safety related SSC's maintain sufficient integrity so that the intended function of safety related SSC's is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.3-23 Component Groups Requiring Aging Management Review – Fuel Pool Cooling and Filter Demineralizer System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting (Dresden only)	Pressure Boundary	3.3.1.22
Piping and Fittings (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.2.145
Piping and Fittings (spatial interaction) (Dresden only)	Leakage Boundary (spatial)	3.3.1.1, 3.3.2.40
Sight Glasses (spatial interaction) (Dresden only)	Leakage Boundary (spatial)	3.3.1.5, 3.3.2.198, 3.3.2.199
Valves (Dresden only)	Pressure Boundary	3.3.1.5, 3.3.2.273
Valves (spatial interaction) (Dresden only)	Leakage Boundary (spatial)	3.3.1.5, 3.3.2.273

Aging management review results for the fuel pool cooling and filter demineralizer system are provided in Section 3.3.

2.3.3.24 Plant Heating System

System Purpose

The purpose of the plant heating system is to supply steam for plant and area heating during cold weather periods, and for miscellaneous functions such as steam cleaning and carbon dioxide or nitrogen vaporizing. Additionally, the Dresden plant heating system supplies steam to the shutdown cooling system during its operation in the reactor heating mode.

System Operation

The plant heating boiler feedwater pumps take suction from the heating system deaerating tank and discharge into the plant heating boilers. In addition, Quad Cities has a small, summer boiler with its own feedwater pumps taking suction from the deaerating tank. The boilers produce steam that flows into a common distribution header. The header discharges steam through a pressure control valve to various loops throughout the plant. Separate loops supply loads in each major building, such as the turbine buildings, reactor buildings, crib house, and radwaste building. From these loops steam flows to loads such as ventilation heating coils, area space heaters, vaporizers, and steam drops for uses such as steam cleaning. The condensate from the loads passes through steam traps to condensate return units located in the major building areas. The condensate return units pump the condensate back to the heating system deaerating tank at Dresden, and to the condensate receiving tank at Quad Cities. At Quad Cities, the condensate receiving tank pumps then pump the condensate back to the deaerating tank. At Dresden, each reactor building heating steam supply loop also provides steam to its unit's shutdown heat exchangers (evaluated with the shutdown cooling system) for use in the reactor heating mode. As the steam supplied to the shutdown heat exchangers condenses, it drains via a steam trap to the reactor building equipment drain tank.

System Evaluation Boundary

The plant heating system boundary begins with the deaerating tank, and continues through the boiler feedwater pumps, boilers, pressure control valves, heating loads, steam traps, condensate return units, condensate receiving tank (Quad Cities only) and back to the deaerating tank. At Quad Cities, the pressure control valve that provides plant service water to the control room heating, ventilation and air conditioning system is considered as part of the plant heating system. This valve and associated piping were evaluated with the residual heat removal service water system. All other associated piping, components and instrumentation contained within the flow paths and systems described above are included in the plant heating system evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): None

Quad Cities Station UFSAR Section(s): None

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-32, LR-DRE-M-175-2, LR-DRE-M-175-3, LR-DRE-M-472-1, LR-DRE-M-472-2, and LR-DRE-M-363.

Quad Cities Station:
LR-QDC-M-22-1, LR-QDC-M-55-1, LR-QDC-M-56-1, LR-QDC-M-56-2, LR-QDC-M-56-3, LR-QDC-M-56-4, and LR-QDC-M-90.

System Intended Functions

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.3-24 Component Groups Requiring Aging Management Review – Plant Heating System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22
Filters/Strainers (spatial interaction)	Leakage Boundary (spatial)	3.3.2.57, 3.3.2.300
NSR Vents or Drains, Piping and Valves (spatial interaction) (Dresden only)	Leakage Boundary (spatial)	3.3.2.130
Piping and Fittings (spatial interaction)	Leakage Boundary (spatial)	3.3.1.5, 3.3.2.26, 3.3.2.142
Pumps (spatial interaction)	Leakage Boundary (spatial)	3.3.2.181, 3.3.2.300
Sight Glasses (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.3.1.5, 3.3.2.197
Tanks (spatial interaction)	Leakage Boundary (spatial)	3.3.1.5, 3.3.2.214
Thermowells (spatial interaction) (Dresden only)	Leakage Boundary (spatial)	3.3.2.2, 3.3.2.40
Traps (spatial interaction)	Leakage Boundary (spatial)	3.3.2.31, 3.3.2.229, 3.3.2.300
Tubing (spatial interaction)	Leakage Boundary (spatial)	3.3.2.34, 3.3.2.40, 3.3.2.41, 3.3.2.243, 3.3.2.252

Table 2.3.3-24 Component Groups Requiring Aging Management Review – Plant Heating System (Continued)

Component Group	Component Intended Function	Aging Management Ref
Valves (spatial interaction)	Leakage Boundary (spatial)	3.3.1.5, 3.3.2.23, 3.3.2.24, 3.3.2.31, 3.3.2.263, 3.3.2.271, 3.3.2.282, 3.3.2.300

Aging management review results for the plant heating system are provided in Section 3.3.

2.3.3.25 Containment Atmosphere Monitoring System

System Purpose

The containment atmosphere monitoring (CAM) system provides the ability to monitor hydrogen, oxygen, and gross gamma radiation levels in the containment following a LOCA, and provides necessary indication and trip signals.

System Operation

During CAM system operation, containment atmosphere is withdrawn through piping connected to primary containment penetrations for obtaining both a drywell and suppression chamber air sample. Hydrogen and oxygen concentration are measured outside the primary containment (evaluated with the primary containment structure) and the sample returned to the primary containment. The sample withdrawal lines in both cases are heat traced to prevent condensation in the sample lines which would cause measurement inaccuracies. A check valve is installed in the return discharge line for primary containment. In addition, a check valve is installed in each reagent and calibration gas line for primary containment. The containment atmosphere monitoring system consists of oxygen and hydrogen analyzer process instrumentation and various indication and annunciation instruments, primary containment monitoring panels, and gross gamma detector channels (from detector to annunciator and computer points). The system is automatically activated upon the occurrence of a LOCA, or manually by an operator. The system initiates a primary containment group 2 isolation on high radiation.

System Evaluation Boundary

The containment atmosphere monitoring system evaluation boundary contains safety related drywell/suppression chamber air sample oxygen and hydrogen analyzer process instrumentation, including various indicators/annunciators, sample piping into and out of the drywell, drywell/suppression chamber sample path valves, suppression chamber sample path valves, primary containment monitoring panels, gross gamma radiation detectors and heat tracing. Also included are calibration gas valves, bottles, sample test points/valves and computer points associated with the system. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the containment atmosphere monitoring system evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): 6.2.5.3.2, 7.3.2.2.7

Quad Cities Station UFSAR Section(s): 6.2.5.2

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-706-1 and LR-DRE-M-706-2

Quad Cities Station:
LR-QDC-M-641-1 and LR-QDC-M-641-2.

System Intended Functions

Primary containment isolation – provides containment isolation for those portions of the system that interface with the primary containment.

Support ESF function(s) - provides signals to indicate and alarm high hydrogen, oxygen, and high gross gamma radiation levels in the containment following a LOCA, and provide provides a primary containment Group 2 isolation signal on high radiation conditions.

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Credited in regulated event(s) – The system contains components that are relied upon for compliance with 10 CFR 50.49, (EQ).

Component Groups Requiring Aging Management Review

Table 2.3.3-25 Component Groups Requiring Aging Management Review – Containment Atmosphere Monitoring System

Component	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22
Filters/Strainers	Filter	3.3.2.230
Flexible Hoses	Pressure Boundary	3.3.2.64, 3.3.2.67
NSR Vents or Drains, Piping and Valves (attached support)	Structural Integrity (attached)	3.3.2.130
Piping and Fittings (attached support)	Structural Integrity (attached)	3.3.2.40, 3.3.2.166
Piping and Fittings	Pressure Boundary	3.3.2.40, 3.3.2.166
Pumps	Pressure Boundary	3.3.2.40, 3.3.2.299
Restricting Orifices	Pressure Boundary	3.3.2.40, 3.3.2.193
Sample Pumps	Pressure Boundary	3.3.2.40, 3.3.2.195
Tubing	Pressure Boundary	3.3.2.40, 3.3.2.42, 3.3.2.248, 3.3.2.254, 3.3.2.255
Valves	Pressure Boundary	3.3.2.23, 3.3.2.40, 3.3.2.42, 3.3.2.260, 3.3.2.289, 3.3.2.295
Valves (attached support)	Structural Integrity (attached)	3.3.2.40, 3.3.2.295

Aging management review results for the system are provided in Section 3.3.

2.3.3.26 Nitrogen Containment Atmosphere Dilution System

System Purpose

The nitrogen containment atmosphere dilution (NCAD) system provides two redundant, single failure proof, independent flow paths for purging the primary containment with nitrogen to provide post-accident combustible gas control. The NCAD system injects gaseous nitrogen into the primary containment to purge the containment of oxygen and hydrogen to maintain the mixture below combustible levels.

System Operation

The NCAD system is a manually operated system comprised of redundant flow paths. It is operated locally by opening a manual valve near the nitrogen supply equipment. The containment purge and vent valves can be aligned to inject nitrogen into the drywell or suppression chamber (evaluated with the primary containment structure) for either flow path. At Quad Cities, the NCAD system is made up of two independent, redundant flow paths for each unit. Each flow path in turn can supply gaseous nitrogen to either the drywell or suppression chamber. One flow path runs from the unit's corresponding electric vaporizer and taps back into the nitrogen inerting system piping just upstream of nitrogen purge vaporization valve, on the non-safety related side. The other flow path runs from the opposite unit's electric vaporizer and taps back into the normal nitrogen makeup system just upstream of the nitrogen makeup valve. Either flowpath can be supplied by the nitrogen atmospheric vaporizer. At Dresden, there is a normal and emergency supply line. The normal NCAD line begins with the drywell nitrogen purge and inerting system (DNPIS) (evaluated with the drywell nitrogen inerting system) connection downstream of the pressure regulating station at the discharge side of the makeup line atmospheric vaporizer. Then, from the pressure regulating stations to the nitrogen supply header. The emergency NCAD line begins with the discharge of the nitrogen auxiliary tank and taps into the emergency truck connection upstream of the makeup line atmospheric vaporizer.

System Evaluation Boundary

The NCAD system evaluation boundary at Dresden includes the normal and emergency supply lines. The NCAD system evaluation boundary at Quad Cities includes the two independent, redundant flow paths. All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the NCAD system evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): 6.2.5.3.3

Quad Cities Station UFSAR Section(s): 6.2.5.3

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-25, LR-DRE-M-356, and LR-DRE-M-4215

Quad Cities Station:

LR-QDC-M-34-2, LR-QDC-M-34-3, and LR-QDC-M-76-2

System Intended Functions

Supports ESF function(s) – provides capability to maintain a non-explosive atmosphere in the primary containment following a design basis accident. Backup to nitrogen inerting system for post LOCA operations. (Quad Cities only)

Component Groups Requiring Aging Management Review

Table 2.3.3-26 Component Groups Requiring Aging Management Review - Nitrogen Containment Atmosphere Dilution System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22, 3.3.2.18
Restricting Orifices (Dresden only)	Pressure Boundary	3.3.2.35, 3.3.2.189
Restricting Orifices (Dresden only)	Throttle	3.3.2.189
Tubing	Pressure Boundary	3.3.2.34, 3.3.2.35, 3.3.2.239
Valves	Pressure Boundary	3.3.2.23, 3.3.2.25, 3.3.2.260

Aging management review results for the nitrogen containment atmosphere dilution system are provided in Section 3.3.

2.3.3.27 Drywell Nitrogen Inerting System

System Purpose

The drywell nitrogen inerting (DNI) system, also known as the drywell nitrogen purge and inerting system, is provided to maintain the drywell in a nitrogen inerted condition as a means of inhibiting the formation of a combustible gas mixture under LOCA conditions. The system is not safety related; however, it can be used for post-LOCA hydrogen control. The system also serves as a backup to the pump-back system to maintain the required drywell-to-suppression chamber differential pressure and provide nitrogen to the NCAD system.

System Operation

The drywell nitrogen inerting system consists of a liquid nitrogen storage tank, nitrogen vaporizers, associated piping, isolation valves, and pressure regulators. Nitrogen is supplied to three possible types of vaporizers. Steam powered vaporizers, which use plant heating steam (evaluated with plant heating system) to ensure supply temperatures do not damage nitrogen piping during periods of large demand, exist at both Dresden and Quad Cities, although Quad Cities typically uses electrically powered vaporizers installed for the same purpose. Additionally, each site has atmospheric vaporizers for periods of low demand. Flow regulating valves are also installed to limit low nitrogen supply temperatures. Nitrogen to the drywell is supplied through the drywell purge inlet line while air is vented to the reactor building ventilation system (evaluated with HVAC – reactor building) or the standby gas treatment system (evaluated with standby gas treatment system). A similar method is used for inerting the suppression chamber. The containment is deinerted by admitting air into the containment as the containment atmosphere is vented to the reactor building ventilation system or the standby gas treatment system.

System Evaluation Boundary

The Quad Cities drywell nitrogen inerting system evaluation boundary begins with the bulk nitrogen storage tank that feeds to the common nitrogen supply header, which is connected to a nitrogen supply line from the diesel generator room. The nitrogen supply header connects to a common nitrogen purge vaporizer and also feeds the nitrogen purge vaporizer in the diesel generator room. The nitrogen from the nitrogen purge vaporizer is split to feed both units. The evaluation boundary ends with its connection to the instrument air system downstream of the drywell pneumatic check valves for Units 1 and 2 (evaluated with instrument air system), at the compressor inlet moisture separator isolation valve of the pumpback air system (evaluated with drywell/suppression chamber dp pumpback air system), at the nitrogen makeup cross-tie valve (evaluated with nitrogen containment atmosphere dilution), at the nitrogen supply from the vaporizer to the Unit 1 and Unit 2 drywell and suppression chamber valves (evaluated with nitrogen containment atmosphere dilution) and at the Unit 1 and Unit 2 connection to the high radiation sampling system valves for containment air sampling (evaluated with high radiation sampling system).

The Dresden drywell nitrogen inerting system evaluation boundary begins with the nitrogen primary tank and nitrogen auxiliary tank to the common nitrogen supply header

to the nitrogen purge vaporizer and then routed to both units. The evaluation boundary ends at the compressor upstream suction valve of the pumpback air system (evaluated with drywell/suppression chamber dp pumpback air system), at the NCAD makeup/inerting bypass pressure relief valve inlet isolation valve (evaluated with NCAD), at the nitrogen auxiliary tank emergency supply to vaporizer check valve (evaluated with NCAD), at the nitrogen bypass supply to nitrogen inerting isolation valve (evaluated with NCAD), at the nitrogen bypass supply to nitrogen normal makeup isolation valve (evaluated with NCAD), at the drywell/suppression chamber nitrogen makeup valve (evaluated with primary containment and suppression chamber piping) and at the drywell/suppression chamber nitrogen purge and pumpback suction valve (evaluated with primary containment and suppression chamber piping). All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the drywell nitrogen inerting system.

UFSAR References

Dresden Station UFSAR Section(s): 6.2.5

Quad Cities Station UFSAR Section(s): 6.2.5

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-25, LR-DRE-M-356, and LR-DRE-M-4215.

Quad Cities Station:

LR-QDC-M-24-12, LR-QDC-M-34-2, LR-QDC-M-34-3, LR-QDC-M-71-7,

LR-QDC-M-76-2, LR-QDC-M-1056-4, and LR-QDC-M-1061-4.

System Intended Functions

Supports ESF function(s) – reduces and maintains a low concentration of oxygen in the primary containment. It can also be used, if available, for post-LOCA hydrogen concentration control.

Credited in regulated event(s) – credited in mitigation of the Appendix R fire event by establishing the inert drywell environment in which a design basis fire cannot occur.

Component Groups Requiring Aging Management Review

Table 2.3.3-27 Component Groups Requiring Aging Management Review – Drywell Nitrogen Inerting System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.3.1.22
Filters/Strainers (Dresden only)	Pressure Boundary	3.3.2.25, 3.3.2.51
Filters/Strainers (Dresden only)	Filter	3.3.2.51
Flow Elements	Pressure Boundary	3.3.1.5, 3.3.2.40, 3.3.2.69, 3.3.2.71
Isolation Barriers	Pressure Boundary	3.3.2.124, 3.3.2.125
Piping and Fittings	Pressure Boundary	3.3.1.5, 3.3.2.27, 3.3.2.138, 3.3.2.161
Tanks (includes vaporizers)	Pressure Boundary	3.3.1.5, 3.3.2.21, 3.3.2.40, 3.3.2.210, 3.3.2.212
Thermowells	Pressure Boundary	3.3.1.5, 3.3.2.223
Traps (Quad Cities only)	Pressure Boundary	3.3.1.5, 3.3.2.228
Tubing	Pressure Boundary	3.3.2.22, 3.3.2.34, 3.3.2.35, 3.3.2.40, 3.3.2.43, 3.3.2.231, 3.3.2.239, 3.3.2.248
Valves	Pressure Boundary	3.3.1.5, 3.3.2.23, 3.3.2.25, 3.3.2.40, 3.3.2.260, 3.3.2.262, 3.3.2.268, 3.3.2.273, 3.3.2.289, 3.3.2.295

Aging management review results for the drywell nitrogen inerting system are provided in Section 3.3.

2.3.3.28 Safe Shutdown Makeup Pump System (Quad Cities Only)

System Purpose

The safe shutdown makeup pump (SSMP) system at Quad Cities is a common system that provides cooling water to the Unit 1 or Unit 2 reactor core in the event that the reactor becomes isolated from the main condenser simultaneously with a loss of the feedwater system.

System Operation

The SSMP system consists of a motor-driven pump, associated valves, piping and instrumentation. The preferred water source to the pump is the contaminated condensate storage tank (evaluated with the condensate and condensate storage system). An alternate source of makeup water is available from the fire header (evaluated with the fire protection system). The SSMP discharge is delivered to the reactor vessel (evaluated with the reactor vessel) via the HPCI system pump discharge line (evaluated with the HPCI system).

System Evaluation Boundary

The SSMP system evaluation boundary begins with the SSMP suction line from the common RCIC suction line (evaluated with RCIC system) from the condensate storage tank, the suction line from the fire header (evaluated with the fire protection system), through the SSMP pump. The discharge path runs from the output side of the pump through one of two valves to either the Unit 1 "B" feedwater line (evaluated with the feedwater system), upstream of the outboard primary containment isolation valves, or to the Unit 2 HPCI pump discharge line (evaluated with the HPCI system). The system evaluation boundary also includes the safe shutdown pump room cooler and its associated piping from the service water system (evaluated with service water system) and the alternate supply from the fire header (evaluated with fire protection). All associated piping, components and instrumentation contained within the flow paths and systems described above are included in the SSMP system evaluation boundary.

UFSAR References

Dresden Station UFSAR Section(s): Not Applicable

Quad Cities Station UFSAR Section(s): 5.4.6.5

License Renewal Boundary Diagram References

Dresden Station: Not Applicable

Quad Cities Station:

LR-QDC-M-70

System Intended Functions

Pressure boundary - maintains pressure boundary integrity at interface with HPCI system piping to support injection of cooling water to the RPV.

Credited for regulated event(s) - provides cooling water injection into the reactor pressure vessel credited in mitigation of the Appendix R fire event.

Component Groups Requiring Aging Management Review

Table 2.3.3-28 Component Groups Requiring Aging Management Review – Safe Shutdown Makeup Pump System (Quad Cities only)

Component Group	Component Intended Function	Aging Management Ref
Air Handlers Heating/Cooling (Aux&RW HVAC) (Quad Cities only)	Pressure Boundary	3.3.2.8, 3.3.2.9, 3.3.2.21
Air Handlers Heating/Cooling (Aux&RW HVAC) (Quad Cities only)	Heat Transfer	3.3.2.7
Closure Bolting (Quad Cities only)	Pressure Boundary	3.3.1.22
Ducts & Fittings, Access Doors, Closure Bolts, Equip Frames (Quad Cities only)	Pressure Boundary	3.3.1.5
Filters/Strainers (Quad Cities only)	Pressure Boundary	3.3.1.5, 3.3.1.19
Filters/Strainers (Quad Cities only)	Filter	3.3.1.19
Piping and Fittings (Quad Cities only) (includes spectacle flanges)	Pressure Boundary	3.3.1.5, 3.3.1.8, 3.3.1.19, 3.3.2.40
Pumps (Quad Cities only)	Pressure Boundary	3.3.1.5, 3.3.1.8
Restricting Orifices (Quad Cities only)	Pressure Boundary	3.3.1.8, 3.3.1.25, 3.3.2.40
Restricting Orifices (Quad Cities only)	Throttle	3.3.1.8, 3.3.1.25
Valves (Quad Cities only)	Pressure Boundary	3.3.1.5, 3.3.1.8, 3.3.1.19

Aging management review results are presented in Section 3.3 for the additional functions of the safe shutdown makeup pump system

2.3.4 Steam and Power Conversion Systems

The section of the application addresses scoping and screening results for the following systems:

- Main steam system
- Feedwater system
- Condensate and condensate storage systems
- Main condenser
- Main turbine and auxiliary systems
- Turbine oil (In-scope for Quad Cities only)
- Main generator and auxiliaries (In-scope for Quad Cities only)

2.3.4.1 Main Steam System

System Purpose

The main steam system delivers steam from the reactor pressure vessel to the main turbine and balance of plant auxiliary steam loads.

System Operation

The main steam system transports steam generated by the reactor through the reactor pressure vessel nozzles to the main turbine via main steam stop valves in each of four lines. At Quad Cities only, the main steam system supplies steam to the HPCI and RCIC systems. Steam can be lined up to bypass the main turbine via bypass valves to the main condenser when required (e.g. during plant startup). Main steam isolation valves (MSIVs) and venturi type flow restrictors are installed to minimize reactor coolant inventory loss in the event of a main steam line break. The MSIVs also limit radiation release rates to prevent exceeding the 10 CFR 100 guidelines in the event of main steam line break outside the primary containment. Relief valves and safety valves located on the main steam piping inside primary containment are provided for reactor pressure vessel over pressure protection. The relief valves will operate automatically if steam pressure exceeds the relief valve setpoint or upon receipt of a signal from the automatic depressurization system. They can also be operated manually to reduce reactor pressure vessel pressure. The main steam system also provides steam to the main turbine gland seals, steam jet air ejectors, off-gas pre-heaters and booster air ejectors, as well as the radwaste maximum recycle re-boiler.

System Evaluation Boundary

The main steam system evaluation boundary starts at the four steam lines at the reactor pressure vessel nozzles and runs to and includes the turbine main steam stop valves and the turbine bypass valves via an equalization header. Each main steam line is equipped with safety valves, at least one relief valve, a venturi type flow restrictor followed by an MSIV inside and outside the primary containment. At Quad Cities only, a connection is provided for supplying steam to the HPCI and RCIC turbines, which are evaluated with the HPCI and RCIC systems. Downstream of the inboard and outboard MSIVs are drain lines to the main condenser. The boundary includes piping and components from gland seal for the main turbine, steam jet air ejectors, off-gas pre-heater and booster air ejectors, and radwaste maximum recycle re-boiler. The evaluation boundary includes piping between the reactor pressure vessel and outboard isolation valve, including the main steam line drain piping, even though they are considered part of the reactor coolant pressure boundary. All associated piping, components, and instrumentation contained within the flow paths and systems described above are included in the evaluation boundary. Solenoids, accumulators, pressure controllers, and position switches associated with the automatic depressurization system and manual isolation valves for instruments associated with the feedwater level control system are evaluated as part of the main steam system.

UFSAR References

Dresden Station UFSAR Section(s): 10.3

Quad Cities Station UFSAR Section(s): 10.3

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE--M-12-1, LR-DRE--M-12-2, LR-DRE-M-25, LR-DRE-M-37-2, LR-DRE-M-345-1, LR-DRE-M-345-2, LR-DRE-M-356, and LR-DRE-M-367-2.

Quad Cities Station:
LR-QDC-CID-13-2, LR-QDC-CID-60-2, LR-QDC-M-13-1, LR-QDC-M-13-2, LR-QDC-M-34-1, LR-QDC-M-60-1, LR-QDC-M-60-2, and LR-QDC-M-76-1.

System Intended Functions

Pressure boundary – maintains the integrity of the reactor coolant pressure boundary and provides steam-line isolation to support the reactor coolant pressure boundary.

Core cooling – in conjunction with the Automatic Depressurization System, supports emergency core cooling by depressurizing the reactor pressure vessel as required to support low pressure coolant injection and core spray operation.

Overpressure protection – provides overpressure protection in transient or accident events that increase pressure in the reactor pressure vessel.

Primary containment isolation – provides containment isolation for those portions of the system that interface with the primary containment.

Supports ESF function(s) – provides process signals for initiation of ESF functions, limits coolant inventory loss rate in some LOCA events, and (at Quad Cities only) provides steam supply for operation of the HPCI and RCIC systems.

Credited in regulated event(s) – provides overpressure protection, reactor vessel isolation capability and pressure control capability credited in mitigation of the Appendix R fire, ATWS, and SBO events. The system also contains components that are relied upon for compliance with 10 CFR 50.49, (EQ).

Post accident plateout of MSIV seat leakage – provides surfaces for plateout of iodine releases resulting from MSIV bypass leakage.

Limit steam line flow - This function limits potential radioactive release by restricting steam flow during a steam line rupture outside of primary containment. Flow is also limited to ensure integrity of dryers in order to prevent restriction of MSIV closure.

Steam flow measurement – The main steam system provides main steam flow input for primary containment isolation.

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.4-1 Component Groups Requiring Aging Management Review - Main Steam

Component Group	Component Intended Function	Aging Management Ref
Accumulators	Pressure Boundary	3.4.2.1
Closure Bolting	Pressure Boundary	3.1.1.1, 3.4.1.6
Dampeners (Quad Cities only)	Pressure Boundary	3.1.1.15, 3.4.2.11, 3.4.2.13
Filters/Strainers (Quad Cities only)	Filter	3.4.2.13, 3.4.2.17
Flexible Hoses	Pressure Boundary	3.4.2.18, 3.4.2.19
Flow Elements	Pressure Boundary	3.1.1.11, 3.4.2.6
Flow Elements	Throttle	3.1.1.15
NSR Vents or Drains, Piping and Valves (spatial interaction)	Leakage Boundary (spatial)	3.4.2.30
NSR Vents or Drains, Piping and Valves (attached support)	Structural Integrity (attached)	3.4.2.30
Piping and Fittings	Pressure Boundary	3.1.1.1, 3.1.1.11, 3.1.1.15, 3.2.1.3, 3.2.1.5, 3.4.1.1, 3.4.1.3, 3.4.1.4, 3.4.1.5, 3.4.2.5, 3.4.2.6, 3.4.2.11, 3.4.2.12, 3.4.2.13, 3.4.2.34
Piping and Fittings (small bore)	Pressure Boundary	3.1.1.5, 3.4.1.3, 3.4.2.5, 3.4.2.6, 3.4.2.11, 3.4.2.13
Restricting Orifices	Pressure Boundary	3.4.1.3, 3.4.1.4, 3.4.1.5
Rupture Discs	Pressure Boundary	3.2.1.3, 3.2.1.5, 3.4.2.13
Tanks (Quad Cities only)	Pressure Boundary	3.1.1.15, 3.4.2.11, 3.4.2.13
Thermowells	Pressure Boundary	3.1.1.15, 3.2.1.3, 3.2.1.5, 3.4.2.6, 3.4.2.12
Tubing (attached support)	Structural Integrity (attached)	3.1.2.42, 3.4.2.13
Vacuum Breakers	Pressure Boundary	3.2.1.3, 3.2.1.5, 3.4.2.13
Valves	Pressure Boundary	3.1.1.1, 3.1.1.11, 3.1.1.15, 3.4.1.2, 3.4.1.3, 3.4.1.4, 3.4.1.5, 3.4.2.5, 3.4.2.6, 3.4.2.11, 3.4.2.12, 3.4.2.13, 3.4.2.51, 3.4.2.53
Valves (attached support) (Dresden only)	Structural Integrity (attached)	3.4.2.13, 3.4.2.53

Aging management review results for the main steam system are provided in Section 3.1 for the reactor coolant pressure boundary functions and Sections 3.2 and 3.4 for the additional main steam system functions.

2.3.4.2 Feedwater System

System Purpose

The feedwater system (in conjunction with the condensate system) delivers condensate from the condenser to the reactor at a rate of water equivalent to what is being generated into steam by boil-off and removed by the main steam system.

System Operation

The feedwater system consists of reactor feed pumps (RFPs), feedwater regulating valves (FWRVs), high pressure feedwater heaters, piping, isolation valves, controls and instrumentation, and subsystems that supply the reactor with regenerative feedwater heating in a closed steam cycle. Three horizontal motor driven feed pumps are provided. All three RFPs need to be in service during normal full load operation. The RFPs take suction on a common header downstream of the low-pressure feedwater heaters (evaluated with the condensate and condensate storage system). The normal flowpath is through the RFP discharge check valve, combining into a common header upstream of the FWRVs, through the FWRVs, combining into a common header downstream of the FWRVs. Flow then goes through a common header upstream of the high-pressure (HP) feedwater heaters, through the HP heaters and associated inlet and outlet isolation MOVs to a common header. A HP heater bypass line is sized to carry 33% of rated flow. Flow then goes to the A and B feedwater lines and associated isolation MOV at the outlet of the HP heaters. Flow then passes through the A and B feedwater headers in parallel through two outboard isolation check valves, one inboard isolation check valve, and an inboard manual isolation valve in each line. Feedwater flow is finally directed into the reactor vessel (evaluated with the reactor vessel). Two FWRVs, whose positions are determined by the feedwater level control system are provided for normal power operation and are normally set to automatically maintain reactor water level. One low-flow regulating valve is used for lower power operation.

Other systems using the feedwater lines to provide a flow path to the reactor vessel are the high pressure coolant injection (HPCI) (evaluated as an ESF system) and reactor water cleanup systems (RWCU) (evaluated as an auxiliary system). At Dresden, HPCI and RWCU tap into the B feedwater line to inject fluid during emergency operations (HPCI) or as a return path for water removed from the vessel (RWCU). At Quad Cities, the reactor core injection cooling (RCIC) system (evaluated as an ESF system) and the RWCU system tap into the "A" feedwater line to either inject fluid during emergency operations (RCIC) or as a return path for water removed from the vessel (RWCU). Also at Quad Cities, HPCI and the safe shutdown makeup pump system (evaluated as an auxiliary system) tap into the B feedwater line to either inject fluid during emergency operations (HPCI) or as an injection path for the discharge of the safe shutdown makeup pump.

System Evaluation Boundary

The feedwater system starts with the reactor feed pumps and ends with the reactor feedwater connection at the reactor pressure vessel nozzles (evaluated with the reactor vessel). The system includes the reactor feed pumps, the pump discharge check and motor operated valves, the feedwater regulating valves, the tube side of the high-

pressure (HP) feedwater heaters and its inlet and outlet motor operated isolation valves, the HP feedwater heater bypass valve, the motor operated inlet valve for the A and B feedwater lines, and the inboard and outboard A and B feedwater line check valves, and associated piping, and instrumentation. The reactor feed pump discharge flow elements, the feedwater regulating valves and the low flow feedwater regulating valve, considered part of the feedwater control system, are all evaluated as part of the feedwater system.

UFSAR References

Dresden Station UFSAR Section(s): 10.4.7

Quad Cities Station UFSAR Section(s): 10.4.7

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-14, LR-DRE-M-19, LR-DRE-M-174-3, LR-DRE-M-177-2, LR-DRE-M-347, LR-DRE-M-352, LR-DRE-M-419-2, and LR-DRE-M-420.

Quad Cities Station:

LR-QDC-M-15-1, LR-QDC-M-15-2, LR-QDC-M-62-1, and LR-QDC-M-62-2.

System Intended Functions

Flowpath - provide flowpath into the reactor pressure vessel for high pressure coolant injection, reactor water cleanup and for Quad Cities only, reactor core isolation cooling and safe shutdown makeup pump flow.

Pressure boundary – maintain the integrity of the reactor coolant pressure boundary.

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.4-2 Component Groups Requiring Aging Management Review - Feedwater System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.1.1.1, 3.4.1.6
NSR Vents or Drains, Piping and Valves (attached support)	Structural Integrity (attached)	3.4.2.30
Piping and Fittings	Pressure Boundary	3.1.1.1, 3.1.1.11, 3.4.1.1, 3.4.1.2, 3.4.1.3, 3.4.1.4, 3.4.2.5, 3.4.2.6
Piping and Fittings (spatial interaction)	Leakage Boundary (spatial)	3.4.1.2, 3.4.1.3, 3.4.1.4, 3.4.2.5, 3.4.2.6
Piping and Fittings (attached support)	Structural Integrity (attached)	3.4.1.2, 3.4.1.3, 3.4.1.4, 3.4.2.5, 3.4.2.6
Piping and Fittings (small bore) (Quad Cities only)	Pressure Boundary	3.1.1.5, 3.4.1.3, 3.4.2.5, 3.4.2.6
Valves	Pressure Boundary	3.1.1.1, 3.1.1.11, 3.1.1.15, 3.4.1.3, 3.4.2.5, 3.4.2.6, 3.4.2.11, 3.4.2.12, 3.4.2.13
Valves (attached support)	Structural Integrity (attached)	3.4.1.2, 3.4.1.3, 3.4.1.4, 3.4.2.5, 3.4.2.13, 3.4.2.54

Aging management review results for the feedwater system are provided in Section 3.1 for the reactor coolant pressure boundary functions and Section 3.4 for the additional feedwater system functions.

2.3.4.3 Condensate and Condensate Storage Systems

System Purpose

The condensate and condensate storage systems (in conjunction with the feedwater system) works to provide water of a quality and quantity required for operation of the power plant. The condensate and condensate booster pump portion of the system supply reactor quality water to the suction of the reactor feedwater pumps. The condensate storage system's contaminated condensate storage tanks (CCSTs) ensure reactor quality water is available for makeup requirements, and are designed to ensure a minimum of 90,000 gallons of water is available from each CCST for use by HPCI. The condensate and feedwater systems' pumping functions are not credited to support safe shutdown or to perform any reactor safety function. The CCSTs are also credited for providing makeup to the reactor via the CRD pumps (at Dresden) or the reactor core isolation cooling (RCIC) and safe shutdown makeup pump (SSMP) systems (at Quad Cities) for safe shutdown scenarios in the Fire Protection Plan.

System Operation

The condensate flowpath includes pumps, valves and piping required to transfer the condensate from the condenser hotwell (evaluated with the main condenser) to the suction of the reactor feed pump (RFP) (evaluated with the feedwater system). Four condensate pumps take suction from both sides of the condenser hotwell through a common header. Condensate then flows through the following components, before reaching the RPFs: steam jet air ejector (SJAE) condensers, off-gas condensers, condensate demineralizers, condensate booster pump and the low pressure heaters. The condensate pumps discharge through check valves to the tube side of two SJAE condensers or a 50% capacity bypass line. The bypass line provides a flowpath in the event a SJAE condenser requires maintenance and is orificed to simulate the pressure drop through one condenser. From the SJAE condenser, condensate flows through two gland seal steam condensers (tube side) to the tube side of two off-gas condensers. The condensate then passes through the condensate demineralizers. The demineralizers discharge into a common condensate booster pump suction header from which a condensate reject line to the CCSTs is provided with a normal and emergency reject valve, controlled by hotwell level instrumentation. The condensate booster pump is driven by the same motor that drives its associated condensate pump. A penetration downstream of the booster pump provides recirculation to the main condenser to provide minimum flow required for the SJAE condenser to operate efficiently, provide minimum flow required for the condensate and condensate booster pumps, to cleanup the main condenser water prior to startup and to maintain adequate differential pressure across the demineralizers. Water flows through the tube sides of three parallel strings of low pressure feedwater heaters. The low-pressure feedwater heater bypass line can carry 33% flow during heater string maintenance and is orificed to approximate the pressure drop through one heater string.

System Evaluation Boundary

The condensate and condensate storage systems were evaluated from the outlet of the condenser hotwell through the condensate pumps and condensate booster pumps up to the inlet of the reactor feedwater pump suction piping. System components included in

the evaluation were the condensate pumps, the condensate pump discharge check valves, tube side of the SJAE condensers, tube side of the gland seal condensers and the tube side of the off-gas condensers. Other system components included in the evaluation were the condensate demineralizer motor operated inlet and outlet valves, condensate demineralizer bypass valve, condensate demineralizer post strainers and the tube side of the low pressure heaters. Also included were the manual isolation valves for the all of the aforementioned condensers, the motor operated inlet and outlet valves for all of the low pressure heater strings, the low pressure heater motor operated bypass valve and the associated system component piping and instrumentation. The common system boundary evaluation also includes the CCSTs, standpipes, associated instrumentation, condensate transfer pumps, associated distribution piping and valves. For Dresden only, valves in the main condenser system providing pressure boundary to control rod drive pump suction supply are evaluated with the condensate and condensate storage system, and an isolation valve from the condensate and condensate storage back up supply line is evaluated with the core spray system. The condensate demineralizers were not included in this evaluation; they were evaluated separately in the Auxiliary Systems.

UFSAR References

Dresden Station UFSAR Section(s): 9.2.6 and 10.4.7

Quad Cities Station UFSAR Section(s): 9.2.6 and 10.4.7

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-15, LR-DRE-M-27, LR-DRE-M-29-1, LR-DRE-M-35-1, LR-DRE-M-348, LR-DRE-M-358, LR-DRE-M-360-1, and LR-DRE-M-366.

Quad Cities Station:
LR-QDC-M-16-1, LR-QDC-M-16-2, LR-QDC-M-16-4, LR-QDC-M-16-5, LR-QDC-M-17, LR-QDC-M-36, LR-QDC-M-39-2, LR-QDC-M-63-1, LR-QDC-M-63-2, LR-QDC-M-63-4, LR-QDC-M-64, and LR-QDC-M-81-2.

System Intended Functions

Support ESF function(s) – provide reactor grade water to HPCI, RCIC (at Quad Cities), core spray, LPCI (at Dresden), and RHR (at Quad Cities).

Credited in regulated events – provide water to support mitigating actions for Appendix R fire, SBO, and ATWS.

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.4-3 Component Groups Requiring Aging Management Review - Condensate and Condensate Storage System

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.4.1.6, 3.4.2.2
Piping and Fittings	Pressure Boundary	3.4.1.2, 3.4.1.3, 3.4.1.4, 3.4.2.3, 3.4.2.4, 3.4.2.7, 3.4.2.8, 3.4.2.11, 3.4.2.14, 3.4.2.15, 3.4.2.31, 3.4.2.35
Piping and Fittings (spatial interaction) (Dresden only)	Leakage Boundary (spatial)	3.4.1.2, 3.4.1.3, 3.4.1.4
Piping and Fittings (attached support) (Quad Cities only)	Structural Integrity (attached)	3.4.1.2, 3.4.1.3, 3.4.1.4
Tanks	Pressure Boundary	3.4.2.39, 3.4.2.40, 3.4.2.41, 3.4.2.42
Thermowells (Dresden only)	Pressure Boundary	3.4.1.2, 3.4.1.3, 3.4.1.4, 3.4.2.4, 3.4.2.45
Tubing	Pressure Boundary	3.4.2.3, 3.4.2.4, 3.4.2.11, 3.4.2.14, 3.4.2.46, 3.4.2.47
Valves	Pressure Boundary	3.4.1.3, 3.4.2.3, 3.4.2.4, 3.4.2.7, 3.4.2.11, 3.4.2.14, 3.4.1.2, 3.4.1.4, 3.4.2.49, 3.4.2.54
Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.4.1.2, 3.4.1.3, 3.4.1.4

Aging management review results for the condensate and condensate storage system are provided in Section 3.4.

2.3.4.4 Main Condenser

System Purpose

The main condenser provides a heat sink for the turbine exhaust steam, turbine bypass steam, and other flows. It also deaerates and stores the condensate for reuse after a period of radioactive decay. Additionally, the main condenser provides for post accident containment holdup and plateout of main steam isolation valve (MSIV) bypass leakage. The purpose of the main condenser includes the following functions:

- to provide a heat sink for the turbine exhaust steam.
- to condense the bypass steam after a turbine trip.
- to accommodate feedwater heater drains, extraction steam, and steam line condensate routed to the condenser during operation with feedwater heaters out of service.
- to retain the condensate for a brief time to allow for the decay of short-lived isotopes.
- to deaerate the condensate and remove fission product gases, hydrogen, and oxygen.
- to provide adequate net positive suction head for condensate pumps.
- to provide for iodine plateout and radioactive decay prior to release.

The main condenser provides a surface for iodine plateout and the hold-up volume for radioactive decay prior to release that is credited in analysis of the Control Rod Drop Accident and in evaluation of the MSIV bypass leakage following a design basis LOCA.

System Operation

The main condenser is a divided water flow, single-pass, multi-pressure, deaerating type with capacity for reverse flow for each half of the condenser. The condenser is designed to accept bypass steam up to approximately 30% of throttle steam flow. During plant operation, steam, after expanding through the low-pressure turbine, exhausts through the bottom of the turbine casing to the condenser. The divided water flow permits circulating water to be reversed periodically through each bank of tubes in each half of the condenser for cleaning purposes. The condenser shell is supported on the turbine foundation mat. An expansion joint is fitted between each low-pressure turbine exhaust hood and condenser inlet connection. The condenser is divided into three separate compartments by two division plates. Cold circulating water enters the cold compartment, which has 100% condensing capacity. The intermediate compartment has 99% condensing capacity because of the warmer temperature of the circulating water. The warm compartment has 97-98% condensing capacity. The excess steam is called reheat steam and is used for deaerating purposes. The reheat steam heats the condensate streams at the weir plate to a boiling temperature that liberates the dissolved noncondensable gases. Vent pipes passing through the lower de-aerating weir plate and collecting tray vent the noncondensable gases to the tube bundle in the intermediate compartment. The air in-leakage and noncondensable gases

are transported via vent pipes to the air cooler trays, which extend the entire condenser length. These gases are removed by the main condenser evacuation system. The condenser hotwells retain the condensate for a brief time to allow short-lived radioactive isotopes to decay to levels that eliminate the need for shielding of the condensate pumps. This condensate retention is accomplished by a series of baffles and tunnel arrangements at the condensate outlet. The condensate is pumped from outlet pipes by the condensate pumps.

System Evaluation Boundary

The evaluation boundary for the main condenser is the condenser shell and condenser tubes, from the low-pressure turbine exhaust inlets and main steam drain line inlets to the condenser hotwell. Included within this boundary are the instrumentation and controls to monitor condenser status and performance. The hotwell sample pumps and components from the main condenser to the sample panel is included in the boundary. The boundary does not include any components of the condensate and condensate storage system, condensate demineralizer subsystem, steam jet air ejector subsystem, turbine bypass subsystem or the circulating water system

UFSAR References

Dresden Station UFSAR Section(s): 10.4 and 15.6.5.5.2

Quad Cities Station UFSAR Section(s): 10.4 and 15.6.5.5.3

License Renewal Boundary Diagram References

Dresden Station:
LR-DRE-M-15, LR-DRE-M-43-1, LR-DRE-M-177-1, LR-DRE-M-348, LR-DRE-M-371-1, and LR-DRE-M-419-1.

Quad Cities Station:
LR-QDC-M-16-1, LR-QDC-M-16-2, LR-QDC-M-16-4, LR-QDC-M-17, LR-QDC-M-63-1, LR-QDC-M-63-2, LR-QDC-M-63-4, LR-QDC-M-64, LR-QDC-M-459-3, and LR-QDC-M-462-3.

System Intended Functions

Post accident containment, holdup and plateout of MSIV bypass leakage - The main condenser provides for post accident containment, holdup and plateout of MSIV bypass leakage.

Component Groups Requiring Aging Management Review

Table 2.3.4-4 Component Groups Requiring Aging Management Review - Main Condenser

Component Group	Component Intended Function	Aging Management Ref
Main Condenser Hotwells, False Floors (includes hatches)	Containment Holdup and Plateout	3.4.2.24, 3.4.2.27
Main Condenser Tubes, Tubesheets (includes hatches)	Containment Holdup and Plateout	3.4.2.25, 3.4.2.26
Main Condenser Waterboxes, Hatches	Containment Holdup and Plateout	3.4.2.27, 3.4.2.28

Aging management review results for the main condenser are provided in Section 3.4.

2.3.4.5 Main Turbine and Auxiliary Systems

System Purpose

The main turbine converts the thermodynamic energy of reactor steam into rotational mechanical energy to drive the main generator. The main turbine consists of one high-pressure (HP) section, and three low pressure (LP) sections. The main turbine is supported by auxiliary systems. The gland sealing system provides gland-sealing steam to the HP and LP turbine glands to prevent steam from entering the turbine building and non-condensables from entering the condenser. The exhaust hood spray system provides cooling water to the condenser exhaust hood at low load, when steam flow through the last few turbine stages is low and insufficient cooling is provided. The turbine electrohydraulic control (EHC) system provides high-pressure fluid and logic to control the turbine main stop valves (MSVs), turbine control valves (TCVs), combined intermediate valves, bypass valves, and the reactor pressure through pressure regulators.

System Operation

Steam is delivered from the reactor pressure vessel through four main steam lines and the turbine throttle to the main stop valves (MSVs) (evaluated with the main steam system), or to other loads on the main steam system (max-recycle reboiler, seal steam regulator, steam jet air ejector regulator, bypass valves, off-gas preheater, and off-gas booster jet/dilution steam). From the MSVs, steam is passed through the steam chest (the area from below the seats of the MSVs to the TCV seats), through the TCVs, and then through the HP turbine section. The steam is then routed to four moisture separators, where steam drying occurs. The dry steam is admitted through six combined intercept valves to the LP turbine sections and exhausted to the main condenser (evaluated with the main condenser system). Extraction steam for the feedwater heaters is drawn from various LP turbine stages. The four TCVs are welded to the MSVs and are completely throttleable as determined by the EHC system. The TCVs regulate the steam to the turbine within the capability of the reactor to supply steam and thereby control reactor pressure. Additionally, the TCVs provide control for rolling, synchronizing and loading the main turbine and generator.

System Evaluation Boundary

The main turbine and auxiliary systems starts with the steam chest (after the main stop valves) and ends at the condenser. Main turbine includes the steam chest, turbine control valves, turbine bypass valves, main turbine, moisture separator tanks, combined intermediate valves, LP turbines, and associated piping, valves, instrumentation, and controls. Auxiliary systems include EHC, off-gas booster air ejectors, turbine gland sealing, exhaust hood spray, gland seal exhaust, steam supply to steam jet air ejectors and associated piping, valves, instrumentation, and controls.

UFSAR References

Dresden Station UFSAR Section(s): 7.7.4, 10.2

Quad Cities Station UFSAR Section(s): 7.7.4, 10.2

License Renewal Boundary Diagram References

Dresden Station:

LR-DRE-M-5650-2 and LR-DRE-M-5650-5.

Quad Cities Station:

LR-QDC-M-2022-2 and LR-QDC-M-2022-4.

System Intended functions

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.4-5 Component Groups Requiring Aging Management Review - Main Turbine and Auxiliary Systems

Component Group	Component Intended Function	Aging Management Ref
Accumulators (spatial interaction)	Leakage Boundary (spatial)	3.4.2.11, 3.4.2.29
Closure Bolting	Pressure Boundary	3.4.1.6
Piping and Fittings (spatial interaction)	Leakage Boundary (spatial)	3.4.2.11, 3.4.2.36
Tubing (spatial interaction) (Includes flex hoses)	Leakage Boundary (spatial)	3.4.2.11, 3.4.2.48
Valves (spatial interaction) (Includes flex hoses)	Leakage Boundary (spatial)	3.4.2.11, 3.4.2.55

Aging management review results for the main turbine and auxiliary systems are provided in Section 3.4.

2.3.4.6 Turbine Oil System (In-Scope for Quad Cities Only)

System Purpose

The turbine oil system at Quad Cities supplies lubricating oil to the main turbine and generator journal bearings, the thrust bearing and thrust bearing wear detector, the mechanical overspeed trip device (for testing), the overspeed trip reset, and the turning gear. The lubricating oil storage and transfer system is used to store, transfer, and purify lubricating oil for use within the main turbine oil system, hydrogen seal oil system, reactor feed pumps and recirculation MG set lubricating oil systems.

System Operation

The turbine oil system supplies all the necessary lubricating oil to the main turbine and its support systems to allow the turbine to be operated properly. The system is required to be in service during startups, normal operations, shutdowns, and at any time the turbine is on the turning gear. And depending upon the operating status of the turbine, the turbine oil system uses one of the six oil pumps to transfer oil from the lube oil reservoir to the turbine and generator components. The oil is cooled and filtered as necessary prior to delivery to the components.

System Evaluation Boundary

Major system components include main turbine oil reservoir, oil driven turbine and booster pump, baffler valves, emergency bearing oil pump, turning gear oil pump, motor suction pump, turbine oil coolers, vapor extractor and the turbine oil filters & pumps. Also included are the turbine bearing oil lift pumps, emergency seal oil pump, main seal oil pump, recirculating seal oil pump, seal oil vacuum pump, hydrogen seal oil vacuum tank and the bulk lubricating oil storage and transfer system. Additionally, included are the system piping, valves, instrumentation and controls to fill the turbine oil tank and to supply oil from the turbine oil tank to the main turbine lubricating oil system, hydrogen seal oil system, reactor feed pumps, HPCI turbine lubricating oil and recirculation MG set lubricating oil systems.

At Quad Cities, portions of this system are in proximity to safety related electrical components.

UFSAR References

Dresden Station UFSAR Section(s): Not applicable

Quad Cities Station UFSAR Section(s): None

License Renewal Boundary Diagram References

Dresden Station: Not applicable

Quad Cities Station:

LR-QDC-M-46-3, LR-QDC-M-48-1, LR-QDC-M-48-5, and LR- LR-QDC-M-48-9.

System Intended functions

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.4-6 Component Groups Requiring Aging Management Review - Turbine Oil System (In-scope for Quad Cities only)

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting (Quad Cities only)	Pressure Boundary	3.4.1.6
Filters/Strainers (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.1.3, 3.4.2.16
Piping and Fittings (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.1.3, 3.4.2.32
Piping and Fittings (attached support) (Quad Cities only)	Structural Integrity (attached)	3.4.1.3, 3.4.2.32
Pump Casings (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.2.9, 3.4.2.37
Tanks (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.1.3, 3.4.2.43
Valves (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.1.3, 3.4.2.50
Valves (attached support) (Quad Cities only)	Structural Integrity (attached)	3.4.1.3, 3.4.2.50

Aging management review results for the turbine oil system are provided in Section 3.4.

2.3.4.7 Main Generator and Auxiliaries (In-Scope for Quad Cities Only)

System Purpose

The main generator and auxiliaries system consists of the main generator, main generator exciter, main generator stator coolers, and the isolated phase bus system. The stator water cooling system removes the heat produced in the generator armature conductors caused by heating losses and removes the heat produced in the main generator field rectifiers. The isolated phase bus system cools the conductors, which connect the generator to the main transformer.

System Operation

The main generator converts the mechanical energy of the turbine into electrical energy. The main generator exciter provides regulated excitation to the generator field windings to control generator output voltage and current. The main generator stator coolers provide clean, de-ionized cooling water to the stator and exciter during plant operation. The isolated phase bus electrically connects the main generator and the unit auxiliary transformer, and cools the main phase conductors.

System Evaluation Boundary

The system evaluation includes the main generator and auxiliaries components located in the Turbine Building. The auxiliary systems include the main generator exciter, stator water cooling system, and the isolated phase bus system.

At Quad Cities, portions of this system are in proximity to safety related electrical components.

UFSAR References

Dresden Station UFSAR Section(s): Not applicable

Quad Cities Station UFSAR Section(s): 8.3

License Renewal Boundary Diagram References

Dresden Station: Not applicable

Quad Cities Station:

LR-QDC-M-2020-1 and LR-LR-QDC-M-2020-2.

System Intended functions

Preclude adverse effects on safety-related SSCs – Non-safety related components that could be a hazard to safety related SSCs maintain sufficient integrity so that the intended function of safety related SSCs is not adversely affected.

Component Groups Requiring Aging Management Review

Table 2.3.4-7 Component Groups Requiring Aging Management Review - Main Generator and Auxiliaries (In-scope for Quad Cites only)

Component Group	Component Intended Function	Aging Management Ref
Closure Bolting	Pressure Boundary	3.4.1.6
Heat Exchangers (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.2.11, 3.4.2.20
Housings (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.2.11, 3.4.2.21
Piping and Fittings (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.2.11, 3.4.2.33
Pumps (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.2.11, 3.4.2.38
Tanks (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.2.11, 3.4.2.44
Valves (spatial interaction) (Quad Cities only)	Leakage Boundary (spatial)	3.4.2.11, 3.4.2.52

Aging management review results for the main generator and auxiliaries system are provided in Section 3.4.

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

The structure scoping and screening results consist of lists of components and component groups that require aging management review, arranged by structure. Brief descriptions and intended functions are provided for structures within the scope of license renewal. For each in-scope structure, components or component groups requiring an aging management review are provided.

In addition to the structures within the scope of license renewal presented in this section, the commodities identified as component supports and insulation within the scope of license renewal were evaluated.

For each structure within the scope of license renewal, this section provides the following information:

- Purpose of the structure,
- A description of the structure,
- Reference to the applicable UFSAR sections,
- Reference to the applicable license renewal boundary diagrams,
- The intended functions of the structure within the scope of license renewal,
- A listing of the components or component groups that require aging management review, and the associated component intended functions and aging management reference to the aging management review results provided in Chapter 3.

A discussion of component groups, and component intended functions is provided in Section 3.0.

For component supports and insulation (commodities), this section provides the following information:

- A general description of commodity,
- A listing of the components or component groups that require aging management review and associated component intended functions and aging management reference to the aging management review results provided in Chapter 3.

Section 3.5 provides the results of the aging management reviews for the identified component groups.

The containments, structures, and component supports scoping and screening results are provided for the following structures and commodity groups:

- Primary Containment
- Reactor Building
- Main Control Room and Auxiliary Electric Equipment Room
- Turbine Building

- Diesel Generator Buildings
- Station Blackout Building and Yard Structures
- Isolation Condenser Pump House (Dresden Only)
- Makeup Demineralizer Building (Dresden Only)
- Radwaste Floor Drain Surge Tank
- Miscellaneous Foundations
- Crib House
- Unit 1 Crib House (Dresden only)
- Station Chimney
- Cranes and Hoists
- Component Supports Commodity Group
- Insulation Commodity Group

2.4.1 Primary Containment

Purpose of the Structure

The primary containment provides a barrier that controls the release of fission products to the secondary containment in the event of a loss-of-coolant accident. It also provides structures and a water pool that limit the pressure increase in the containment in the event of a loss-of-coolant accident.

Description of the Structure

The primary containment is a General Electric Mark I design. It consists of a drywell; a pressure suppression chamber that is partially filled with water, and a vent system connecting the drywell and the suppression chamber. The design, fabrication, and inspection of the primary containment was in accordance with the requirements of the ASME Pressure Vessel Code, Section III, Class B. It is a Class I structure.

The drywell is a steel pressure vessel with a spherical lower section and a cylindrical upper section. A portion of the lower spherical section is embedded in concrete. This embedment, in combination with upper lateral supports that are attached to the cylindrical section, forms the reactor support system. The drywell houses the reactor vessel, the reactor coolant recirculation system, and branch connections of the reactor primary system. It includes structural steel framing, a concrete radiation shield wall between the reactor pressure vessel and the drywell walls, a removable steel head, an equipment hatch and other access hatches, a personnel airlock with two mechanically interlocked doors, and penetrations.

The drywell head is removed during refueling operations. The head is held in place by bolts and is sealed with a double gasket, tongue-and-groove arrangement that permits checks for leak tightness without pressurizing the entire containment.

The pressure suppression chamber is a toroidal shaped, steel pressure vessel encircling the base of drywell. The suppression chamber is commonly called the torus and includes internal steel framing, supports, access hatches, and penetrations. The suppression chamber is mounted on support structures that transmit loads to the concrete foundation of the reactor building.

Eight circular vent lines form a connection between the drywell and the pressure suppresion chamber. These drywell vent lines are connected to a header which is contained within the air space of the suppression chamber. The header downcomers terminate below the suppression chamber water level.

The primary containment also contains structural interfacing components of the electrical penetrations.

UFSAR References

Dresden Station UFSAR Section(s): 6.2.1, 3.2.1

Quad Cities Station UFSAR Section(s): 6.2.1, 3.2.1

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1

Quad Cities Station: LR-QDC-M-1

Structure Intended Functions

Primary Containment - controls the release of fission products to the secondary containment in the event of design basis loss-of-coolant accidents (LOCA) so that offsite consequences are within acceptable limits.

Physical support and protection - provides physical support and protection for safety related components and components relied upon to demonstrate compliance with Fire Protection, ATWS, and SBO regulated events. The structure also contains components that are relied upon for compliance with 10 CFR 50.49, (EQ).

Pressure suppression - provides sufficient air and water volumes to absorb the energy released to the containment in the event of design basis events so that the pressure is within acceptable limits.

Water source - provides a source of water for emergency core cooling systems.

Radiation shielding - biological shield wall between the reactor pressure vessel and the drywell walls provides protection to personnel and components from radiation.

Component Groups Requiring Aging Management Review

Table 2.4-1 Component Groups Requiring Aging Management Review - Primary Containment

Component	Component Intended Function	Aging Management Ref
Beam Seats	Structural Support	3.5.1.20
Concrete & Grout	Structural Support	3.5.1.29
Concrete Slabs	Structural Support	3.5.1.20, 3.5.1.27
Concrete Walls	Structural Support	3.5.1.20, 3.5.1.27
Concrete Walls	Shelter, Protection, Shielding	3.5.1.20, 3.5.1.27
Containment Penetrations (Electrical)	Structural Support	3.5.1.3
Containment Penetrations (Electrical)	Fission Product Barrier	3.5.1.3
Containment Penetrations (Electrical)	Structural Pressure Barrier	3.5.1.3
Containment Penetrations (Mechanical)	Structural Support	3.5.1.3
Containment Penetrations (Mechanical)	Fission Product Barrier	3.5.1.3

Table 2.4-1 Component Groups Requiring Aging Management Review - Primary Containment (Continued)

Component	Component Intended Function	Aging Management Ref
Containment Penetrations (Mechanical)	Structural Pressure Barrier	3.5.1.3
Containment Penetrations Bellows	Fission Product Barrier	3.5.1.2
Containment Penetrations Bellows	Structural Pressure Barrier	3.5.1.2
Downcomers	Structural Pressure Barrier	3.5.1.12, 3.5.1.14
Drywell Expansion Foam	Expansion/Separation	3.5.2.8
Drywell Heads	Structural Support	3.5.1.12, 3.5.1.14
Drywell Heads	Fission Product Barrier	3.5.1.12, 3.5.1.14
Drywell Heads	Structural Pressure Barrier	3.5.1.12, 3.5.1.14
Drywells	Structural Support	3.5.1.12, 3.5.1.14
Drywells	Fission Product Barrier	3.5.1.12, 3.5.1.14
Drywells	Structural Pressure Barrier	3.5.1.12, 3.5.1.14
Hatches	Structural Pressure Barrier	3.5.1.4, 3.5.1.5
Misc. Steel (Includes Stairs, Ladders, Platforms, Gratings)	Non-S/R Structural Support	3.5.1.20
Penetration Sleeves, Penetration Bellows	Structural Support	3.5.1.1
Penetration Sleeves, Penetration Bellows	Fission Product Barrier	3.5.1.1
Penetration Sleeves, Penetration Bellows	Structural Pressure Barrier	3.5.1.1
Seals	Structural Pressure Barrier	3.5.1.6
Steel Embedments	Structural Support	3.5.1.20
Steel Panels and Cabinets	Structural Support	3.5.1.20
Structural Steel	Structural Support	3.5.1.20
Suppression Chambers	Structural Support	3.5.1.12, 3.5.1.13, 3.5.1.14
Suppression Chambers	Fission Product Barrier	3.5.1.12, 3.5.1.13, 3.5.1.14
Suppression Chambers	Structural Pressure Barrier	3.5.1.12, 3.5.1.13, 3.5.1.14
Thermowells	Structural Support	3.5.2.15
Thermowells	Structural Pressure Barrier	3.5.2.15
Vent Headers	Structural Support	3.5.1.13
Vent Headers	Structural Pressure Barrier	3.5.1.12, 3.5.1.13, 3.5.1.14
Vent Line Bellows	Structural Support	3.5.1.13
Vent Line Bellows	Structural Pressure Barrier	3.5.1.13, 3.5.1.17
Vent Lines	Structural Support	3.5.1.12, 3.5.1.14

Table 2.4-1 Component Groups Requiring Aging Management Review - Primary Containment (Continued)

Component	Component Intended Function	Aging Management Ref
Vent Lines	Structural Pressure Barrier	3.5.1.12, 3.5.1.14
Walls, Ceilings, Floors	Fire Barrier	3.3.1.28

Aging management review results for the primary containment are provided in Sections 3.3 and 3.5.

2.4.2 Reactor Building

Purpose of the Structure

The reactor building serves as the secondary containment. The secondary containment, in conjunction with other engineered safeguards and nuclear safety systems, limits the release of radioactive materials ensuring that site exposure resulting from a postulated design basis accident will remain below 10 CFR 100 guideline values. The reactor building provides secondary containment when the primary containment is in service and provides primary containment during reactor refueling and maintenance operations when the primary containment system is open.

Description of the Structure

A single seismic Class I reactor building for each unit completely encloses both reactor and primary containment structures, and auxiliary systems of the nuclear steam supply system. A major sub-structure within the reactor building is a reinforced concrete biological shield that surrounds each reactor and drywell portion of the primary containment. Additionally, the building houses the spent fuel pool, steam dryer/moisture separator storage pool, the new fuel storage vault, reactor cavity, reactor auxiliary equipment, refueling equipment and reactor servicing equipment. The reactor building consists of monolithic reinforced concrete floors and walls from its foundation to the refueling floor, with a separation wall between the two units. Above this floor, is the common refueling floor, where the building superstructure consisting of structural steel framing, sealed sheet metal siding and a pre-cast concrete roof, provide secondary containment integrity. The building is designed to contain positive internal pressure without structural failure and without pressure relief. Blowoff panels are installed as part of the reactor building superstructure siding to relieve pressure and control potential damage under short-term tornado loads. Personnel interlock/airlock access control doors have seals and are electrically controlled so that only one door in an "airlock" can be open at a time.

The containment barrier function of the reactor building is achieved through design and construction low leakage of air through the interlock/airlock doors, pipe and electrical penetration seals, and the building walls and roof. During normal operation, pressure in the building is automatically maintained at a slight negative pressure by controlling the exhaust to minimize exfiltration of airborne radioactive contamination, even under high wind conditions. The reactor building ventilation system (evaluated with HVAC-reactor building) is isolated on a secondary containment isolation signal.

Other structural components evaluated in this section include the reactor building penetrations and doors, equipment access building, the spent fuel pool, high density spent fuel racks, crane rails and the new fuel storage vault with associated components.

Reactor building structural items evaluated in other areas include the refueling platforms (evaluated with refueling equipment) and reactor building cranes (evaluated with cranes and hoists).

UFSAR References
Dresden Station UFSAR Section(s): 6.2.3, 3.2.1
Quad Cities Station UFSAR Section(s): 6.2.3, 3.2.1

License Renewal Boundary Diagram References
Dresden Station: LR-DRE-M-1
Quad Cities Station: LR-QDC-M-1

Structure Intended Functions

Containment - controls the potential release of fission products to the external environment so that offsite consequences of design basis events are within acceptable limits. The reactor building provides secondary containment function when the primary containment is required to be in service and provides primary containment function during reactor refueling and maintenance operations when the primary containment systems are open.

Physical support and protection - provides physical support for safety related and non-safety related components, protection for all personnel and safety related components; and components relied upon to demonstrate compliance with regulated events.

Protection and Radiation Shielding – provides leak-tight boundary to protect public health and safety in the event of postulated design basis events and radiation shielding.

Protection – provides protection for safe storage of new fuel.

Component Groups Requiring Aging Management Review

Table 2.4-2 Component Groups Requiring Aging Management Review – Reactor Building

Component	Component Intended Function	Aging Management Ref
Blowout Panels	Structural Pressure Barrier	3.5.1.20
Caulking/Sealants	Structural Pressure Barrier	3.5.2.4
Concrete & Grout	Structural Support	3.5.1.29
Concrete Beams	Structural Support	3.5.1.20, 3.5.1.21
Concrete Columns	Structural Support	3.5.1.20, 3.5.1.21, 3.5.1.27
Concrete Curbs	Direct Flow	3.5.1.20
Concrete Slabs	Structural Support	3.5.1.20, 3.5.1.21
Concrete Slabs	Shelter, Protection, Shielding	3.5.1.20
Concrete Walls	Structural Support	3.5.1.20, 3.5.1.21
Concrete Walls	Shelter, Protection, Shielding	3.5.1.20
Concrete Walls	Structural Pressure Barrier	3.5.1.20
Door Seals	Flood Barrier	3.5.2.7

Table 2.4-2 Component Groups Requiring Aging Management Review – Reactor Building (Continued)

Component	Component Intended Function	Aging Management Ref
Fire Doors	Fire Barrier	3.3.2.4
Fire Doors (Dresden only)	Shelter, Protection, Shielding	3.3.2.4
Fire Proofing	Fire Barrier	3.3.2.62
Fire Wrap	Fire Barrier	3.3.2.63
Foundations	Structural Support	3.5.1.20, 3.5.1.21, 3.5.1.25, 3.5.1.26
Liners	Structural Pressure Barrier	3.5.1.23
Masonry Walls	Structural Support	3.5.1.24
Masonry Walls	Fire Barrier	3.3.2.129
Masonry Walls	Missile Barrier	3.5.1.24
Masonry Walls	HELB Shielding	3.5.1.24
Metal Decking	Structural Support	3.5.1.20
Metal Siding	Shelter, Protection, Shielding	3.5.1.20
Metal Siding	Structural Pressure Barrier	3.5.1.20
Misc. Steel (Includes Grating, Ladders)	Structural Support	3.5.1.20
Misc. Steel (Includes Kick Plates, Ladders, Platforms, Stairs, Railing)	Non-S/R Structural Support	3.5.1.20
Neutron-Absorbing Sheets	Absorb Neutrons	3.3.1.12, 3.3.1.9
New Fuel Racks	Structural Support	3.5.2.10
Penetration Seals (Includes Secondary Containment Boot Seal)	Fire Barrier	3.3.1.18
Penetration Sleeves	Non-S/R Structural Support	3.5.1.20
Precast Concrete Panels	Structural Support	3.5.1.20
Precast Concrete Panels	Shelter, Protection, Shielding	3.5.1.20
Roofing	Shelter, Protection, Shielding	3.5.2.11
Secondary Containment Boot Seals	Structural Pressure Barrier	3.5.2.12
Steel Doors	Shelter, Protection, Shielding	3.5.1.20
Steel Doors	Flood Barrier	3.5.1.20
Steel Doors	Structural Pressure Barrier	3.5.1.20
Steel Embedments	Structural Support	3.5.1.20
Steel Panels and Cabinets	Structural Support	3.5.1.20
Steel Plates	Missile Barrier	3.5.1.20
Steel Plates	HELB Shielding	3.5.1.20
Steel Plates	Direct Flow	3.5.1.20

Table 2.4-2 Component Groups Requiring Aging Management Review – Reactor Building (Continued)

Component	Component Intended Function	Aging Management Ref
Storage Racks	Structural Support	3.3.1.11
Structural Steel (includes flued head anchor support)	Structural Support	3.5.1.20
Structural Steel	HELB Shielding	3.5.1.20
Structural Steel	Pipe Whip Restraint	3.5.1.20
Walls, Ceilings, Floors	Fire Barrier	3.3.1.28

Aging management review results for the reactor building are provided in Sections 3.3 and 3.5.

2.4.3 Main Control Room and Auxiliary Electric Equipment Room

Purpose of the Structure

The main control room and auxiliary electric equipment room provide protection and structural support of the control equipment required for normal station operation and for shutdown of the plant under abnormal conditions. The main control room provides protection to safety related components and to operating personnel from radiation exposure, High Energy Line Break (HELB), tornado and internally generated missiles.

Description of the Structure

The main control room and auxiliary electric equipment room contain the controls for normal station operation and for shutdown of the plant under abnormal conditions. This combined structure is seismic Class I, primarily reinforced concrete, capable of accommodating loading conditions imposed during any design basis accident (DBA) without failure.

The Dresden main control room has reinforced concrete and reinforced concrete block walls, with a reinforced concrete floor and ceiling. The Dresden auxiliary electric equipment room serves as the cable spreading room for both units and houses the computer room. It is classified as a Class II structure, which has been investigated to assure that the integrity of the Class I items is not compromised. The auxiliary electrical equipment room is a reinforced concrete structure, with structural steel support elements, a reinforced concrete floor, and the control room floor above, as its ceiling.

The Quad Cities main control room, auxiliary electrical equipment room, and the cable spreading room complex is a Class I structure, designed to accommodate loading conditions imposed during any DBA without failure. The control room is heavy-walled, constructed of ordinary reinforced concrete and of magnetite (high density) concrete, with ordinary reinforced concrete for the control room and cable spreading room floor, and ordinary reinforced concrete for the auxiliary electric equipment room floor slab, and roof slab. The cable spreading room is located directly below the main control room and above the auxiliary electrical equipment room and is used solely for the routing of instrument and control cables. The auxiliary electrical equipment room contains alternate safe shutdown equipment and the cabling from the tunnel below to the cable spreading room.

UFSAR References

Dresden Station UFSAR Section(s): 3.1.1.3.1, 3.2.1, 3.2.6 and 6.4

Quad Cities Station UFSAR Section(s): 3.1.3.1, 3.2.1 and 6.4

License Renewal Boundary Diagram References

Dresden Station: None

Quad Cities Station: None

Structure Intended Functions

Physical support and protection - provides physical support and protection for safety related components and components relied upon to demonstrate compliance with Fire Protection and SBO regulated events.

Personnel protection - provides shelter, protection and radiation shielding for essential operating personnel.

Component Groups Requiring Aging Management Review

Table 2.4-3 Component Groups Requiring Aging Management Review - Main Control Room and Auxiliary Electric Equipment Room

Component	Component Intended Function	Aging Management Ref
Concrete & Grout	Structural Support	3.5.1.29
Concrete Beams (Quad Cities only)	Structural Support	3.5.1.20
Concrete Columns (Quad Cities only)	Structural Support	3.5.1.20
Concrete Curbs (Dresden only)	Direct Flow	3.5.1.20
Concrete Manholes (Dresden only)	Structural Support	3.5.1.20
Concrete Manholes (Dresden only)	Fire Barrier	3.3.1.28
Concrete Slabs	Structural Support	3.5.1.20, 3.5.1.21, 3.5.1.27
Concrete Slabs	Shelter, Protection, Shielding	3.5.1.20, 3.5.1.21, 3.5.1.27
Concrete Walls	Structural Support	3.5.1.20
Concrete Walls	Shelter, Protection, Shielding	3.5.1.20, 3.5.1.27
Fire Doors	Fire Barrier	3.3.2.4
Fire Proofing	Fire Barrier	3.3.2.62
Fire Wrap	Fire Barrier	3.3.2.63
Foundations	Structural Support	3.5.1.20, 3.5.1.21, 3.5.1.25, 3.5.1.26
Masonry Walls	Structural Support	3.5.1.24
Masonry Walls	Fire Barrier	3.3.2.129
Masonry Walls	Shelter, Protection, Shielding	3.5.1.24

Table 2.4-3 Component Groups Requiring Aging Management Review - Main Control Room and Auxiliary Electric Equipment Room (Continued)

Component	Component Intended Function	Aging Management Ref
Masonry Walls	Missile Barrier	3.5.1.24
Metal Decking (Dresden only)	Structural Support	3.5.1.20
Misc. Steel (Quad Cities only)	Structural Support	3.5.1.20
Penetration Seals	Fire Barrier	3.3.1.18
Penetration Seals (Dresden only)	Non-S/R Structural Support	3.3.1.18
Penetration Sleeves	Non-S/R Structural Support	3.5.1.20
Roofing (Quad Cities only)	Shelter, Protection, Shielding	3.5.2.11
Steel Embedments	Structural Support	3.5.1.20
Steel Panels and Cabinets	Structural Support	3.5.1.20
Structural Steel	Structural Support	3.5.1.20
Walls, Ceilings, Floors	Fire Barrier	3.3.1.28

Aging management review results for the main control room and auxiliary electric equipment room are provided in Sections 3.3 and 3.5.

2.4.4 Turbine Building

Purpose of the Structure

The purpose of the turbine building is the protection of the main turbine generators and other plant equipment from environmental hazards and missiles, as well as providing structural support for equipment and radiation shielding.

Description of the Structure

The turbine building is a common structure shared by both units at each station. Located in one side or half of the turbine building are the turbine-generator, exciter, condenser, feedwater heaters, feedwater and condensate pumps, demineralizer system, condenser circulating system and electrical switchgear. Duplicate equipment and systems for the other unit are located in the other half of the building. Each turbine building superstructure consists of a structural steel frame-type design with metal siding from the turbine floor up. All Class I components in the turbine building are located in levels below the turbine main floor within a reinforced concrete structure with capabilities similar to the reactor building. Large equipment, located in the superstructure, is designed and supported to preclude failure that could damage equipment related to the ECCS systems or cause significant release of radioactivity.

The building is a Class II structure and provides Class I protection in areas where Class I items and associated SSCs are located. Exceptions are the swing emergency diesel generators and Quad Cities emergency diesel generators which are evaluated in the Emergency Diesel Generator Room. The turbine building cranes are evaluated with cranes and hoists.

UFSAR References

Dresden Station UFSAR Section(s): 1.2.2.2

Quad Cities Station UFSAR Section(s): 1.2.2.2

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1

Quad Cities Station: LR-QDC-M-1

Structure Intended Functions

Physical support and protection - provides physical support and protection for safety related components and components relied upon to demonstrate compliance with regulated events.

Radiation shielding – provides shielding that protects personnel and components from radiation.

Protection – provides missile barrier protection for internally and externally generated events and the flood protection for SSCs.

Component Groups Requiring Aging Management Review

Table 2.4-4 Component Groups Requiring Aging Management Review - Turbine Building

Component	Component Intended Function	Aging Management Ref
Caulking/Sealants	Structural Pressure Barrier	3.5.2.3, 3.5.2.4
Concrete & Grout	Structural Support	3.5.1.29
Concrete & Grout	Non-S/R Structural Support	3.5.1.29
Concrete Beams	Structural Support	3.5.1.20, 3.5.1.27
Concrete Columns	Structural Support	3.5.1.20
Concrete Curbs	Direct Flow	3.5.1.20
Concrete Manholes	Structural Support	3.5.1.20
Concrete Manholes	Shelter, Protection, Shielding	3.5.1.20
Concrete Slabs	Structural Support	3.5.1.20
Concrete Walls	Structural Support	3.5.1.20
Fire Doors	Fire Barrier	3.3.1.18
Fire Proofing	Fire Barrier	3.3.2.62
Fire Wrap	Fire Barrier	3.3.2.63
Foundations	Structural Support	3.5.1.20, 3.5.1.25, 3.5.1.26
Masonry Walls	Structural Support	3.5.1.24
Masonry Walls	Fire Barrier	3.3.2.129
Masonry Walls	Shelter, Protection, Shielding	3.5.1.24
Masonry Walls	Non-S/R Structural Support	3.5.1.24
Metal Siding	Shelter, Protection, Shielding	3.5.1.20
Misc. Steel (Includes Gratings, Ladders, Platforms, Railings, Stairs, Kickplates)	Non-S/R Structural Support	3.5.1.20
Penetration Seals	Flood Barrier	3.3.1.18
Penetration Sleeves	Non-S/R Structural Support	3.5.1.20
Precast Concrete Panels	Structural Support	3.5.1.20
Precast Concrete Panels	Non-S/R Structural Support	3.5.1.20
Roofing	Shelter, Protection, Shielding	3.5.2.11
Steel Doors	Flood Barrier	3.5.1.20
Steel Doors	Non-S/R Structural Support	3.5.1.20
Steel Doors	Structural Pressure Barrier	3.5.1.20
Steel Embedments	Structural Support	3.5.1.20
Steel Panels and Cabinets	Structural Support	3.5.1.20
Steel Plates	Shelter, Protection, Shielding	3.5.1.20

Table 2.4-4 Component Groups Requiring Aging Management Review - Turbine Building (Continued)

Component	Component Intended Function	Aging Management Ref
Steel Plates (Dresden only)	Flood Barrier	3.5.1.20
Structural Steel	Structural Support	3.5.1.20
Structural Steel	Pipe Whip Restraint	3.5.1.20
Walls, Ceilings, Floors	Fire Barrier	3.3.1.28

Aging management review results for the turbine building are provided in Sections 3.3 and 3.5.

2.4.5 Diesel Generator Buildings

Purpose of the Structure

The purpose of the diesel generator buildings is to provide structural support and protection of the emergency diesel generators and HPCI system components (Dresden only).

Description of the Structure

The diesel generator buildings contain the Dresden Unit 2/3 (swing) emergency diesel generator and HPCI building (a structure which includes both the swing diesel generator and HPCI system components) and the Quad Cities Unit 1,2 and 1/2 (swing) emergency diesel generator rooms.

The Dresden diesel generator and HPCI building is a Class I concrete structure that houses the Unit 2/3 (swing) emergency diesel generator, HPCI system equipment, and other safe shutdown equipment. It abuts the Unit 3 reactor building and shares the reactor building wall on its north side. The Dresden Unit 2 and 3 emergency diesel generators are housed in the turbine building.

The three Quad Cities diesel generator rooms are Class II concrete structures that have been evaluated to ensure that they have the capability to protect safety related components. The rooms provide structural support and protection of the emergency diesel generators as well as fire protection of adjacent safety related structures. The Unit 1 diesel generator room is located in the southeast corner of the Unit 1 section of the turbine building. The Unit 2 diesel generator room is located in the northeast corner of Unit 2 section of the turbine building. The Unit 1/2 (swing) diesel generator room is adjacent to the reactor building. It is centered on the reactor building east wall, which is shared with the Unit 1/2 diesel generator room.

UFSAR References

Dresden Station UFSAR Section(s): 3.2.6, 8.3

Quad Cities Station UFSAR Section(s): 3.2.6, 8.3.1.6.1

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1

Quad Cities Station: LR-QDC-M-1

Structure Intended Functions

Physical support and protection - provides physical support and protection for safety related components and components relied upon to demonstrate compliance with Fire Protection and SBO (Dresden only) regulated events.

Containment - provide leak-tight barrier protecting the health and safety of the public in the event of any postulated design basis events and also provides secondary containment boundary (Dresden 2/3 Diesel Generator Room only)

Protection – provides missile barrier for internally and externally generated events.

Component Groups Requiring Aging Management Review

Table 2.4-5 Component Groups Requiring Aging Management Review - Diesel Generator Buildings

Component	Component Intended Function	Aging Management Ref
Concrete & Grout	Structural Support	3.5.1.29
Concrete & Grout	Non-S/R Structural Support	3.5.1.29
Concrete Beams (Dresden only)	Structural Support	3.5.1.20
Concrete Curbs	Direct Flow	3.5.1.20
Concrete Shield Plugs (Dresden only)	Structural Support	3.5.1.20
Concrete Shield Plugs (Dresden only)	Fire Barrier	3.3.1.28
Concrete Shield Plugs (Dresden only)	Shelter, Protection, Shielding	3.5.1.20
Concrete Slabs	Structural Support	3.5.1.20
Concrete Slabs	Shelter, Protection, Shielding	3.5.1.20
Concrete Walls	Structural Support	3.5.1.20, 3.5.1.21, 3.5.1.27
Concrete Walls	Shelter, Protection, Shielding	3.5.1.20
Concrete Walls	Missile Barrier	3.5.1.20
Fire Doors	Fire Barrier	3.3.1.18
Fire Proofing	Fire Barrier	3.3.2.62
Fire Wrap	Fire Barrier	3.3.2.63
Foundations (Dresden only)	Structural Support	3.5.1.20
Masonry Walls (Dresden only)	Structural Support	3.5.1.24
Masonry Walls (Dresden only)	Fire Barrier	3.3.2.129
Metal Decking (Quad Cities only)	Structural Support	3.5.1.20
Misc. Steel (Includes Ladders, Railings, Stairs, Gratings, Kick Plates, Platforms)	Non-S/R Structural Support	3.5.1.20

Table 2.4-5 Component Groups Requiring Aging Management Review - Diesel Generator Buildings (Continued)

Component	Component Intended Function	Aging Management Ref
Penetration Seals (Dresden only)	Fire Barrier	3.3.1.18
Penetration Sleeves	Non-S/R Structural Support	3.5.1.20
Penetration Sleeves (Quad Cities only)	Structural Pressure Barrier	3.5.1.20
Steel Doors (Dresden only)	Structural Pressure Barrier	3.5.1.20
Steel Embedments	Structural Support	3.5.1.20
Steel Panels and Cabinets	Structural Support	3.5.1.20
Steel Plates (Dresden only)	Direct Flow	3.5.1.20
Structural Steel	Structural Support	3.5.1.20
Walls, Ceilings, Floors	Fire Barrier	3.3.1.28

Aging management review results for the diesel generator buildings are provided in Sections 3.3 and 3.5.

2.4.6 Station Blackout Building and Yard Structures

Purpose of the Structure

The station blackout (SBO) building provides structural support and environmental protection for the station blackout diesel generators and associated components. The off site power structures are to provide sufficient capacity and capability to start and operate safety related equipment.

Description of the Structure

Other structures grouped with the SBO building for evaluation are off site power structures and foundations associated with the reserve auxiliary transformers, dead end structures, bus duct supports and intermediate transmission towers. For both stations, the bus duct supports, dead end structures, and intermediate transmission towers are either galvanized or coated steel with reinforced concrete foundations. Foundations for supporting transformers and circuit breakers are also reinforced concrete.

Structural boundaries include the physical extent of the circuit breaker foundations in the switchyards serving the RATs, 345-kV and 138-kV dead end structures, intermediate transmission towers serving the RATs, 345 k-V and 138-kV dead end structures serving adjacent to the reserve auxiliary transformer (Dresden only), reserve auxiliary transformer foundations, and bus ducts and their supports and foundations terminating at the turbine building (Dresden) and terminating at the diesel generator/turbine building (Quad Cities)

The Dresden station blackout building is a Class I structure that houses the station blackout diesel generators and safety related components, including the Unit 2 alternate 125VDC batteries. It is a heavy-walled reinforced concrete structure capable of protecting its contents from weather-related events that could initiate a station blackout event. The underground diesel oil tank foundation on the eastern side of the building supports the 15,000-gallon fuel tank.

The Quad Cities station blackout building protects the diesel generators and associated components from weather-related events, which could initiate a station blackout event and provides physical isolation from safety related components. It is a two-floor structure consisting of a reinforced concrete ground floor slab/foundation, steel framed exterior walls with corrugated metal siding, metal deck supported concrete slab second floor, and a roof consisting of a fully-adhered single-ply system on rigid insulation supported by metal decking. The station blackout diesel generators are supported within the building by independent reinforced concrete foundation slabs. Fire-rated block walls separate the Unit 1 and 2 diesel generator rooms, the day tank rooms and the second floor battery rooms.

UFSAR References

Dresden Station UFSAR Section(s): 9.5.9, 8.2

Quad Cities Station UFSAR Section(s): 8.3.1.9, 8.2

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1
Quad Cities Station: LR-QDC-M-1

Structure Intended Functions

Physical support and protection – provides physical support and protection for safety related components and components relied upon to demonstrate compliance with the SBO regulated event. For Quad Cities only, the structure also provides protection for components relied upon to demonstrate compliance with the Fire Protection regulated event.

Component Groups Requiring Aging Management Review

Table 2.4-6 Component Groups Requiring Aging Management Review - Station Blackout Building

Component	Component Intended Function	Aging Management Ref
Bus Duct Covers	Non-S/R Structural Support	3.5.2.1
Bus Duct Supports	Non-S/R Structural Support	3.5.2.2
Caulking/Sealants	Flood Barrier	3.5.2.4
Caulking/Sealants	Expansion/Separation	3.5.2.4
Concrete & Grout	Structural Support	3.5.1.29
Concrete & Grout	Non-S/R Structural Support	3.5.1.29
Concrete Curbs	Direct Flow	3.5.1.20
Concrete Manholes (Quad Cities only)	Structural Support	3.5.1.20
Concrete Manholes (Quad Cities only)	Non-S/R Structural Support	3.5.1.20, 3.5.1.21
Concrete Slabs	Structural Support	3.5.1.20
Concrete Slabs	Non-S/R Structural Support	3.5.1.20
Concrete Walls (Dresden only)	Structural Support	3.5.1.20, 3.5.1.21
Dead End Structures	Non-S/R Structural Support	3.5.2.6
Doors	Fire Barrier	3.3.1.18
Fire Proofing	Fire Barrier	3.3.2.62
Fire Wrap	Fire Barrier	3.3.2.63
Foundations	Structural Support	3.5.1.20, 3.5.1.25, 3.5.1.26, 3.5.1.27
Foundations	Non-S/R Structural Support	3.5.1.20
Masonry Walls	Structural Support	3.5.1.24
Masonry Walls	Fire Barrier	3.3.2.129
Masonry Walls	Shelter, Protection, Shielding	3.5.1.24
Metal Decking	Non-S/R Structural Support	3.5.1.20
Metal Decking (Dresden only)	Shelter, Protection, Shielding	3.5.1.20

Table 2.4-6 Component Groups Requiring Aging Management Review - Station Blackout Building (Continued)

Component	Component Intended Function	Aging Management Ref
Metal Siding	Shelter, Protection, Shielding	3.5.1.20
Misc. Steel (Dresden only-Includes Gratings, Kick Plates, Ladders, Platforms, Railings)	Non-S/R Structural Support	3.5.1.20
Penetration Seals (Quad Cities only)	Fire Barrier	3.3.1.18
Penetration Seals (Quad Cities only)	Expansion/Separation	3.3.1.18
Penetration Sleeves	Non-S/R Structural Support	3.5.1.20
Steel Embedments	Structural Support	3.5.1.20
Steel Panels and Cabinets	Non-S/R Structural Support	3.5.1.20
Steel Piles (Dresden only)	Non-S/R Structural Support	3.3.2.207
Steel Plates (Dresden only)	Missile Barrier	3.5.1.20
Structural Steel	Non-S/R Structural Support	3.5.1.20
Transmission Towers	Non-S/R Structural Support	3.5.2.16
Walls, Ceilings, Floors	Fire Barrier	3.3.1.28

Aging management review results for the station blackout structure and foundation are provided in Sections 3.3 and 3.5.

2.4.7 Isolation Condenser Pump House (Dresden Only)

Purpose of the Structure

The isolation condenser pump house provides structural support and environmental protection for the two diesel-driven isolation condenser makeup water pumps.

Description of the Structure

The isolation condenser pump house is a two-floor Class II structure with the first floor at grade and the other floor being a reinforced concrete basement. The above grade exterior north, south and east walls, as well as, an interior center wall are constructed of concrete block. The west wall that borders the reactor building is reinforced concrete with Rodofoam seismic gap separation at the reactor building wall. The first floor is a metal deck supported concrete slab. The roof consists of single-ply system on rigid insulation supported by metal decking on structural steel.

UFSAR References

Dresden Station UFSAR Section(s): 5.4.6

Quad Cities UFSAR Section(s): Not Applicable

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1

Quad Cities Station: Not applicable

Structure Intended Functions

Credited in regulated events – provides physical support and protection for components relied upon to demonstrate compliance with the Fire Protection regulated event.

Component Groups Requiring Aging Management Review

Table 2.4-7 Component Groups Requiring Aging Management Review - Isolation Condenser Pump House (Dresden Only)

Component	Component Intended Function	Aging Management Ref
Caulking/Sealants (Dresden only)	Expansion/Separation	3.5.2.4
Concrete Duct Banks (Dresden only)	Non-S/R Structural Support	3.5.1.21
Concrete Walls (Dresden only)	Structural Support	3.5.1.20
Concrete Walls (Dresden only)	Non-S/R Structural Support	3.5.1.20

Table 2.4-7 Component Groups Requiring Aging Management Review - Isolation Condenser Pump House (Dresden only) (Continued)

Component	Component Intended Function	Aging Management Ref
Doors (Dresden only)	Fire Barrier	3.3.1.18
Foundations (Dresden only)	Structural Support	3.5.1.20, 3.5.1.21, 3.5.1.25, 3.5.1.26
Foundations (Dresden only)	Non-S/R Structural Support	3.5.1.20
Masonry Walls (Dresden only)	Structural Support	3.5.1.24
Masonry Walls (Dresden only)	Fire Barrier	3.3.2.129
Masonry Walls (Dresden only)	Non-S/R Structural Support	3.5.1.24
Metal Decking (Dresden only)	Shelter, Protection, Shielding	3.5.1.20
Metal Decking (Dresden only)	Non-S/R Structural Support	3.5.1.20
Penetration Seals (Dresden only)	Fire Barrier	3.3.1.18
Penetration Sleeves (Dresden only)	Non-S/R Structural Support	3.5.1.20
Roofing (Dresden only)	Shelter, Protection, Shielding	3.5.2.11
Seismic Gap Filler (Dresden only)	Expansion/Separation	3.5.2.13
Steel Doors (Dresden only)	Non-S/R Structural Support	3.5.1.20
Steel Embedments (Dresden only)	Structural Support	3.5.1.20
Steel Panels and Cabinets (Dresden only)	Non-S/R Structural Support	3.5.1.20
Structural Steel (Dresden only)	Non-S/R Structural Support	3.5.1.20
Walls, Ceilings, Floors (Dresden only)	Fire Barrier	3.3.1.28

Aging management review results for the isolation condenser pump house are provided in Sections 3.3 and 3.5.

2.4.8 Makeup Demineralizer Building (Dresden Only)

Purpose of the Structure

The makeup demineralizer building at Dresden provides support and protection for instrumentation required for remote monitoring of water level of the "B" contaminated condensate storage tank in the event that the main control room is evacuated due to fire.

Description of the Structure

The makeup demineralizer building is a pre-engineered steel building that includes an interior reinforced concrete slab, anchor bolt hardware, instrument rack, and foundation support for the level indicator.

UFSAR References

Dresden Station UFSAR Section(s): None

Quad Cities Station UFSAR Section(s): Not Applicable

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1

Quad Cities Station: Not applicable

Structure Intended Functions

Physical support and protection - provides physical support and protection for components relied upon to demonstrate compliance with the Fire Protection regulated event.

Component Groups Requiring Aging Management Review

Table 2.4-8 Component Groups Requiring Aging Management Review - Makeup Demineralizer Building (Dresden Only)

Component	Component Intended Function	Aging Management Ref
Concrete & Grout (Dresden only)	Structural Support	3.5.1.29
Concrete Slabs (Dresden only)	Structural Support	3.5.1.20
Concrete Slabs (Dresden only)	Non-S/R Structural Support	3.5.1.20
Foundations (Dresden only)	Structural Support	3.5.1.20, 3.5.1.21, 3.5.1.25, 3.5.1.26, 3.5.1.27

Table 2.4-8 Component Groups Requiring Aging Management Review - Makeup Demineralizer Building (Dresden Only) (Continued)

Component	Component Intended Function	Aging Management Ref
Foundations (Dresden only)	Non-S/R Structural Support	3.5.1.20
Metal Decking (Dresden only)	Shelter, Protection, Shielding	3.5.1.20
Metal Siding (Dresden only)	Shelter, Protection, Shielding	3.5.1.20
Steel Doors (Dresden only)	Shelter, Protection, Shielding	3.5.1.20
Steel Panels and Cabinets (Dresden only)	Structural Support	3.5.1.20
Structural Steel (Dresden only)	Non-S/R Structural Support	3.5.1.20

Aging management review results for the makeup demineralizer building are provided in Section 3.5.

2.4.9 Radwaste Floor Drain Surge Tank

Purpose of the Structure

The floor drain surge tank provides the necessary surge volume for the floor drain system, which collects potentially radioactive liquids.

Description of the Structure

The above ground, floor drain surge tank has thick reinforced concrete walls for shielding and electric heaters to prevent freezing during cold weather. The tank bottom is sloped to reduce sludge buildup. The floor drain surge tank is a Class I structure and is, therefore, not considered an above-ground tank for the purpose of the curies content requirements. The floor drain surge tank includes the attached pump house structure, foundations, floors, walls, roof, and stainless steel liner.

UFSAR References

Dresden Station UFSAR Section(s): 11.2, 3.2.1

Quad Cities Station UFSAR Section(s): 11.2

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1

Quad Cities Station: LR-QDC-M-1

Structure Intended Functions

Radioactive fluid containment - provides physical barrier and support to contain potentially radioactive liquid waste.

Component Groups Requiring Aging Management Review

Table 2.4-9 Component Groups Requiring Aging Management Review - Radwaste Floor Drain Surge Tank

Component	Component Intended Function	Aging Management Ref
Concrete Manholes	Structural Support	3.5.1.20, 3.5.1.21
Concrete Manholes	Shelter, Protection, Shielding	3.5.1.20
Concrete Slabs	Structural Support	3.5.1.20
Concrete Slabs	Shelter, Protection, Shielding	3.5.1.20

Table 2.4-9 Component Groups Requiring Aging Management Review - Radwaste Floor Drain Surge Tank (Continued)

Component	Component Intended Function	Aging Management Ref
Concrete Walls	Structural Support	3.5.1.20
Concrete Walls	Shelter, Protection, Shielding	3.5.1.20
Foundations	Structural Support	3.5.1.20, 3.5.1.21, 3.5.1.25, 3.5.1.26
Liners	Structural Pressure Barrier	3.5.1.28
Steel Embedments	Structural Support	3.5.1.20

Aging management review results for the radwaste floor drain surge tank and foundations are provided in Section 3.5.

2.4.10 Miscellaneous Foundations

Purpose of the Structure

Contaminated Condensate Storage Tank Foundations

The contaminated condensate storage tank foundations provide physical support for the non-safety related contaminated condensate storage tanks.

Diesel Generator Fuel Oil Storage Tank Foundations

The diesel generator fuel oil storage tank foundations provide structural support for the safety related diesel generator fuel oil storage tanks.

Description of the Structure

Contaminated Condensate Storage Tank Foundations

The condensate storage facilities provide a storage volume for clean and potentially contaminated water of suitable quality for use in the reactor and other systems throughout the plant. The Dresden condensate storage facilities ensure that an adequate amount of water is available from each contaminated condensate storage tank for use by HPCI pumps. The Quad Cities condensate storage facilities ensure that an adequate amount of water is available from each contaminated condensate storage tank for use by HPCI, RCIC, and safe shutdown pumps. The contaminated condensate storage tank foundations are Class II reinforced concrete foundations and include anchor bolts.

Diesel Generator Fuel Oil Storage Tank Foundations

Each diesel generator fuel oil storage tank, except for the Quad Cities Unit 1 fiberglass tank, is supported on three reinforced concrete foundation pads and anchored with anchor bolts (four per pad). The Quad Cities Unit 1 fiberglass tank is anchored to two reinforced concrete foundations and is restrained in place by stainless steel straps and turnbuckle assemblies.

UFSAR References

Dresden Station UFSAR Section(s): 9.2.6, 9.5.4

Quad Cities Station UFSAR Section(s): 9.2.6, 9.5.4

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1

Quad Cities Station: LR-QDC-M-1

Structure Intended Functions

Contaminated Condensate Storage Tank Foundations

Regulated event component support - provide support for components relied upon to demonstrate compliance with Fire Protection, ATWS, and SBO regulated events.

Diesel Generator Fuel Oil Storage Tank Foundations

Safety-related component support – provide support for safety related, seismically qualified fuel oil storage tanks provided for emergency diesel generators.

Component Groups Requiring Aging Management Review

Table 2.4-10 Component Groups Requiring Aging Management Review - Miscellaneous Foundations

Component	Component Intended Function	Aging Management Ref
Caulking/Sealants (Dresden only)	Shelter, Protection, Shielding	3.5.2.4
Foundations	Structural Support	3.5.1.20, 3.5.1.21, 3.5.1.25, 3.5.1.26
Foundations	Non-S/R Structural Support	3.5.1.20, 3.5.1.26
Steel Embedments (Quad Cities only)	Structural Support	3.5.1.20

Aging management review results for miscellaneous foundations are provided in Section 3.5.

2.4.11 Crib House

Purpose of the Structure

The crib house serves as the entry point for river water into plant systems. It protects and supports the pumps and pipes which deliver river water to the plant.

Description of the Structure

The crib house is a reinforced concrete structure with a concrete block and steel superstructure. It contains the circulating water, service water and diesel driven fire pumps.

At Dresden, the crib house includes the diesel generator cooling water pumps and the suction piping for the containment cooling service water system pumps. The diesel generator cooling water pumps and the containment cooling service water system are safety related. The crib house also contains stop logs that can be used to isolate the compartment and raise its water level where the containment cooling service water system pump and the diesel fire pump take their suction. The crib house is classified as Class II, and was investigated to assure that the integrity of the Class I items is not compromised.

At Quad Cities, the crib house includes the suction lines for the RHR service water system. The RHR service water system is safety related. The crib house is classified as Class II, and was investigated to assure that it will not fail and isolate the plant from the river water source. For license renewal evaluation purposes the Quad Cities discharge flume weir wall that forms one of the boundaries of the ultimate heat sink is included as part of the crib house.

UFSAR References

Dresden Station UFSAR Section(s): 1.2.2.2, 3.3.2.3.2, 3.8.5, 9.2.5, 9.5.5

Quad Cities Station UFSAR Section(s): 3.3, 3.8.6, 9.2.5

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1

Quad Cities Station: LR-QDC-M-1

Structure Intended Functions

Physical support and protection - provides physical support and protection for safety related components and components relied upon to demonstrate compliance with the Fire Protection regulated event.

Heat sink – provides heat sink during SBO or design basis events.

Water source – provides source of cooling water for plant shutdown.

Component Groups Requiring Aging Management Review

Table 2.4-11 Component Groups Requiring Aging Management Review - Crib House

Component	Component Intended Function	Aging Management Ref
Concrete & Grout	Structural Support	3.5.1.29
Concrete & Grout	Non-S/R Structural Support	3.5.1.29
Concrete Canal Weirs (Quad Cities only)	Heat Sink	3.5.1.22
Concrete Curbs	Direct Flow	3.5.1.22
Concrete Slabs	Structural Support	3.5.1.22, 3.5.1.26
Concrete Slabs	Shutdown Cooling Water	3.5.1.22
Concrete Slabs	Heat Sink	3.5.1.22, 3.5.1.26
Concrete Stairs	Structural Support	3.5.1.22
Concrete Stairs	Non-S/R Structural Support	3.5.1.22
Concrete Walls	Structural Support	3.5.1.22
Concrete Walls	Non-S/R Structural Support	3.5.1.22
Concrete Walls	Shutdown Cooling Water	3.5.1.22
Concrete Walls	Heat Sink	3.5.1.22
Fire Doors (Dresden only)	Fire Barrier	3.3.1.18
Foundations	Structural Support	3.5.1.22, 3.5.1.26
Foundations	Non-S/R Structural Support	3.5.1.22
Masonry Walls	Structural Support	3.5.1.24
Masonry Walls	Shelter, Protection, Shielding	3.5.1.24
Metal Siding (Dresden only)	Shelter, Protection, Shielding	3.5.1.22
Misc. Steel (Dresden only)	Non-S/R Structural Support	3.5.1.22
Misc. Steel (Dresden only)	Direct Flow	3.5.1.22
Precast Concrete Panels	Structural Support	3.5.1.22
Precast Concrete Panels	Shelter, Protection, Shielding	3.5.1.22
Roofing	Shelter, Protection, Shielding	3.5.2.11
Steel Embedments	Structural Support	3.5.1.20, 3.5.1.22
Steel Embedments (Dresden only)	Non-S/R Structural Support	3.5.1.22
Steel Panels and Cabinets	Structural Support	3.5.1.20, 3.5.1.22
Steel Panels and Cabinets (Quad Cities only)	Non-S/R Structural Support	3.5.1.20
Steel Plates (Dresden only)	Direct Flow	3.5.1.22

Table 2.4-11 Component Groups Requiring Aging Management Review - Crib House (Continued)

Component	Component Intended Function	Aging Management Ref
Steel Sump Screens (Quad Cities only)	Non-S/R Structural Support	3.5.1.22
Structural Steel	Non-S/R Structural Support	3.5.1.22
Walls, Ceilings, Floors	Fire Barrier	3.3.1.28

Aging management review results for the crib house are provided in Sections 3.3 and 3.5.

2.4.12 Unit 1 Crib House (Dresden Only)

Purpose of the Structure

The Unit 1 crib house at Dresden supports a diesel-driven fire pump, which is required to support the Unit 2 and 3 fire protection system.

Description of the Structure

The diesel-driven fire pump assembly is located on a reinforced concrete floor slab and takes its suction from the center bay of the Unit 1 crib house. The diesel engine is supported by a reinforced concrete pedestal and anchored by cast-in-place anchor bolts. The fire pump support consists of a steel leveling/bearing plate, on grout, with cast-in-place anchor bolts. The anchor bolts and the steel leveling bearing plate are evaluated in the component support commodity group.

UFSAR References

Dresden Station UFSAR Section(s): 9.2.2

Quad Cities Station UFSAR Section(s): Not Applicable

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1

Structure Intended Functions

Credited in regulated events - provides physical support for components relied upon to demonstrate compliance with the Fire Protection regulated events.

Component Groups Requiring Aging Management Review

Table 2.4-12 Component Groups Requiring Aging Management Review - Unit 1 Crib House (Dresden Only)

Component	Component Intended Function	Aging Management Ref
Concrete & Grout (Dresden only)	Non-S/R Structural Support	3.5.1.29
Concrete Slabs (Dresden only)	Structural Support	3.5.1.22
Concrete Slabs (Dresden only)	Non-S/R Structural Support	3.5.1.22
Walls, Ceilings, Floors (Dresden only)	Fire Barrier	3.3.1.28

Aging management review results for the Unit 1 crib house are provided in Sections 3.3 and 3.5.

2.4.13 Station Chimney

Purpose of the Structure

The station chimney provides an elevated discharge point for treated gaseous radioactive effluents.

Description of the Structure

The chimney is a 310 foot tall tapered structure that contains and/or directs the release of fission products. The reinforced concrete chimney is founded on bedrock. The lower section of the chimney is divided into 5 cells, comprised of reinforced concrete walls that provide a holdup volume for the gland exhausters.

UFSAR References

Dresden Station UFSAR Section(s): 11.3

Quad Cities Station UFSAR Section(s): 11.3

License Renewal Boundary Diagram References

Dresden Station: LR-DRE-M-1

Quad Cities Station: LR-QDC-M-1

Structure Intended Functions

Elevated release - provides for the discharge of treated gaseous waste to meet the requirements of 10 CFR 100.

Pressure control path - provides a secondary pressure control path for primary containment.

Component Groups Requiring Aging Management Review

Table 2.4-13 Component Groups Requiring Aging Management Review - Station Chimney

Component	Component Intended Function	Aging Management Ref
Caulking/Sealants	Gaseous Release Path	3.5.2.4
Concrete Slabs	Structural Support	3.5.1.20
Concrete Walls	Structural Support	3.5.1.20
Concrete Walls	Gaseous Release Path	3.5.1.20
Foundations	Structural Support	3.5.1.20, 3.5.1.21, 3.5.1.25, 3.5.1.26

Table 2.4-13 Component Groups Requiring Aging Management Review - Station Chimney (Continued)

Component	Component Intended Function	Aging Management Ref
Masonry Walls (Quad Cities only)	Structural Pressure Barrier	3.5.2.9
Masonry Walls (Quad Cities only)	Gaseous Release Path	3.5.2.9
Misc. Steel (Includes Platforms, Ladders, Railings)	Non-S/R Structural Support	3.5.1.20
Steel Doors (Dresden only)	Gaseous Release Path	3.5.1.20
Steel Embedments	Structural Support	3.5.1.20
Steel Plates	Gaseous Release Path	3.5.1.20
Structural Steel	Non-S/R Structural Support	3.5.1.20

Aging management review results for the station chimney are provided in Section 3.5.

2.4.14 Cranes and Hoists

Purpose of the Structure

Cranes and hoists provide systems for lifting, transporting and handling of loads.

Description of the Structure

Cranes and hoists include those cranes and hoists, whose failure could affect safety related components, except for the refueling bridge platform, which is covered with refueling equipment. Cranes and hoists include the reactor building crane, the turbine building cranes, smaller capacity cranes and hoists, and jib cranes that are located in various parts of the reactor and turbine buildings. Cranes and hoists and jib cranes are classified as Safety Class II components.

The reactor building crane services the operating floor, which is shared by both units. It is a bridge-type crane equipped with a 125-ton main hoist and a 9-ton auxiliary hoist and can reach major component storage areas on the operating floor. The reactor building crane is used for lifting and transporting the spent fuel cask between the spent fuel pools and the cask decontamination work area and handling other equipment and reactor components accessible from the refueling floor. The crane hoist system consists of a dual load path through the hoist gear train, the reeving system, and the hoist load block along with restraints at critical points to provide load retention and minimization of uncontrolled motions of the load in the event of failure of any single hoist component. Redundancy has also been designed into the hoist, trolley brakes, the spent fuel cask lifting devices, and crane control components.

The two turbine building overhead cranes are equipped with a 175-ton hoist, with a 25-ton auxiliary hoist (for the south crane at Quad Cities and the west crane at Dresden) and a 125-ton hoist with a 10-ton auxiliary hoist (for the north crane at Quad Cities and the east crane at Dresden).

UFSAR References

Dresden Station UFSAR Section(s): 9.1.4

Quad Cities Station UFSAR Section(s): 9.1.4

License Renewal Boundary Diagram References

Dresden Station: None

Quad Cities Station: None

Structure Intended Functions

Lifting and transporting loads - provide a safe means for handling safety related components and loads above or near safety related components.

Component Groups Requiring Aging Management Review

Table 2.4-14 Component Groups Requiring Aging Management Review - Cranes and Hoists

Component	Component Intended Function	Aging Management Ref
Cranes	Structural Support	3.3.1.3
Cranes	Non-S/R Structural Support	3.3.1.14
Rails	Non-S/R Structural Support	3.3.1.14

Aging management review results for cranes and hoists are provided in Section 3.3.

2.4.15 Component Supports Commodity Group

Commodity Group Description

The component support commodity group consists of support members (includes support members, welds, bolted connections and support anchorage to building structures), high strength bolting for Class I supports, and miscellaneous supports (includes constant aand variable load springs, guides, stops, slidiing surfaces, design clearances, vibration isolators and clevis pins). Grout (which includes reinforced concrete, grout and masonry) is evaluated as a component group within structures. The compoonent supports commodity group includes:

- Supports for ASME Class I, 2 and 3 piping and components
- Supports for ASME Class MC components including suppression chamber seismic restraints, suppression chamber support saddles and columns, and vent system supports
- Supports for cable trays, conduit, HVAC ducts, tube track, instrument tubing and non-ASME piping and components
- Anchorage of racks, panels, cabinets and enclosures for electrical equipment and instrumentation
- Supports for emergency diesel generator, HVAC system components, and miscellaneous mechanical equipment
- Supports for platforms, pipe whip restraints, jet impingement shields, masonry walls, and miscellaneous structures

Component Groups Requiring Aging Management Review

Table 2.4-15 Component Groups Requiring Aging Management Review - Component Supports

Component	Component Intended Function	Aging Management Ref
Anchorage to Buildings, Including Bolted/Welded Connections	Structural Support	3.5.1.29, 3.5.1.30
Anchorage to Buildings, Including Bolted/Welded Connections	Non-S/R Structural Support	3.5.1.29
Bolting	Structural Support	3.5.1.32
Clevis Pins: Suppression chamber Columns, Vent Systems, ESF Lines	Structural Support	3.5.2.5
Instrument Racks, Frames, Panels, Etc,	Structural Support	3.5.1.29
Instrument Racks, Frames, Panels, Etc,	Non-S/R Structural Support	3.5.1.29

Table 2.4-15 Component Groups Requiring Aging Management Review - Component Supports (Continued)

Component	Component Intended Function	Aging Management Ref
Raceways	Structural Support	3.5.1.29
Sliding Surfaces	Structural Support	3.5.1.31
Support Members (Includes Spring Hangers)	Structural Support	3.2.2.79, 3.2.2.80, 3.2.2.81, 3.5.1.29, 3.5.1.31, 3.5.2.14
Support Members	Non-S/R Structural Support	3.5.1.29
Vibration Isolation Elements (Quad Cities only)	Structural Support	3.5.1.29

Aging management review results for component supports are provided in Sections 3.2 and 3.5.

2.4.16 Insulation Commodity Group

Commodity Group Description

The insulation commodity group consists of the following categories of insulation:

- Mirror insulation inside containment
- Insulation and jacketing inside containment
- Insulation and jacketing outside containment
- Asbestos insulation outside containment
- Anti-sweat insulation outside containment
- Outdoor insulation and jacketing

Plant areas where systems and equipment in the scope of license renewal require temperature control include inside the drywell, the ECCS pump rooms, the outboard MSIV rooms and on outdoor heat-traced piping for freeze protection. Plant areas where insulation jacketing is subjected to periodic wetting is limited to outdoor heat-traced piping.

Insulation materials in use at the stations include both originally installed materials and replacement materials. These include metallic reflective insulation, asbestos, fiberglass batts, calcium silicate, quilted fiberglass blankets, preformed fiberglass and closed cell foam. Outdoor insulation installed over electric heat tracing consists of either calcium silicate or preformed fiberglass with aluminum jacketing.

Insulation requiring aging management consists of asbestos and fiberglass batt insulation located in the drywell, ECCS pump rooms, outboard MSIV rooms, and outdoor insulation and jacketing installed over heat-traced piping.

Component Groups Requiring Aging Management Review

Table 2.4-16 Component Groups Requiring Aging Management Review – Insulation

Component	Component Intended Function	Aging Management Ref
Insulation	Insulating Characteristics	3.2.2.44, 3.2.2.45, 3.2.2.46, 3.2.2.47, 3.3.2.122, 3.4.2.22
Insulation Jacketing	Insulation Jacket Integrity	3.2.2.48, 3.3.2.123, 3.4.2.23

Aging management review results for insulation are provided in Sections 3.2, 3.3, and 3.4.

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROLS SYSTEMS

The guidance provided in NEI 95-10, Appendix B was used to define passive, long-lived electrical commodities subject to aging management review. After applying the scoping and screening criteria discussed in Section 2.1.2, the electrical commodities requiring aging management reviews were determined.

Passive and long-lived electrical and instrumentation and controls component groups were evaluated using the plant "spaces" approach, whereby aging effects are identified, and bounding environmental conditions were used to evaluate the identified aging effect(s) with respect to component function.

The License Renewal Application is a joint application and discussions are applicable to both Dresden, Units 2 and 3 and Quad Cities, Units 1 and 2 unless otherwise noted. Clear statements (such as Dresden only or Quad Cities only) are made if discussions are applicable to only one station.

The following electrical commodity groups were determined to require aging management review.

- Cables and connections (splices, connectors, fuse blocks, and terminal blocks)
- Bus ducts
- High voltage transmission conductors and insulators
- Electrical penetrations

This section presents the results of the system scoping and screening processes for electrical commodities and provides the following information:

- A general description of the commodity,
- A listing of the components or component groups that require aging management review, associated component intended functions and a reference to the Section 3.6 Table that provides the aging management review results.

The interface of electrical and instrumentation and controls components with other types of components and the assessments of these interfacing components are provided in the appropriate mechanical or structural sections. For example, the assessment of electrical racks, panels, frames, cabinets, cable trays, conduit, and their supports is provided in the structural assessment documented in Section 2.4.

2.5.1 Electrical Commodities

2.5.1.1 Cables and Connections

Using the "spaces" approach, all electrical insulated cables and connections were evaluated for aging management based on the comparison of material property capability with environmental conditions. As appropriate, electrical cables and connections were excluded from aging management if they were identified as feeding an electrical component that performed no license renewal intended function.

The function of insulated cables and connections is to electrically connect specified sections of an electrical circuit to deliver voltage, current or signals. Electrical cables and their connections are reviewed as commodity groups. The types of connections included in this review are splices, connectors, fuse blocks, and terminal blocks.

2.5.1.2 Bus Ducts

The bus ducts within the scope of license renewal are the bus ducts used for safety related systems and those associated with the 4160V power feeds between the reserve auxiliary transformers (RATs) and switchgear. The bus ducts utilize pre-assembled raceway (enclosure) design with conductors supported by electrical insulators.

The function of the bus ducts is to electrically connect power supplies and load centers to deliver voltage and current.

The function of bus duct insulators is to support and insulate the bus bar conductors.

2.5.1.3 High Voltage Transmission Conductors and Insulators

The high voltage transmission conductors and insulators within scope of license renewal rule are those associated with the power feeds from the switchyard to reserve auxiliary transformers (RATs).

The function of the high voltage transmission conductors is to supply power to the plant systems through the reserve auxiliary transformers (RATs).

The function of high voltage insulators is to support and insulate the high voltage transmission conductors.

2.5.1.4 Electrical Penetrations

Electrical penetrations perform the functions of primary containment boundary (pressure integrity) and electrical continuity across the primary containment boundary. All primary containment electrical penetrations are included in the scope of the Rule. The electrical continuity function for penetrations is managed under the Environmental Qualification (EQ) Program which is discussed in Section 4.4, Environmental Qualification of Electrical Equipment (EQ). The pressure boundary function of every primary

containment electrical penetration is evaluated in Section 2.4.1, Primary Containment, and the aging management program is referenced in Section 3.5.1.3.

2.5.1.5 Electrical Equipment Subject to 10 CFR 50.49 Environmental Qualification (EQ) Requirements

Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements are managed under the environmental qualification (EQ) program which is discussed in Section 4.4, Environmental Qualification of Electrical Equipment (EQ).

Component Groups Requiring Aging Management Review

Table 2.5-1 Component Groups Requiring Aging Management Review – Electrical Commodities

Component	Component Intended Function	Aging Management Ref
Connectors	Electrical Continuity	3.6.1.2
Electrical Cables	Electrical Continuity	3.6.1.2, 3.6.1.3, 3.6.1.4
Electrical Equipment Subject to 10 CFR 50.49 (EQ) Requirements	Electrical Continuity	3.6.1.1
Electrical Equipment Subject to 10 CFR 50.49 (EQ) Requirements	Insulate	3.6.1.1
Fuse Blocks	Electrical Continuity	3.6.1.2
High Voltage Transmission Conductors	Electrical Continuity	3.6.2.1
Insulators	Insulate	3.6.2.2, 3.6.2.3
Splices	Electrical Continuity	3.6.1.2
Terminal Blocks	Electrical Continuity	3.6.1.2

Aging management review results for electrical and instrumentation and controls components are provided in Section 3.6.

CHAPTER 3
AGING MANAGEMENT REVIEW RESULTS

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3.0 AGING MANAGEMENT REVIEW RESULTS

10 CFR 54.21 (a)(3) requires a demonstration that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation. This section is provided in accordance with the requirements of 10 CFR 54.21 (a)(3). This section also discusses the layout of this application relative to aging management review results.

Aging Management Reviews included in NUREG-1801

Aging management reviews were performed by determining the aging effects of components or component groups, manufactured from similar materials, residing in similar environments. Aging management programs or activities were assigned to manage the applicable aging effect. Once this evaluation was completed, each component group, material, and environment was compared to the aging management review results performed in NUREG-1801. This evaluation was performed at the line-item level presented in NUREG-1801, Volume 2.

The NUREG-1801 line-item review was performed to assure that the component groups, materials, environments and aging effects referenced in NUREG –1801 are applicable to Dresden and Quad Cities and that the aging management program described in NUREG-1801 is appropriate.

In addition, a separate review of the aging management program and activities was performed to determine if the referenced program or activity contains the same program elements that are presented in Chapters X and XI of NUREG-1801. The results of this program element review are presented in Appendix B of this application.

The aging management review results for component groups, material, aging effects and aging mechanisms combinations that are consistent with evaluations performed in NUREG-1801 are provided in Tables 3.X-1. These tables are provided in the format and content described in Chapter 3 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," for all BWR applicable lines.

The overall conclusion provided in the discussion column of Tables 3.X-1 is a combination of each of these individual reviews, as discussed below.

Each line of the 3.X-1 Tables provides a discussion column that identifies:

- Consistent with NUREG-1801

  Identifies aging management reviews that are consistent with the NUREG-1801. This means that the component group, material and environment are applicable, the aging effect and aging mechanisms identified require management, the aging management program identified is appropriate, and the review results of the key elements provided in Appendix B concludes that the program elements are consistent with those elements provided in Chapters X and IX of NUREG-1801. In these cases, the discussion states – "Consistent with NUREG-1801."

- Exceptions to NUREG-1801

  Identifies those evaluations which are an exception to the NUREG-1801 aging effects or aging management program or activity and provides reference to the section in Section 3 and/or Appendix B which provides further explanation and justification. In these cases, the exception refers to all of the NUREG-1801 line items. In these cases, the discussion states – "Exception to NUREG-1801."

- Consistent to NUREG-1801, with exception

  Identifies those evaluations where several of the individual NUREG-1801 line items may be evaluated as consistent with NUREG-1801 while other line items in the same NUREG-1800 line may be evaluated as exception to NUREG-1801. In these cases, the discussion states – "Consistent with NUREG-1801 with exception identified in Section 3.X.X and or Appendix B."

- Further evaluations recommended by NUREG-1801

  Identifies and provides reference to sections providing further evaluation of aging management recommended by NUREG-1801

- Notes to clarify

  Provides notes to clarify NUREG-1801 Volume 2 line items such as those that are not in scope of license renewal or not installed at Dresden or Quad Cities

Plant-specific aging management activities recommended by NUREG-1801 are identified in the Aging Management Program column in each of the 3.X-1 Tables by including the plant-specific program in parentheses.

Aging Management Reviews not included in NUREG-1801

Aging management review results are provided in Tables 3.X-2 for components and component groups made of materials not included in NUREG-1801 or aging effects and aging mechanisms not identified in NUREG-1801. These tables provide the results of

the aging management review and identify the component group, material, environment, aging effects requiring management, and the aging management program credited for managing the aging effect.

Component, Material, and Environment Considerations

Component Group

Components were grouped together to perform the aging management reviews. Component groups used in aging management reviews are discussed in further detail in the beginning of each 3.X section.

Materials

Components made of materials not included in NUREG-1801 were evaluated separately and the results of the aging management reviews are provided in Tables 3.X-2.

Environment

The aging management reviews for components and structures were evaluated based upon component groupings in common environments. Environments used are consistent with the environments presented in NUREG-1801.

Operating Experience

A review of plant-specific operating experience was conducted to identify aging effects requiring management. Industry-wide operating experience since the preparation of NUREG-1801 was also reviewed to identify aging effects requiring management. These reviews concluded that the aging effects identified by plant-specific and industry-wide operating experience were consistent with those identified in NUREG-1801. On-going review of plant-specific and industry operating experience is performed in accordance with corrective action programs and operating experience programs.

3.1 AGING MANAGEMENT OF REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

The following systems are evaluated as part of the reactor vessel, internals, and reactor coolant system:

- Reactor vessel and internals
- Recirculation system, recirculation flow control, and MG sets
- Reactor vessel head vent system
- Nuclear boiler instrumentation system
- Head spray system (Dresden only)
- Reactor coolant pressure boundary components of the following systems:

  High pressure coolant injection system

  Core spray system

  Reactor core isolation cooling system (Quad Cities only)

  Isolation condenser (Dresden only)

  Residual heat removal system (Quad Cities only)

  Low pressure coolant injection system (Dresden only)

  Standby liquid control system

  Shutdown cooling system (Dresden only)

  Control rod drive hydraulic system

  Reactor water cleanup system

  Main steam system

  Feedwater system

<u>Components Evaluated Consistent with NUREG-1801</u>

The components or component groups requiring aging management review in each of the reactor vessel, internals, and reactor coolant systems listed above are presented in Chapter 2. Aging management reviews were performed to assure that the component groups, materials, environments and aging effects referenced in NUREG-1801 are applicable to Dresden and Quad Cities and that the aging management program described in NUREG-1801 is appropriate.

When the components or component group and associated evaluations corresponded with an individual line item in NUREG-1801, Volume 2, the component aging management results were included in the appropriate line items in Table 3.1-1 "Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system" for the reactor vessel, internals, and reactor coolant system. Each line in Table 3.1-1 "Aging management

programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system" matches a line in Chapter 3 of NUREG-1800, that is applicable to Boiling Water Reactors (BWR) or to both Boiling Water Reactors and Pressurized Water Reactors (BWR/PWR).

Not all component types in the Dresden and Quad Cities reactor vessel, internals, and reactor coolant system are listed in NUREG-1801, Volume 2. However, the aging management reviews presented in NUREG-1801, Volume 2 were applied to additional component types if the following criteria were satisfied:

- Constructed of the same material as components in the NUREG-1801 line item,
- Assigned the same Component Intended Function as components in the NUREG-1801 line item,
- Located in the same environment as components in the NUREG-1801 line item,
- Have exhibited the same aging effects identified in the NUREG-1801 line item, and

Component types meeting these criteria have been included in the presentation of aging management review results in Table 3.1-1 "Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system." The third column of the table shows the component types included in each evaluation line. "NUREG-1801 Components" are those that correspond exactly with component types in NUREG-1801, Volume 2. "Evaluated with NUREG-1801 Components" shows the component types that meet the four (4) criteria above, and therefore share the same evaluation characteristics. Dresden and Quad Cities do not have all of the component types identified in NUREG-1801, Volume 2. The component type entries in the third column of Table 3.1-1 "Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system" under the "NUREG-1801 Components" heading are those components or component groups that were identified and evaluated at Dresden and Quad Cities.

Other Components Evaluated

Table 3.1-2 "Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801" presents the aging management review results for the remainder of the reactor vessel, internals, and reactor coolant system components. These entries result from aging management review results where the component type, material, environment or aging effect/mechanism differs from NUREG-1801, Volume 2 line item entries. Each line in Table 3.1-2 includes a line reference number, component group, material, environment, aging effect/mechanism, aging management program and discussion.

3.1.1 Aging management programs evaluated in NUREG-1801 that are relied upon for license renewal for the reactor vessel, internals, and reactor coolant system

Table 3.1-1 "Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system" shows the component groups and aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system.

Table 3.1-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.1	Reactor coolant pressure boundary components	NUREG-1801 Components Closure Bolting Core Plates Core Spray Lines and Spargers Incore Instrumentation Dry Tubes and Guide Tubes Jet Pump Assemblies (Does not include Sensing Lines) Nozzle Safe Ends Nozzles Orificed Fuel Supports Penetrations Piping and Fittings Pumps Support Skirts and Attachment Welds Top Guides Top Head Enclosure (Head Flanges) Valves Vessel Bottom Heads Vessel Shells	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Further Evaluation of cumulative fatigue damage is described in Section 3.1.1.1.1, Section 4.3.1(reactor pressure vessel), Section 4.3.2 (reactor vessel internals), Section 4.3.3.1 (Dresden 3 RCPB piping), Section 4.3.3.2 (RCPB piping) and Section 4.3.4 (environmental effects of fatigue).

Table 3.1-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.2	Isolation condenser	NUREG-1801 Components Isolation Condensers	Loss of material due to general, pitting, and crevice corrosion	Inservice inspection (B.1.1); water chemistry (B.1.2)	Yes, plant specific	Consistent with NUREG-1801, with exception. The exceptions to water chemistry and inservice inspection are described in Section 3.1.1.2.3. The exceptions to ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD are described in Section B.1.1. The exceptions to Water Chemistry are described in Section B.1.2. Further evaluation of Loss of Material due to Pitting and Crevice Corrosion BWR PWR is described in Section 3.1.1.1.2. Dresden only has isolation condenser.
3.1.1.3	Pressure vessel ferritic materials that have a neutron fluence greater than 10^{17} n/cm^2 (E>1 MeV)	NUREG-1801 Components Nozzles Vessel Shells	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99	Yes, TLAA	Further evaluation of "Loss of Fracture Toughness due to Neutron Embrittlement" are described in Section 3.1.1.1.3 and Section 4.2.
3.1.1.4	Reactor vessel beltline shell and welds	NUREG-1801 Components Vessel Shells	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor vessel surveillance (B.1.22)	Yes, plant specific	Consistent with NUREG-1801. Further evaluation of Loss of Fracture Toughness due to Neutron Irradiation Embrittlement BWR PWR is described in Section 3.1.1.1.4.

Table 3.1-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.5	Small-bore reactor coolant system and connected systems piping	NUREG-1801 Components Piping and Fittings (small bore) Evaluated with NUREG-1801 Components Valves (small bore)	Crack initiation and growth due to SCC, intergranular SCC, and thermal and mechanical loading	Inservice inspection (B.1.1); water chemistry (B.1.2); one-time inspection (B.1.23)	Yes, parameters monitored/ inspected and detection of aging effects are to be further evaluated	Consistent with NUREG-1801, with exception. The exceptions to ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD are described in Section B.1.1. The exceptions to Water Chemistry are described in Section B.1.2. Further evaluation of Crack Initiation and Growth due to Thermal and Mechanical Loading or Stress Corrosion Cracking BWR PWR is described in Section 3.1.1.1.5.
3.1.1.6	Jet pump sensing line, and reactor vessel flange leak detection line	NUREG-1801 Components Pipes Valves	Crack initiation and growth due to SCC, inter-granular stress corrosion cracking (IGSCC), or cyclic loading	Plant specific	Yes, plant specific	Further evaluation of Crack Initiation and Growth due to Thermal and Mechanical Loading or Stress Corrosion Cracking BWR PWR is described in Section 3.1.1.1.6. Jet pump sensing lines are not in scope for license renewal at Dresden and Quad Cities. Dresden leak detection line is carbon steel and is evaluated as a non-NUREG-1801 item, Quad Cities leak detection line is stainless steel.

Table 3.1-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.7	Isolation condenser	NUREG-1801 Components Isolation Condensers	Crack initiation and growth due to stress corrosion cracking (SCC) or cyclic loading;	Inservice inspection (B.1.1); water chemistry (B.1.2)	Yes, plant specific	Consistent with NUREG-1801, with exception. The exceptions to water chemistry and inservice inspection are described in Section 3.1.1.2.3. The exceptions to ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD are described in Section B.1.1. The exceptions to Water Chemistry are described in Section B.1.2. Further evaluation of Crack Initiation and Growth due to Thermal and Mechanical Loading or Stress Corrosion Cracking BWR PWR is described in Section 3.1.1.1.7. Dresden only has Isolation Condenser.
3.1.1.8	Reactor vessel closure studs and stud assembly	NUREG-1801 Components Top Head Enclosure (Closure Studs and Nuts)	Crack initiation and growth due to SCC and/or IGSCC	Reactor head closure studs (B.1.3)	No	Consistent with NUREG-1801, with exception. The exceptions to Reactor Head Closure Studs are described in Section B.1.3.
3.1.1.9	CASS pump casing and valve body	NUREG-1801 Components Pumps Valves	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection (B.1.1)	No	Consistent with NUREG-1801, with exception. The exceptions to ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD are described in Section B.1.1.
3.1.1.10	CASS piping	See Discussion Column	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	No	CASS piping does not exist at Dresden or Quad Cities.

Table 3.1-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.11	BWR piping and fittings; steam generator components	NUREG-1801 Components Piping and Fittings Valves Evaluated with NUREG-1801 Components Filters/Strainers Flow Elements Valves	Wall thinning due to flow-accelerated corrosion	Flow-accelerated corrosion (B.1.11)	No	Consistent with NUREG-1801, with exception. The exceptions to flow accelerated corrosion are described in Section 3.1.1.2.2.
3.1.1.12	Reactor coolant pressure boundary (RCPB) valve closure bolting, manway and holding bolting, and closure bolting in high pressure and high temperature systems	NUREG-1801 Components Closure Bolting Flanges	Loss of material due to wear; loss of preload due to stress relaxation; crack initiation and growth due to cyclic loading and/or SCC	Bolting integrity (B.1.12)	No	Consistent with NUREG-1801, with exception. The exceptions to loss of preload aging degradation are described in Section 3.1.1.2.1. The exceptions to Bolting Integrity are described in Section B.1.12.
3.1.1.13	Feedwater and control rod drive (CRD) return line nozzles	NUREG-1801 Components Nozzles	Crack initiation and growth due to cyclic loading	Feedwater nozzle (B.1.5); CRD return line nozzle (B.1.6)	No	Consistent with NUREG-1801, with exception. The exceptions to BWR Control Rod Drive Return Line Nozzle are described in Section B.1.6.

Table 3.1-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.14	Vessel shell attachment welds	NUREG-1801 Components Vessel Shell Attachment Welds	Crack initiation and growth due to SCC, IGSCC	BWR vessel ID attachment welds (B.1.4); water chemistry (B.1.2)	No	Consistent with NUREG-1801, with exception. The exceptions to Water Chemistry are described in Section B.1.2. The exceptions to BWR Vessel ID Attachment Welds are described in Section B.1.4.
3.1.1.15	Nozzle safe ends, recirculation pump casing, connected systems piping and fittings, body and bonnet of valves	NUREG-1801 Components Nozzle Safe Ends Piping and Fittings Pumps Valves Evaluated with NUREG-1801 Components Dampeners Flow Elements Tanks Thermowells Tubing	Crack initiation and growth due to SCC, IGSCC	BWR stress corrosion cracking (B.1.7); water chemistry (B.1.2)	No	Consistent with NUREG-1801, with exception. The exceptions to Water Chemistry are described in Section B.1.2. The exceptions to BWR Stress Corrosion Cracking are described in Section B.1.7.
3.1.1.16	Penetrations	NUREG-1801 Components Penetrations Penetrations (Control Rod Drive Stub Tubes)	Crack initiation and growth due to SCC, IGSCC, cyclic loading	BWR penetrations (B.1.8); water chemistry (B.1.2)	No	Consistent with NUREG-1801, with exception. The exceptions to Water Chemistry are described in Section B.1.2. The exceptions to BWR Penetrations are described in Section B.1.8.

Table 3.1-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.17	Core shroud and core plate, support structure, top guide, core spray lines and spargers, jet pump assemblies, control rod drive housing, nuclear instrumentation guide tubes	NUREG-1801 Components Control Rod Drive Housings Control Rod Guide Tubes Core Plates and Bolts Core Shrouds (Upper, Central, Lower) Core Spray Lines and Spargers Incore Instrumentation Dry Tubes and Guide Tubes Jet Pump Assemblies (Does not include Sensing Lines) Reactor Internals Modification/Repair Hardware Shroud Support Structures Top Guides Evaluated with NUREG-1801 Components Orificed Fuel Support Pieces	Crack initiation and growth due to SCC, IGSCC, IASCC	BWR vessel internals (B.1.9); water chemistry (B.1.2)	No	Consistent with NUREG-1801, with exception. The exceptions to Water Chemistry are described in Section B.1.2. The exceptions to BWR Vessel Internals are described in Section B.1.9. LPCI couplings are not used at Dresden or Quad Cities.

Table 3.1-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the reactor vessel, internals, and reactor coolant system (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.18	Core shroud and core plate access hole cover (welded and mechanical covers)	NUREG-1801 Components Access Hole Covers (Mechanical) Access Hole Covers (Welded)	Crack initiation and growth due to SCC, IGSCC, IASCC	ASME Section XI Inservice Inspection (B.1.1); water chemistry (B.1.2)	No	Consistent with NUREG-1801, with exception. The exceptions to ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD are described in Section B.1.1. The exceptions to Water Chemistry are described in Section B.1.2. Dresden only has welded access hole covers.
3.1.1.19	Jet pump assembly castings; orificed fuel support	NUREG-1801 Components Jet Pump Assemblies (Does not include Sensing Lines) Orificed Fuel Support Pieces	Loss of fracture toughness due to thermal aging and neutron embrittlement	Thermal aging and neutron irradiation embrittlement (B.1.10)	No	Consistent with NUREG-1801.
3.1.1.20	Unclad top head and nozzles	See Discussion Column	Loss of material due to general, pitting, and crevice corrosion	Inservice inspection (B.1.1); water chemistry (B.1.2)	No	Dresden and Quad Cities have cladded top head enclosure and nozzles, therefore this aging effect is not applicable.

3.1.1.1 Further evaluation of aging management as recommended by NUREG-1801 for the reactor vessel, internals, and reactor coolant system

3.1.1.1.1 Cumulative Fatigue Damage BWR/PWR (NUREG-1800, Section 3.1.2.2.1)

Cumulative fatigue damage of the reactor pressure vessel, reactor vessel internals, and reactor coolant pressure boundary components is a TLAA as defined in 10 CFR 54.3. Cumulative fatigue damage of reactor pressure vessel, reactor vessel internals, and reactor coolant pressure boundary components is required to be evaluated in accordance with 10 CFR 54.21(c)(1). The TLAA evaluation cumulative fatigue damage for the reactor pressure vessel, reactor vessel internals, and reactor coolant pressure boundary components is addressed as follows:

- Reactor vessel fatigue analysis is addressed in Section 4.3.1.
- The only reactor vessel internals components with a thermal fatigue analysis are the Quad Cities core shroud and shroud repair hardware. Fatigue analysis of the reactor vessel internals is addressed in Section 4.3.2.
- Dresden Unit 3 RCPB piping with an ASME Section III Class 1 fatigue analysis is addressed in Section 4.3.3.1.
- Fatigue of RCPB piping designed in accordance with USAS B31.1 is addressed in Section 4.3.3.2.
- Environmental effects of fatigue are addressed in Section 4.3.4.
- Recirculation pumps are designed to ASME Section III Class C (1965). ASME Section III Class C (1965) does not require evaluation of thermal or pressure cycle fatigue.
- No fatigue analysis exists for RCPB valves or valve closure bolting.

3.1.1.1.2 Loss of Material due to Pitting and Crevice Corrosion BWR/PWR (NUREG-1800, Section 3.1.2.2.2.2)

NUREG-1801 indicates that ASME Section XI inservice inspections (ISI), control of isolation condenser water chemistry and specified augmentation activities are adequate to mitigate loss of material and to provide detection of aging effects. NUREG-1801 specifies that aging management program XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," should be augmented to detect loss of material due to pitting or crevice corrosion. The plant-specific aging management program Heat Exchanger Test and Inspection Activities (B.2.6) will augment aging management program ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.1.1.) The heat exchanger test and inspection activities include temperature and radioactivity monitoring of the shell side water, and eddy current testing of the tubes to ensure intended function is maintained.

3.1.1.1.3 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement BWR/PWR (NUREG-1800, Section 3.1.2.2.3.1)

Evaluation of loss of fracture toughness is a TLAA as defined in 10 CFR 54.3. Loss of fracture toughness for the reactor pressure vessel shell is evaluated in accordance with 10 CFR 54.21(c)(1). Fluence at the reactor pressure vessel nozzles is less than $1x10^{17}$ n/cm^2 at the end of the license renewal term. Therefore reactor pressure vessel nozzles are not evaluated for loss of fracture toughness due to neutron embrittlement. The TLAA evaluation of the loss of fracture toughness for the reactor pressure vessel shell is addressed in Section 4.2. Loss of fracture toughness for the reactor pressure vessel shell and nozzles will be managed with the Reactor Vessel Surveillance Program (B.1.22.)

3.1.1.1.4 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement BWR/PWR (NUREG-1800, Section 3.1.2.2.3.2)

Loss of fracture toughness due to neutron irradiation embrittlement will be managed using aging management program Reactor Vessel Surveillance (B.1.22.) The proposed withdrawal schedule will be provided prior to the period of extended operation.

3.1.1.1.5 Crack Initiation and Growth due to Thermal and Mechanical Loading or Stress Corrosion Cracking BWR/PWR (NUREG-1800, Section 3.1.2.2.4.1)

An inspection of small bore reactor coolant piping is to be conducted in accordance with aging management program One-Time Inspection (B.1.23) to verify that service-induced weld cracking is not occurring in the small-bore piping less than 4 inches including pipe, fittings and branch connections. A review of the Dresden and Quad Cities Risk Informed Inservice Inspection (RISI) Evaluations on degradation mechanism assessment demonstrated that only Dresden had a high failure potential on a small bore pipe due to thermal fatigue. The inspection will consist of an ultrasonic exam on one of the two-inch drain lines off the Dresden main steam header. These lines are Class 1 and within the scope of License Renewal. The aging mechanisms cited by the report for these lines are thermal stratification, cycling, and stripping (TASCS), thermal transients (TT), and flow accelerated corrosion. RISI lists the reasons for susceptibility to TASCS and TT due to the potential for two phase flow and because hot steam line condensate will flow into the line that is at ambient temperature whenever the drain valve is open. Selection of these lines will also minimize exposure levels.

3.1.1.1.6 Crack Initiation and Growth due to Thermal and Mechanical Loading or Stress Corrosion Cracking BWR/PWR (NUREG-1800, Section 3.1.2.2.4.2)

The reactor vessel flange leak detection line at Quad Cities is a Class 2 line. The line is stainless steel and therefore, it is susceptible to cracking due to stress corrosion cracking and intergranular stress corrosion cracking. Quad Cities ISI Program, Relief Request PR-02 (relief granted per SER dated 9/15/95), proposes an alternate inspection of the reactor vessel flange leak detection line. The alternate examination utilizes a VT-2 visual examination on the line during vessel flood-up during a refueling outage.

3.1.1.1.7 Crack Initiation and Growth due to Thermal and Mechanical Loading or Stress Corrosion Cracking BWR/PWR (NUREG-1800, Section 3.1.2.2.4.3)

NUREG-1801 indicates that ASME Section XI inservice inspections (ISI) and control of isolation condenser water chemistry, and specified augmentation activities are adequate to mitigate cracking and to provide detection of aging effects. NUREG-1801 specifies that aging management program XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," should be augmented to detect cracking due to SCC or cyclic loading. The plant-specific aging management program Heat Exchanger Test and Inspection Activities (B.2.6) will augment aging management program ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.1.1.) The heat exchanger test and inspection activities include temperature and radioactivity monitoring of the shell side water, and eddy current testing of the tubes to ensure intended function is maintained.

3.1.1.2 Aging management programs or evaluations that are different than those described in NUREG-1801 for the reactor vessel, internals, and reactor coolant system

3.1.1.2.1 Exception for loss of preload aging degradation (GALL Items IV.C1.2-e and IV.C1.3-f)

EPRI 1003056, Rev. 3, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools," states that loss of preload mechanisms are typically addressed during installation and subsequent maintenance of closure bolting. As the loss of pre-load in a bolt is a design driven effect, it is not an applicable aging effect and does not require aging management.

3.1.1.2.2 Exception to NUREG-1801 for flow accelerated corrosion

Flow accelerated corrosion is an applicable aging mechanism for the main steam lines and feedwater lines. However, carbon steel components in the reactor vessel head vent, core spray, shutdown cooling (Dresden only), HPCI, RCIC (Quad Cities only), and nuclear boiler instrumentation (Quad Cities only) systems are not susceptible to flow accelerated corrosion and do not require aging management. This exception is based on the following:

1. EPRI NSAC-202L-R2, "Recommendations for an Effective Flow-Accelerated Corrosion Program," allows an exclusion from flow accelerated corrosion for systems that operate less than 2% of plant operating time.

2. EPRI TR-114882, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools," states that flow rates less than 6 ft/sec do not need to be considered for FAC.

3. NUREG-1557, "Summary of Technical Information and Agreements from Nuclear Management and Resources Council Industry Reports Addressing License Renewal," states that erosion/corrosion in HPCI and the RCIC turbine steam supply piping is non-significant due to the low flow range.

4. Dresden and Quad Cities operate these systems less than 2% of plant operating time or at flow rates less than 6 ft/sec. Additionally, plant experience has not revealed flow accelerated corrosion in these lines.

3.1.1.2.3 Exception to GALL for XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD", for Class 1 components; and XI.M2 "Water Chemistry"; and Chapter XI.M1 AMP augmentation activities

NUREG-1801 lines IV.C1.4-a and IV.C1.4-b specify the use of ASME Section XI Inspection for Class 1 components; Water Chemistry controls; and additional augmentation activities to detect cracking or loss of material, and verify effectiveness of the program.

At Dresden, the isolation condenser is classified as ISI Class 2 on the tube side and ISI Class 3 on the shell side, so ISI Class 1 inspection requirements do not apply. VT-2 examinations of the reactor coolant pressure boundary are conducted during system pressure testing. The water chemistry controls specified in NUREG-1801, XI.M2 are not applied to the isolation condenser shell. However, the water chemistry controls specified in Water Chemistry (B.1.2) are applied to the makeup water supplied to the isolation condenser. Additionally, aging management program ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.1.1) is augmented with plant-specific Heat Exchanger Test and Inspection activities (B.2.6).

3.1.2 Components or aging effects that are not addressed in NUREG-1801 for the reactor vessel, internals, and reactor coolant system

Table 3.1-2, "Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801" contains aging management review results for the reactor vessel, internals, and reactor coolant systems for component groups that are not addressed in NUREG-1801.

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.1	Closure Bolting	Low-Alloy Steel	Containment Nitrogen	Crack initiation and growth/ Cyclic loading	Bolting Integrity (B.1.12)	NUREG-1801 does not address closure bolting in a containment nitrogen environment.
3.1.2.2	Closure Bolting	Low-Alloy Steel	Containment Nitrogen	Loss of material/ Wear	Bolting Integrity (B.1.12)	NUREG-1801 does not address closure bolting in a containment nitrogen environment.
3.1.2.3	Component External Surfaces (piping and fittings, filters/strainers, valves, flow elements, restricting orifices)	Carbon Steel	Air, moisture, and humidity < 100°C (212°F)	Loss of material/ General corrosion	Bolting Integrity (B.1.12) and Structures Monitoring Program (B.1.30)	NUREG-1801 does not address carbon steel in a plant indoor environment for Reactor Coolant System components. Bolting Integrity (B.1.12) is used to manage piping and fittings, filter/strainers, valves, flow elements, and restricting orifices. In addition, Structures Monitoring Program (B.1.30) inspects piping adjacent to selected supports.
3.1.2.4	Component External Surfaces (piping and fittings, nozzles, penetrations, tubing, valves, top head enclosure head and nozzles, vessel shells)	Carbon Steel	Containment Nitrogen	None	None	NUREG-1801 does not address carbon steel components in a containment nitrogen environment. A nitrogen ambient environment is not conducive to promoting aging degradation.
3.1.2.5	Component External Surfaces (sight glasses)	Glass	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address sight glass components. A plant indoor environment is not conducive to promoting aging degradation of glass.
3.1.2.6	Component External Surfaces (sight glasses)	Glass	Containment Nitrogen	None	None	NUREG-1801 does not address sight glass components. A nitrogen environment is not conducive to promoting aging degradation of glass.

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.7	Component External Surfaces (filters/strainers, piping and fittings, dampeners, tubing, valves)	Stainless Steel	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address stainless steel in a plant indoor environment. Plant indoor environment is not an aggressive wetted environment conducive to promoting aging degradation of stainless steel components.
3.1.2.8	Component External Surfaces (piping and fittings, flow element, pumps, tanks, tubing, filters/strainers, restricting orifices, thermowells, valves)	Stainless Steel	Containment Nitrogen	None	None	NUREG-1801 does not address stainless steel in a containment nitrogen environment. A nitrogen environment is not conducive to promoting aging degradation.
3.1.2.9	Dampeners	Stainless Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.1.2.10	Filters/Strainers	Stainless Steel Casting	Oxygenated water, up to 288°C (550°F)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address this environment for CRD filter located around CRD housing containing CST water. This also serves as a reactor coolant pressure boundary.
3.1.2.11	Filters/Strainers	Stainless Steel Casting	Oxygenated water, up to 288°C (550°F)	Crack Initiation and growth/ Stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address this environment for CRD filters/strainers located around CRD housing containing CST water. This also serves as a reactor coolant pressure boundary.

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.12	Filters/Strainers	Carbon Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.1.2.13	Filters/Strainers	Stainless Steel	288°C (550°F) reactor coolant water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non-safety related components in a reactor coolant water.
3.1.2.14	Flow Elements	Carbon Steel	25-288°C (77-550°F) demineralized water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non-safety related components in a demineralized water environment.
3.1.2.15	Isolation Condensers	Tubes: stainless steel	Tube side: Steam; shell side: Demineralized water	Buildup of Deposit/Fouling	Heat Exchanger Test and Inspection Activities (B.2.6)	NUREG-1801 does not identify fouling as an applicable aging effect. Fouling is identified in EPRI/SANDIA, and is considered applicable due to construction and operating conditions.
3.1.2.16	Nozzles	SA508 Cl2 with or without Stainless Steel Cladding	288°C (550°F) steam	None	None	NUREG-1801 addresses cumulative fatigue damage (and embrittlement for the shell) as a TLAA. There are no other aging effects for these nozzles.
3.1.2.17	Nozzles	SA508 Cl2 with or without Stainless Steel Cladding	Up to 288°C (550°F) reactor coolant water	None	None	NUREG-1801 addresses cumulative fatigue damage (and embrittlement for the shell) as a TLAA. There are no other aging effects for these nozzles..

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.18	NSR Vents or Drains, Piping and Valves	Carbon Steel, Stainless Steel, Brass or Bronze	Air, moisture, humidity, and leaking fluid	Loss of material/ Corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address NSR vents or drains in an air, moisture, humidity and leaking fluid environment.
3.1.2.19	Pipes	Carbon Steel	Leaking reactor coolant water and/or steam up to 288°C (550°F)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2)	NUREG-1801, item IV A1.1-d aging effects do not apply to Dresden since vessel flange leak detection line is constructed of carbon steel.
3.1.2.20	Piping and Fittings	Carbon Steel	25-288°C (77-550°F) demineralized water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non-safety related components in a demineralized water environment.
3.1.2.21	Piping and Fittings	Carbon Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.1.2.22	Piping and Fittings	Carbon Steel	Wet Gas	Loss of material/ General (carbon steel only) pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address components in a wet gas environment.

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.23	Piping and Fittings	Stainless Steel	25-288°C (77-550°F) demineralized water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non-safety related components in a demineralized water environment.
3.1.2.24	Piping and Fittings	Stainless Steel	288°C (550°F) reactor coolant water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non-safety related components in a reactor coolant water environment.
3.1.2.25	Piping and Fittings	Stainless Steel	Oxygenated water, up to 288°C (550°F)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address this environment for CRD piping and fittings located around CRD housing containing CST water. This also serves as a reactor coolant pressure boundary.
3.1.2.26	Piping and Fittings	Stainless Steel	Oxygenated water, up to 288°C (550°F)	Crack initiation and growth/ Stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address this environment for CRD piping and fittings located around CRD housing containing CST water. This also serves as a reactor coolant pressure boundary.

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.27	Restricting Orifices	Carbon Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.1.2.28	Restricting Orifices	Stainless Steel	Oxygenated water, up to 288°C (550°F)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non-safety related components in an oxygenated water environment.
3.1.2.29	Restricting Orifices	Stainless Steel	Oxygenated water, up to 288°C (550°F)	Crack initiation and growth/ Stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address this environment for CRD restricting orifices located around CRD housing containing CST water. This also serves as a reactor coolant pressure boundary.
3.1.2.30	Sight Glasses	Glass	25-288°C (77-550°F) demineralized water	None	None	NUREG-1801 does not address glass components. Glass in this environment does not have any applicable aging effect.
3.1.2.31	Sight Glasses	Glass	Lubricating oil (with contaminants and/or moisture)	None	None	NUREG-1801 does not address glass components in an oil environment. An oil environment is not conducive to promoting aging degradation of glass components. Glass in this environment does not have any applicable aging effect.

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.32	Sight Glasses	Glass	Wet Gas	None	None	NUREG-1801 does not address glass components in a wet gas environment. A wet gas environment is not conducive to promoting aging degradation of glass components. Glass in this environment does not have any applicable aging effect.
3.1.2.33	Support Skirts and Attachment Welds	SA-302 Gr B Welds Low Alloy Steel	Containment nitrogen	None	None	NUREG-1801 addresses cumulative fatigue damage as a TLAA. There are no other aging effects for support skirts and attachment welds. A nitrogen ambient environment is not conducive to promoting aging degradation.
3.1.2.34	Tanks	Stainless Steel	Oxygenated water, up to 288°C (550°F)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address this environment for CRD accumulator (tanks) containing CST water. This also serves as a reactor coolant pressure boundary.
3.1.2.35	Tanks	Stainless Steel	Oxygenated water, up to 288°C (550°F)	Crack initiation and growth/ Stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address this environment for CRD accumulator (tanks) located around CRD housing containing CST water. This also serves as a reactor coolant pressure boundary.
3.1.2.36	Top Head Enclosure (Head Flanges)	SA336 with or without Stainless Steel Cladding	288°C (550°F) steam	None	None	NUREG-1801 addresses cumulative fatigue damage as a TLAA. There are no other aging effects for the Top Head Enclosure head flanges.

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.37	Top Head Enclosure (Top Heads)	SA302Gr B with Stainless Steel Cladding	288°C (550°F) steam	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.1.1), for Class 1 components; and Water Chemistry (B.1.2)	NUREG-1801 does not address cladded top head enclosure.
3.1.2.38	Tubing	Stainless Steel	25-288°C (77-550°F) demineralized water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non-safety related components in a demineralized water environment.
3.1.2.39	Tubing	Stainless Steel	Oxygenated water, up to 288°C (550°F)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non safety-related components in an oxygenated water environment.
3.1.2.40	Tubing	Stainless Steel	Oxygenated water, up to 288°C (550°F)	Crack initiation and growth/ Stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non safety-related components in an oxygenated water environment.
3.1.2.41	Tubing	Stainless Steel	Saturated air	Loss of material/ Pitting and crevice corrosion	Compressed Air Monitoring (B.1.16)	NUREG-1801 does not address stainless steel components in a saturated air environment.

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.42	Tubing	Stainless Steel	Warm, moist air	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel piping components in a warm moist air environment.
3.1.2.43	Valves	Carbon Steel	25-288°C (77-550°F) demineralized water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non-safety related components in a demineralized water environment.
3.1.2.44	Valves	Carbon Steel	Leaking reactor coolant water and/or steam up to 288°C (550°F)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2)	NUREG-1801, item IV A1.1-d aging effects do not apply to Dresden since vessel flange leak detection line is constructed of carbon steel.
3.1.2.45	Valves	Carbon Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.1.2.46	Valves	Carbon Steel	Oxygenated water, up to 288°C (550°F)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address carbon steel components in an oxygenated water environment.
3.1.2.47	Valves	Carbon Steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non-safety related components in a treated water environment.

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.48	Valves	Carbon Steel	Wet Gas	Loss of material/ General (carbon steel only) pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address components in a wet gas environment.
3.1.2.49	Valves	Stainless Steel	288°C (550°F) reactor coolant water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non-safety related components in a reactor coolant water environment.
3.1.2.50	Valves	Stainless Steel	Saturated air	Loss of material/ Pitting and crevice corrosion	Compressed Air Monitoring (B.1.16)	NUREG-1801 does not address stainless steel valves in a saturated air environment.
3.1.2.51	Valves	Stainless Steel	Wet Gas	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address components in a wet gas environment.
3.1.2.52	Valves	Stainless Steel Casting	Oxygenated water, up to 288°C (550°F)	Crack initiation and growth/ Stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address this environment for CRD valves located around CRD housing containing CST water. This also serves as a reactor coolant pressure boundary.

Table 3.1-2 Aging management review results for the reactor vessel, internals, and reactor coolant system that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.1.2.53	Valves	Stainless Steel Casting	Oxygenated water, up to 288°C (550°F)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address this environment for CRD valves located around CRD housing containing CST water. This also serves as a reactor coolant pressure boundary.
3.1.2.54	Vessel Bottom Heads	SA302Gr B with 308 309 308L 309L Cladding and Low Alloy Steel Weldments	Up to 288°C (550°F) reactor coolant water	None	None	NUREG-1801 addresses cumulative fatigue damage (and embrittlement for the shell) as a TLAA. There are no other aging effects for the vessel bottom heads.
3.1.2.55	Vessel Shells	SA302Gr B with 308 309 308L 309L Cladding and Low Alloy Steel Weldments	288°C (550°F) steam	None	None	NUREG-1801 addresses cumulative fatigue damage (and embrittlement for the shell) as a TLAA. There are no other aging effects for the vessel shells.
3.1.2.56	Vessel Shells	SA336 with Stainless Steel Cladding	288°C (550°F) steam	None	None	NUREG-1801 addresses cumulative fatigue damage (and embrittlement for the shell) as a TLAA. There are no other aging effects for the vessel shells.
3.1.2.57	Vessel Shells	SA533Gr B with 308 309 308L 309L Cladding Low Alloy Steel Weldments	288°C (550°F) steam	None	None	NUREG-1801 addresses cumulative fatigue damage (and embrittlement for the shell) as a TLAA. There are no other aging effects for the vessel shells.
3.1.2.58	Penetrations Drain line	Carbon steel	Up to 288°C (550°F) reactor coolant water	None	None	NUREG-1801 addresses cumulative fatigue damage as a TLAA. There are no other aging effects for these penetrations.

3.1.2.59	Top Head Enclosure (Top Head Nozzles)	SA-508 C12 with Stainless Steel Cladding	288°C (550°F) steam	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B.1.1), for Class 1 components; and Water Chemistry (B.1.2)	NUREG-1801 does not address cladded top head enclosure nozzles.
3.1.2.60	Nozzle Safe Ends	Carbon Steel	Up to 288°C (550°F) reactor coolant water	None	None	NUREG-1801 addresses cumulative fatigue damage as a TLAA. There are no other aging effects for these nozzles.
3.1.2.61	Vessel Shells	SA-302 Gr B with 308, 309, 308L, 309L and Low Alloy Steel Weldments	288°C (550°F) reactor coolant water $5X10^8$ - $5X10^9$ $n/cm^2 \bullet s$	None	None	NUREG-1801 addresses cumulative fatigue damage (and embrittlement for the shell) as a TLAA. There are no other aging effects for vessel shells.
3.1.2.62	Penetrations	SA-336 or SA-508 Cl 2	Up to 288°C (550°F) reactor coolant water	None	None	NUREG-1801 addresses cumulative fatigue damage as a TLAA. There are no other aging effects for these penetrations.
3.1.2.63	Penetrations	SB-166	Up to 288°C (550°F) reactor coolant water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	BWR Penetrations (B.1.8); and Water Chemistry (B.1.2)	NUREG-1801 does not address SB-166 penetrations.

3.2. AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES

The following systems are evaluated as part of the engineered safety features:

- High pressure coolant injection system
- Core spray system
- Containment isolation components and primary containment piping system
- Reactor core isolation cooling system (Quad Cities only)
- Isolation condenser (Dresden only)
- Residual heat removal system (Quad Cities only)
- Low pressure coolant injection (Dresden only)
- Standby gas treatment system
- Anticipated transients without scram system
- Automatic depressurization system (evaluated under main steam)

Components Evaluated Consistent with NUREG-1801

The components or component groups requiring aging management review in each of the engineered safety features systems listed above are presented in Chapter 2. Aging management reviews were performed to assure that the component groups, materials, environments and aging effects referenced in NUREG –1801 are applicable to Dresden and Quad Cities and that the aging management program described in NUREG-1801 is appropriate.

When the components or component group and associated evaluations corresponded with an individual line item in NUREG-1801, Volume 2, the component aging management results were included in the appropriate line items in Table 3.2-1, "Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the engineered safety features" for engineered safety features systems. Each line in Table 3.2-1, "Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the engineered safety features" matches a line in Chapter 3 of NUREG-1800, that is applicable to Boiling Water Reactors (BWR) or to both Boiling Water Reactors and Pressurized Water Reactors (BWR/PWR).

Not all component types in the Dresden and Quad Cities engineered safety features systems are listed in NUREG-1801, Volume 2. However, the aging management reviews presented in NUREG-1801, Volume 2 were applied to additional component types if the following criteria were satisfied:

- Constructed of the same material as components in the NUREG-1801 line item,
- Assigned the same component intended function as components in the NUREG-1801 line item,

- Located in the same environment as components in the NUREG-1801 line item, and
- Have exhibited the same aging effects identified in the NUREG 1801 line item.

Component types meeting these criteria have been included in the presentation of aging management review results in Table 3.2-1, "Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the engineered safety features." The third column of the table shows the component types included in each evaluation line. "NUREG 1801 Components" are those that correspond exactly with component types in NUREG 1801, Volume 2. "Evaluated with NUREG 1801 Components" shows the component types that meet the four (4) criteria above, and therefore share the same evaluation characteristics. Dresden and Quad Cities do not have all of the component types identified in NUREG 1801, Volume 2. The component type entries in the third column of Table 3.2-1 under the "NUREG 1801 Components" heading are those components or component groups that were identified and evaluated at Dresden and Quad Cities.

Other Components Evaluated

Table 3.2-2, "Aging management review results for the engineered safety features that are not addressed in NUREG-1801" presents the aging management review results for the remainder of the engineered safety features systems components. These entries result from aging management review results where the component type, material, environment or aging effect/mechanism differs from NUREG-1801, Volume 2 line item entries. Each line in Table 3.2-2, "Aging management review results for the engineered safety features that are not addressed in NUREG-1801" includes a line reference number, component group, material, environment, aging effect/mechanism, aging management program and discussion.

3.2.1 Aging management programs evaluated in NUREG-1801 that are relied upon for license renewal for the engineered safety features

Table 3.2-1, "Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the engineered safety features" shows the component groups and aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the engineered safety features systems.

Table 3.2-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the engineered safety features

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.1	Piping, fittings, and valves in emergency core cooling system	NUREG-1801 Components Piping and Fittings	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Further evaluation of cumulative fatigue damage is provided in Section 3.2.1.1.1 and Section 4.3.3.2.
3.2.1.2	Piping, fittings, pumps, and valves in emergency core cooling system	NUREG-1801 Components ECCS Suction Headers Piping and Fittings Pumps Valves Evaluated with NUREG-1801 Components Filters/Strainers Flow Elements Flow Orifices Restricting Orifices Tanks Thermowells Traps	Loss of material due to general corrosion	Water chemistry (B.1.2) and one-time inspection (B.1.23)	Yes, detection of aging effects is to be further evaluated	Consistent with NUREG-1801, with exception. The exceptions to Water Chemistry are described in Section B.1.2. Further evaluation of Loss of Material due to General Corrosion is described in Section 3.2.1.1.2.

Table 3.2-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the engineered safety features (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.3	Components in containment spray (PWR only), standby gas treatment (BWR only), containment isolation, and emergency core cooling systems	NUREG-1801 Components Doors, Closure Bolts, Equip Frames Fan Housings Housings and Supports Isolation Barriers Piping and Fittings Evaluated with NUREG-1801 Components Isolation Barriers Rupture Discs Thermowells Vacuum Breakers	Loss of material due to general corrosion	Plant specific	Yes, plant specific	Further evaluation of Loss of Material due to General Corrosion is described in Section 3.2.1.1.3. External surfaces of carbon steel components identified in NUREG-1801 item V.E.1-b. are evaluated in Table 3.2.2.

Table 3.2-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the engineered safety features (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.4	Piping, fittings, pumps, and valves in emergency core cooling system	NUREG-1801 Components ECCS Suction Headers Piping and Fittings Pumps Valves Evaluated with NUREG-1801 Components Filters/Strainers Flow Elements Flow Orifices Restricting Orifices Tanks Thermowells Traps	Loss of material due to pitting and crevice corrosion	Water chemistry (B.1.2) and one-time inspection (B.1.23)	Yes, detection of aging effects is to be further evaluated	Consistent with NUREG-1801, with exception. The exceptions to Water Chemistry are described in Section B.1.2. Further evaluation of Local Loss of Material due to Pitting and Crevice Corrosion is described in Section 3.2.1.1.4.
3.2.1.5	Components in containment spray (PWR only), standby gas treatment (BWR only), containment isolation, and emergency core cooling systems	NUREG-1801 Components Isolation Barriers Piping and Fittings Evaluated with NUREG-1801 Components Isolation Barriers Rupture Discs Thermowells Vacuum Breakers	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific	Further evaluation of Local Loss of Material due to Pitting and Crevice Corrosion is described in Section 3.2.1.1.5.
3.2.1.6	Containment isolation valves and associated piping	NUREG-1801 Components Isolation Barriers	Loss of material due to microbiologically influenced corrosion	Plant specific	Yes, plant specific	Further evaluation of Local Loss of Material due to Microbiologically Influenced Corrosion is described in Section 3.2.1.1.6.

Table 3.2-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the engineered safety features (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.7	Seals in standby gas treatment system	NUREG-1801 Components Flex Collars, Doors and Damper Seals Seals	Changes in properties due to elastomer degradation	Plant specific	Yes, plant specific	Further evaluation of Changes in Properties due to Elastomer Degradation is described in Section 3.2.1.1.7.
3.2.1.8	Drywell and suppression chamber spray system nozzles and flow orifices	See Discussion Column	Plugging of nozzles and flow orifices due to general corrosion	Plant specific	Yes, plant specific	NUREG-1801 specifies carbon steel material. Dresden and Quad Cities have brass/bronze spray nozzles.
3.2.1.9	Piping and fittings of CASS in emergency core cooling system	See Discussion Column	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	No	CASS material does not exist at Dresden or Quad Cities.
3.2.1.10	Components serviced by open-cycle cooling system	See Discussion Column	Local loss of material due to corrosion and/or buildup of deposit due to biofouling	Open-cycle cooling water system (B.1.13)	No	Material does not match materials at Dresden or Quad Cities.
3.2.1.11	Components serviced by closed-cycle cooling system	See Discussion Column	Loss of material due to general, pitting, and crevice corrosion	Closed-cycle cooling water system (B.1.14)	No	Material does not match materials at Dresden or Quad Cities.
3.2.1.12	Emergency core cooling system valves and lines to and from HPCI and RCIC pump turbines	NUREG-1801 Components Piping and Fittings Valves	Wall thinning due to flow-accelerated corrosion	Flow-accelerated corrosion (B.1.11)	No	Consistent with NUREG-1801, with exception. The exceptions to flow accelerated corrosion are described in Section 3.2.1.2.1.

Table 3.2-1 Aging management programs evaluated in NUREG-1801 that are relied on for license renewal for the engineered safety features (Continued)

Ref No	Component	Components Evaluated	Aging Effect/Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.13	Pumps, valves, piping, and fittings in emergency core cooling systems	NUREG-1801 Components Piping and Fittings Valves Evaluated with NUREG-1801 Components Dampeners Diffusers Filters/Strainers Flow Elements Pumps Restricting Orifices Tanks Thermowells Tubing	Crack initiation and growth due to SCC and IGSCC	Water chemistry (B.1.2) and BWR stress corrosion cracking (B.1.7)	No	Consistent with NUREG-1801, with exception. The exceptions to BWR stress corrosion cracking are described in Section 3.2.1.2.2. The exceptions to Water Chemistry are described in Section B.1.2. The exceptions to BWR Stress Corrosion Cracking are described in Section B.1.7.
3.2.1.14	Closure bolting in high pressure or high temperature systems	NUREG-1801 Components Closure Bolting	Loss of material due to general corrosion, loss of preload due to stress relaxation and crack initiation and growth due to cyclic loading or SCC	Bolting integrity (B.1.12)	No	Consistent with NUREG-1801, with exception. The exceptions to Bolting Integrity are described in Section B.1.12.

3.2.1.1 Further evaluation of aging management as recommended by NUREG-1801 for the engineered safety features systems

3.2.1.1.1 Cumulative Fatigue Damage (NUREG-1800, Section 3.2.2.2.1)

Cumulative fatigue damage of ESF piping is a TLAA as defined in 10 CFR 54.3. Cumulative fatigue damage of ESF piping is required to be evaluated in accordance with 10 CFR 54.21(c)(1). The TLAA evaluation of ESF piping outside the RCPB is addressed in Section 4.3.3.2.

3.2.1.1.2 Loss of Material due to General Corrosion (NUREG-1800, Section 3.2.2.2.2.1)

An inspection of selected components exposed to a stagnant flow water environment will be conducted in accordance with aging management program One-Time Inspection (B.1.23.) The inspection of selected components will verify the effectiveness of the chemistry control program to manage loss of material due to general corrosion in low flow or stagnant flow areas by ensuring that significant degradation is not occurring and the component intended function will be maintained during the extended period of operation.

HPCI components were selected to provide typical samples of the aging effects seen in the ESF systems. Examinations will be conducted on carbon steel components in an area where typically stagnant flow is present but occasionally there is flow, which will cause replenishment of the oxygen supply. Inspections will be conducted on the HPCI torus suction check valves and the HPCI booster pumps. The carbon steel HPCI torus suction check valves are exposed to torus water while the carbon steel HPCI booster pumps are exposed to condensate storage tank water. Each will undergo a visual examination.

3.2.1.1.3 Loss of Material due to General Corrosion (NUREG-1800, Section 3.2.2.2.2.2)

An inspection in accordance with One-Time Inspection (B.1.23) of standby gas treatment system (SGTS) ducts and components will be performed. The one-time inspection will provide assurance that penetrating corrosion of SGTS components is not occurring at an unacceptable rate. The inspection will consist of VT-3 visual inspections for the presence of general corrosion in selected standby gas treatment components.

An inspection in accordance with One-Time Inspection (B.1.23) of carbon steel piping most likely to experience a loss of material in the Dresden and Quad Cities safety relief discharge piping, Dresden and Quad Cities HPCI systems, Dresden LPCI (spray piping) system, Quad Cities RHR (spray piping), and the Quad Cities RCIC system that are exposed to a containment atmosphere environment (wet gas) will be performed. The safety relief discharge piping at Dresden and Quad Cities is carbon steel. The water level in the suppression chamber fluctuates, subjecting the section of safety relief discharge piping, HPCI piping, and RCIC piping at the waterline to repeated wetting and drying, and therefore making it more susceptible to general corrosion, pitting and crevice

corrosion in that area. The examination will consist of four ultrasonic tests to detect reduction in wall thickness due to loss of material on the inside of the piping at the waterline. Engineering will specify one safety relief discharge piping inspection location at Dresden and another inspection location at Quad Cities. Engineering will also specify one HPCI piping inspection location at Dresden and another inspection location at Quad Cities. An evaluation of the inspection results will be performed to determine that there is no unacceptable loss of material for the selected piping in the Dresden and Quad Cities safety relief discharge piping, Dresden and Quad Cities HPCI systems, Dresden LPCI (spray piping) system, Quad Cities RHR (spray piping), and the Quad Cities RCIC system components exposed to a containment atmosphere environment (wet gas).

Containment isolation barriers (penetration piping and isolation valves) will be inspected per the requirements of aging management program 10 CFR 50, Appendix J (B.1.28), to verify the pressure retaining integrity of individual penetrations. Containment isolation barriers subject to loss of material due to general corrosion are found in the following license renewal systems:

- Primary containment and suppression pool piping
- Traversing incore probe system
- Drywell equipment and floor drain system
- Atmospheric containment air dilution
- Service and emergency breathing air system
- Instrument air system

Components Requiring Aging Management for Loss of Material due to General Corrosion

Component Group	Aging Management Program		
	One-Time Inspection (B.1.23) Ventilation and SBGT Systems	One-Time Inspection (B.1.23) Piping Exposed to Containment Atmosphere (Wet Gas)	10 CFR 50, Appendix J (B.1.28)
Duct & Fittings, Access Doors, Closure Bolts, and Equipment Frames	X		
Fan Housings	X		
Filter Housing and Supports	X		
Isolation Barriers		X	X
Piping and Fittings		X	
Rupture Discs		X	
Thermowells		X	
Vacuum Breakers		X	

3.2.1.1.4 Local Loss of Material due to Pitting and Crevice Corrosion (NUREG-1800, Section 3.2.2.2.3.1)

An inspection of selected components exposed to a stagnant flow water environment will be conducted in accordance with aging management program One-Time Inspection (B.1.23.) The inspection of selected components will verify the effectiveness of the chemistry control program in low flow or stagnant flow areas. The inspections ensure that significant degradation due to pitting and crevice corrosion is not occurring and the component intended function will be maintained during the extended period of operation. Examinations will be conducted on components in areas where typically stagnant flow is present but occasionally there is flow, which will cause replenishment of the oxygen supply. Inspections will be conducted on the HPCI torus suction check valves, the HPCI booster pumps, and the control rod drive (CRD) scram valves. These components were selected to provide typical samples of the aging effects seen in the ESF systems. The carbon steel HPCI torus suction check valves are exposed to torus water, while the carbon steel HPCI booster pumps and the stainless steel CRD scram valves are exposed to condensate storage tank water. Each will undergo a visual examination.

3.2.1.1.5 Local Loss of Material due to Pitting and Crevice Corrosion (NUREG-1800, Section 3.2.2.2.3.2)

An inspection in accordance with One-Time Inspection (B.1.23) of carbon steel piping most likely to experience a loss of material in the Dresden and Quad Cities safety relief discharge piping, Dresden and Quad Cities HPCI systems, Dresden LPCI (spray piping) system, Quad Cities RHR (spray piping), and the Quad Cities RCIC system that are exposed to a containment atmosphere environment (wet gas) will be performed. The safety relief discharge piping at Dresden and Quad Cities is carbon steel. The water level in the suppression chamber fluctuates, subjecting the section of safety relief discharge piping, HPCI piping, and RCIC piping at the waterline to repeated wetting and drying, and therefore making it more susceptible to general corrosion, pitting and crevice corrosion in that area. The examination will consist of four ultrasonic tests to detect reduction in wall thickness due to loss of material on the inside of the piping at the waterline. Engineering will specify one safety relief discharge piping inspection location at Dresden and another inspection location at Quad Cities. Engineering will also specify one HPCI piping inspection location at Dresden and another inspection location at Quad Cities. An evaluation of the inspection results will be performed to determine that there is no unacceptable loss of material for the selected piping in the Dresden and Quad Cities safety relief discharge piping, Dresden and Quad Cities HPCI systems, Dresden LPCI (spray piping) system, Quad Cities RHR (spray piping), and the Quad Cities RCIC system components exposed to a containment atmosphere environment (wet gas).

Containment isolation barriers (penetration piping and isolation valves) will be inspected per the requirements of aging management program 10 CFR 50, Appendix J (B.1.28), to verify the pressure retaining integrity of individual penetrations. Containment isolation barriers subject to loss of material due to pitting and crevice corrosion are found in the following license renewal systems:

- Primary containment and suppression pool piping
- Traversing incore probe system

- Drywell equipment and floor drain system
- Atmospheric containment air dilution
- Service and emergency breathing air system
- Instrument air system

Components Requiring Aging Management for Loss of Material due to Pitting and Crevice Corrosion

Component Group	Aging Management Program	
	One-Time Inspection: (B.1.23) Piping Exposed to Containment Atmosphere (wet gas)	10 CFR 50 Appendix J (B.1.28)
Isolation Barriers	X	X
Piping and Fittings	X	
Rupture Discs	X	
Thermowells	X	
Vacuum Breakers	X	

3.2.1.1.6 Local Loss of Material due to Microbiologically Influenced Corrosion (NUREG-1800, Section 3.2.2.2.4)

Management of aging due to local loss of material resulting from microbiologically influenced corrosion (MIC) in the drywell equipment drain sump and drywell floor drain sump containment isolation barriers is performed in accordance with aging management program 10 CFR Part 50, Appendix J (B.1.28.) No other containment isolation barriers are subject to loss of material due to MIC or biofouling.

3.2.1.1.7 Changes in Properties due to Elastomer Degradation (NUREG-1800, Section 3.2.2.2.5)

Aging management of standby gas treatment system elastomers will be performed by the periodic inspection of ventilation system elastomers in accordance with plant-specific aging management program Periodic Inspection of Ventilation System Elastomers (B.2.3.)

3.2.1.2 Aging management programs or evaluations that are different than those described in NUREG-1801

3.2.1.2.1 Exception to NUREG-1801 for flow accelerated corrosion

Flow accelerated corrosion is an applicable aging mechanism for the Quad Cities HPCI steam line drains. However, carbon steel components in the ATWS, isolation

condenser, core spray, LPCI (Dresden only), RHR (Quad Cities only), primary containment and suppression pool piping, HPCI (except as previously noted) and RCIC (Quad Cities only) systems are not susceptible to flow accelerated corrosion and do not require aging management. This exception is based on the following:

1. EPRI NSAC-202L-R2, "Recommendations for an Effective Flow-Accelerated Corrosion Program," allows an exclusion from flow accelerated corrosion for systems that operate less than 2% of plant operating time.

2. EPRI TR-114882, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools," states that flow rates less than 6 ft/sec do not need to be considered for flow accelerated corrosion .

3. NUREG-1557, "Summary of Technical Information and Agreements from Nuclear Management and Resources Council Industry Reports Addressing License Renewal," states that erosion/corrosion in HPCI and the RCIC turbine steam supply piping is non-significant due to the low flow range.

4. Dresden and Quad Cities operate these systems less than 2% of plant operating time or at flow rates of less than 6 ft/sec. Additionally, plant experience has not revealed flow accelerated corrosion in these lines.

3.2.1.2.2 Exception to GALL for XI.M7, "BWR Stress Corrosion Cracking" and XI.M2, "Water Chemistry"

NUREG-1801 program XI.M7, "BWR Stress Corrosion Cracking," does not apply to the segments of ECCS systems which are stainless steel and contain torus water. EPRI TR-1003056, "Mechanical Tools" Appendix A, states that cracking due to SCC and IGSCC is not likely in a high purity environment below 200 degrees F. NUREG-1801 program XI.M7, "BWR Stress Corrosion Cracking," applies to piping that contains reactor coolant at a temperature above 200 degrees F. The ECCS piping that contains torus water does not reach this level of temperature. Therefore, aging management program XI.M7 does not apply. Aging management program Water Chemistry (B.1.2) alone will manage aging due to cracking by controlling chloride and sulfate contaminants.

3.2.2 Components or aging effects that are not addressed in NUREG-1801 for the engineered safety features

Table 3.2-2 "Aging management review results for the engineered safety features that are not addressed in NUREG-1801" contains aging management review results for the engineered safety features systems for component groups that are not addressed in NUREG-1801.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.1	Closure Bolting	Low-Alloy Steel	Containment Nitrogen	Crack initiation and growth/ Cyclic loading	Bolting Integrity (B.1.12)	NUREG-1801 does not address closure bolting in a containment nitrogen environment.
3.2.2.2	Piping and Fittings	Stainless Steel	Air and steam up to 320°C (608°F) (Primarily Air)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address NSR components in an air and steam environment.
3.2.2.3	Tanks	Brass or Bronze	Saturated air	Loss of material/ Pitting and crevice corrosion	Compressed Air Monitoring (B.1.16)	NUREG-1801 does not address brass or bronze components in a saturated air environment.
3.2.2.4	Closure Bolting	Low-Alloy Steel	Containment Nitrogen	Loss of material/ Wear	Bolting Integrity (B.1.12)	NUREG-1801 does not address closure bolting in a containment nitrogen environment.
3.2.2.5	Sight Glasses	Glass	Air and steam up to 320°C (608°F)	None	None	NUREG-1801 does not address glass components in an air and steam environment. An air and steam environment is not conducive to promoting aging degradation of glass components. Glass in this environment does not have any applicable aging effect.
3.2.2.6	Closure Bolting	Low-Alloy Steel	Outdoor ambient conditions	Loss of Material/General corrosion and wear	Bolting Integrity (B.1.12)	NUREG-1801 does not address closure bolting in an outdoor environment.
3.2.2.7	Valves	Brass or Bronze	Air and steam up to 320°C (608°F)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address brass or bronze components in an air and steam environment.
3.2.2.8	Component External Surfaces (turbine casings)	Alloy Steel Casting (A217)	Air, moisture, and humidity < 100°C (212°F)	Loss of material/ General corrosion	Bolting Integrity (B.1.12)	NUREG-1801 does not address ESF System alloy steel components in a plant indoor environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.9	Component External Surfaces (piping and fittings)	Aluminum	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address aluminum in a plant indoor environment. Plant indoor environment is not an aggressive wetted environment conducive to promoting aging degradation of aluminum components.
3.2.2.10	Component External Surfaces (piping and fittings, valves, tanks)	Aluminum	Outdoor ambient conditions	Loss of material/ Pitting	Bolting Integrity (B.1.12) and Structures Monitoring Program (B.1.30)	NUREG-1801 does not address aluminum component external surfaces in an outdoor environment. Bolting Integrity (B.1.12) is used to manage piping and fittings, valves, and tanks. In addition, Structures Monitoring Program (B.1.30) inspects piping adjacent to selected supports.
3.2.2.11	Component External Surfaces (valves, tanks)	Brass or Bronze	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address brass or bronze components in a plant indoor environment. Copper alloy materials are not subject to any viable aging mechanism in this environment.
3.2.2.12	Component External Surfaces (piping and fittings, valves, spray nozzles)	Brass or Bronze	Containment Nitrogen	None	None	NUREG-1801 does not address brass or bronze components in a containment nitrogen environment. A containment nitrogen environment is not conducive to promoting aging degradation.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.13	Component External Surfaces (piping and fittings, valves, restricting orifices, thermowells, traps, tubing, filters/ strainers, tanks, tubing)	Carbon Steel	Air, moisture, and humidity where surface temp > 100°C (212°F)	None	None	NUREG-1801 does not address high temperature carbon steel external surfaces. A temperature limit of 212°F applies to all materials as moisture must be present for corrosion to occur.
3.2.2.14	Component External Surfaces (piping and fittings, valves, tubing, isolation barriers)	Carbon Steel	Containment Nitrogen	None	None	NUREG-1801 does not address carbon steel in a containment nitrogen environment. A containment nitrogen environment is not conducive to promoting aging degradation.
3.2.2.15	Component External Surfaces (piping and fittings, valves)	Carbon Steel	Outdoor ambient conditions	Loss of material/ General pitting crevice corrosion	Bolting Integrity (B.1.12)	NUREG-1801 does not address ESF System carbon steel component external surfaces in an outdoor environment.
3.2.2.16	Component External Surfaces (carbon steel components)	Carbon Steel	Soil and groundwater	Loss of Material/ General pitting crevice and microbiologically influenced corrosion	Buried Piping and Tanks Inspection (B.1.25)	NUREG-1801 does not address buried SGTS carbon steel piping external surfaces.
3.2.2.17	Component External Surfaces (pumps, valves, tanks)	Cast Iron	Air, moisture, and humidity < 100°C (212°F)	Loss of material/ Pitting and crevice corrosion	Bolting Integrity (B.1.12)	NUREG-1801 does not address cast iron component external surfaces in an indoor environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.18	Component External Surfaces (tubing)	Copper	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address copper in a plant indoor environment. The plant indoor environment is not an aggressive wetted environment conducive to promoting aging degradation of copper components.
3.2.2.19	Component External Surfaces (tubing)	Copper	Containment Nitrogen	None	None	NUREG-1801 does not address copper components in a containment nitrogen environment. A containment nitrogen environment is not conducive to promoting aging degradation.
3.2.2.20	Component External Surfaces (sight glasses)	Glass	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address glass in a plant indoor environment. A plant indoor environment is not conducive to promoting aging degradation of glass components. Glass in this environment does not have any applicable aging effect.
3.2.2.21						Line left intentionally blank.
3.2.2.22	Component External Surfaces (piping and fittings, valves, tubing, dampeners, filters/strainers, rupture discs, flow elements, restricting orifices, thermowells, isolation barriers, tanks, pumps,)	Stainless Steel	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address stainless steel engineered safety features components in a plant indoor environment. Plant indoor environment is not conducive to promoting aging degradation of stainless steel components.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.23	Component External Surfaces (piping and fittings, valves, dampeners, rupture discs, tubing)	Stainless Steel	Air, moisture, and humidity where surface temp > 100°C (212°F)	None	None	NUREG-1801 does not address high temperature stainless steel external surfaces. A temperature limit of 212°F applies to all materials as moisture must be present for corrosion to occur.
3.2.2.24	Component External Surfaces (piping and fittings, valves, isolation barriers, tubing, flow elements)	Stainless Steel	Containment Nitrogen	None	None	NUREG-1801 does not address stainless steel in a containment nitrogen environment. A containment nitrogen environment is not conducive to promoting aging degradation
3.2.2.25	Component External Surfaces (piping and fittings, valves)	Stainless Steel	Outdoor ambient conditions	Loss of material/ Pitting and crevice corrosion	Bolting Integrity (B.1.12) and Structures Monitoring Program (B.1.30)	NUREG-1801 does not address outdoor stainless steel ECCS supply piping external surfaces. Bolting Integrity (B.1.12) is used to manage piping and fittings and valves. In addition, Structures Monitoring Program (B.1.30) inspects piping adjacent to selected supports.
3.2.2.26	Component External Surfaces (piping and fittings)	Stainless Steel	Soil and groundwater	Loss of material/ Pitting crevice and microbiologically influenced corrosion	Buried Piping and Tanks Inspection (B.1.25)	NUREG-1801 does not address buried stainless steel ECCS supply piping external surfaces.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.27	Component External Surfaces (piping and fittings, valves)	Steel Chrome Moly	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address chrome-moly steel in a plant indoor environment. Plant indoor environment is not an aggressive wetted environment conducive to promoting aging degradation of chrome-moly steel components.
3.2.2.28	Component External Surfaces (piping and fittings)	Steel Chrome Moly	Air, moisture, and humidity where surface temp > 100°C (212°F)	None	None	NUREG-1801 does not address high temperature chrome-moly steel external surfaces. A temperature limit of 212°F applies to all materials as moisture must be present for corrosion to occur.
3.2.2.29	Dampeners	Stainless Steel	25-288°C (77-550°F) demineralized water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non safety related components in a demineralized water environment.
3.2.2.30	Dampeners	Stainless Steel	Air	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel dampeners in an air environment.
3.2.2.31	Filters/Strainers	Stainless Steel	Internal: occasional exposure to moist air; external: ambient plant air environment	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel components with an internal exposure to occasional moisture and external exposure to plant air.
3.2.2.32	Filters/Strainers	Carbon Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.33	Flexible Hoses	Elastomers Neoprene and Similar Materials	Lubricating oil (with contaminants and/or moisture)	Hardening and loss of strength/ Elastomer degradation	One-Time Inspection (B.1.23)	NUREG-1801 does not address elastomers, neoprene or similar material components in a lubricating oil environment.
3.2.2.34	Flexible Hoses	Elastomers Neoprene and Similar Materials	Moist air	Hardening and loss of strength/ Elastomer degradation	One-Time Inspection (B.1.23)	NUREG-1801 does not address elastomers in a moist air environment.
3.2.2.35	Flexible Hoses	Elastomers Neoprene and Similar Materials	Moist containment atmosphere (air/nitrogen), steam, or demineralized water	Hardening and loss of strength/ Elastomer degradation	One-Time Inspection (B.1.23)	NUREG-1801 does not address elastomers in a moist containment atmosphere environment.
3.2.2.36	Flexible Hoses	Elastomers Neoprene and Similar Materials	Saturated air	Hardening and loss of strength/ Elastomer degradation	One-Time Inspection (B.1.23)	NUREG-1801 does not address elastomers in a saturated air environment.
3.2.2.37	Flow Elements	Stainless Steel	Warm, moist air	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel flow elements in a warm, moist air environment.
3.2.2.38	Heat Exchangers	Tubes: Admiralty Brass	Tube Side: Condensate (demineralized water); Shell side: Lubricating oil	Buildup of Deposit/Fouling	Heat Exchanger Test and Inspection Activities (B.2.6)	NUREG-1801 does not address lube oil coolers.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.39	Heat Exchangers	Tubes: Admiralty Brass	Tube Side: Condensate (demineralized water); Shell side: Reactor coolant water and Warm moist air	Buildup of Deposit/Fouling	Heat Exchanger Test and Inspection Activities (B.2.6)	NUREG-1801 does not address admiralty brass components or air environments for ECCS heat exchangers.
3.2.2.40	Heat Exchangers	Tubes: Admiralty Brass; Tubesheet: Brass; Channel Head: Carbon Steel; Shell: Carbon Steel	Tube Side: Condensate (demineralized water); Shell side: Lubricating oil	Loss of Material/General Corrosion, Galvanic Corrosion, MIC, Erosion or FAC, Wear, Selective Leaching	Water Chemistry (B.1.2), Selective Leaching of Materials (B.1.24), Lube Oil Monitoring Activities, Heat Exchanger Test and Inspection Activities (B.2.6)	NUREG-1801 does not address lube oil coolers. Galvanic corrosion, erosion or FAC, and wear are not included in NUREG-1801 for ECCS heat exchangers.
3.2.2.41	Heat Exchangers	Tubes: Admiralty Brass; Tubesheet: Brass; Channel Head: Carbon Steel; Shell: Carbon Steel	Tube Side: Condensate (demineralized water); Shell side: Lubricating oil	Cracking/Mech Fatigue, SCC	Water Chemistry (B.1.2), Lube Oil Monitoring Activities, Heat Exchanger Test and Inspection Activities (B.2.6)	NUREG-1801 does not address lube oil coolers.
3.2.2.42	Heat Exchangers	Tubes: Admiralty Brass; Tubesheet: Carbon Steel; Channel Head: Carbon Steel; Shell: Carbon Steel	Tube Side: Condensate (demineralized water); Shell side: Reactor coolant water and Warm moist air	Loss of Material/General Corrosion, Galvanic Corrosion, MIC, Erosion or FAC, Wear, Selective Leaching, Pitting Corrosion, Crevice Corrosion	Water Chemistry (B.1.2), Selective Leaching of Materials (B.1.24), Heat Exchanger Test and Inspection Activities	NUREG-1801 does not address admiralty brass components or air environments for ECCS heat exchangers.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.43	Heat Exchangers	Tubes: Admiralty Brass; Tubesheet: Carbon Steel; Channel Head: Carbon Steel; Shell: Carbon Steel	Tube Side: Condensate (demineralized water); Shell side: Reactor coolant water and Warm moist air	Cracking/Mech Fatigue, SCC	Water Chemistry (B.1.2), Heat Exchanger Test and Inspection Activities (B.2.6)	NUREG-1801 does not address admiralty brass components or air environments for ECCS heat exchangers.
3.2.2.44	Insulation	Asbestos	Air, moisture, and humidity < 100°C (212°F)	Insulation degradation/Loss of insulating characteristics	Structures Monitoring Program (B.1.30)	NUREG-1801 does not address indoor asbestos insulation degradation.
3.2.2.45	Insulation	Fiberglass	Air, moisture, and humidity < 100°C (212°F)	Insulation degradation/Loss of insulating characteristics	Structures Monitoring Program (B.1.30)	NUREG-1801 does not address indoor fiberglass insulation degradation.
3.2.2.46	Insulation	NUKON quilted fiberglass	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address NUKON quilted fiberglass insulation in a plant indoor environment. Plant indoor environment is not conducive to promoting aging degradation of quilted fiberglass insulation.
3.2.2.47	Insulation	Stainless Steel Mirror Insulation	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address stainless steel mirror insulation in a plant indoor environment. Stainless steel materials are not subject to any viable aging mechanism in the absence of aggressive chemical species.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.48	Insulation Jacketing	Stainless Steel	Air, moisture, and humidity < 100°C (212°F)	None	None	NUREG-1801 does not address stainless steel insulation jacketing in a plant indoor environment. Stainless steel materials are not subject to any viable aging mechanism in the absence of aggressive chemical species.
3.2.2.49	Isolation Barriers	Brass or Bronze	Saturated air	Loss of material/ Pitting and crevice corrosion	10 CFR Part 50, Appendix J (B.1.28)	NUREG-1801 does not address brass or bronze components in a saturated air environment.
3.2.2.50	Isolation Barriers	Carbon Steel	Saturated air	Loss of material/ General pitting crevice corrosion	10 CFR Part 50, Appendix J (B.1.28)	NUREG-1801 does not address carbon steel components in a saturated air environment.
3.2.2.51	Isolation Barriers	Carbon Steel	Warm, moist air	Loss of material/ General pitting crevice corrosion	10 CFR Part 50, Appendix J (B.1.28)	NUREG-1801 does not address carbon steel components in a warm, moist air environment.
3.2.2.52	Isolation Barriers	Stainless Steel	Saturated air	Loss of material/ Pitting and crevice corrosion	10 CFR Part 50, Appendix J (B.1.28)	NUREG-1801 does not address stainless steel components in a saturated air environment.
3.2.2.53	Isolation Barriers	Stainless Steel	Warm, moist air	Loss of material/ Pitting and crevice corrosion	10 CFR Part 50, Appendix J (B.1.28)	NUREG-1801 does not address stainless steel components in a warm, moist air environment.
3.2.2.54	Manifolds	Stainless Steel	Internal: occasional exposure to moist air; external: ambient plant air environment	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel components with an internal exposure to occasional moisture and external exposure to plant air.
3.2.2.55	NSR Vents or Drains, Piping and Valves	Carbon Steel, Stainless Steel, Brass or Bronze	Air, moisture, humidity, and leaking fluid	Loss of material/ Corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address NSR vents or drains in an air, moisture, humidity and leaking fluid environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.56	Piping and Fittings	Aluminum	25-288°C (77-550°F) demineralized water	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2)	NUREG-1801 does not address aluminum in a reactor grade water environment.
3.2.2.57	Piping and Fittings	Carbon Steel	25-288°C (77-550°F) demineralized water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non safety-related components in a demineralized water environment.
3.2.2.58	Piping and Fittings	Carbon Steel	Air and steam up to 320°C (608°F) (Primarily Steam)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.59	Piping and Fittings	Carbon Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.2.2.60	Piping and Fittings	Carbon Steel	Saturated air	Loss of material/ General and pitting corrosion	Compressed Air Monitoring (B.1.16)	NUREG-1801 does not address carbon steel components in a saturated air environment.
3.2.2.61	Piping and Fittings	Carbon Steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non safety related components in a treated water environment.
3.2.2.62	Piping and Fittings	Carbon Steel	Warm, moist air	Loss of material/ General (carbon steel only) pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address carbon steel piping and fittings in a warm, moist air environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.63	Piping and Fittings	Stainless Steel	25-288°C (77-550°F) demineralized water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non safety related components in a demineralized water environment.
3.2.2.64	Piping and Fittings	Stainless Steel	Air and steam up to 320°C (608°F) (Primarily Steam)	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address stainless steel piping and fittings in an air and steam environment.
3.2.2.65	Piping and Fittings	Stainless Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel components in a lubricating oil environment.
3.2.2.66	Piping and Fittings	Stainless Steel	Saturated air	Loss of material/ Pitting and crevice corrosion	Compressed Air Monitoring (B.1.16)	NUREG-1801 does not address stainless steel components in a saturated air environment.
3.2.2.67	Piping and Fittings	Stainless Steel	Warm, moist air	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel valves in a warm, moist air environment.
3.2.2.68	Piping and Fittings	Steel Chrome Moly	25-288°C (77-550°F) demineralized water	Loss of material/ Pitting	Water Chemistry (B.1.2)	NUREG-1801 does not address chrome moly in a reactor grade water environment.
3.2.2.69	Pumps	Cast Iron	25-288°C (77-550°F) demineralized water	Loss of Material/ Selective Leaching	Selective Leaching of Materials (B.1.24)	NUREG-1801 does not address cast iron in a reactor grade water environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.70	Pumps	Cast Iron	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General pitting crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address cast iron components in a lubricating oil environment.
3.2.2.71	Pumps	Cast Iron	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.2.2.72	Restricting Orifices	Carbon Steel	25-288°C (77-550°F) demineralized water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non safety related components in a demineralized water environment.
3.2.2.73	Restricting Orifices	Carbon Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.2.2.74	Restricting Orifices	Stainless Steel	Warm, moist air	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel valves in a warm, moist air environment.
3.2.2.75	Sight Glasses	Carbon Steel	25-288°C (77-550°F) demineralized water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non safety related components in a demineralized water environment.
3.2.2.76	Sight Glasses	Glass	25-288°C (77-550°F) demineralized water	None	None	NUREG-1801 does not address glass components. Glass in this environment does not have any applicable aging effect.
3.2.2.77	Sight Glasses	Glass	Lubricating oil (with contaminants and/or moisture)	None	None	NUREG-1801 does not address glass components in an oil environment. An oil environment is not conducive to promoting aging degradation of glass components. Glass in this environment does not have any applicable aging effect.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.78	Spray Nozzles	Brass or Bronze	Air	Plugging of flow orifice and spray nozzles/ General corrosion	Periodic Testing of Drywell and Torus Spray Nozzles (B.2.4)	NUREG-1801 does not address components made of brass or bronze.
3.2.2.79	Support Members	Carbon Steel	25-288°C (77-550°F) demineralized water	Loss of material/ General galvanic pitting and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address support members in submerged environments.
3.2.2.80	Support Members	Stainless Steel	25-288°C (77-550°F) demineralized water	Cracking/ Stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address support members in submerged environments.
3.2.2.81	Support Members	Stainless Steel	25-288°C (77-550°F) demineralized water	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address support members in submerged environments.
3.2.2.82	Tanks	Aluminum	25-288°C (77-550°F) demineralized water	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2)	NUREG-1801 does not address aluminum in a reactor grade water environment.
3.2.2.83	Tanks	Carbon Steel	Air and steam up to 320°C (608°F) (Primarily Steam)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.84	Tanks	Carbon Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.2.2.85	Tanks	Cast Iron	25-288°C (77-550°F) demineralized water	Loss of Material/ Selective Leaching	Selective Leaching of Materials (B.1.24)	NUREG-1801 does not address cast iron in a reactor grade water environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.86	Thermowells	Carbon Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.2.2.87	Thermowells	Carbon Steel	Warm, moist air	Loss of material/ General (carbon steel only) pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address carbon steel thermowells in a warm, moist air environment.
3.2.2.88	Traps	Carbon Steel	Air and steam up to 320°C (608°F) (Primarily Steam)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.89	Tubing	Carbon Steel	25-288°C (77-550°F) demineralized water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non safety related components in a demineralized water environment.
3.2.2.90	Tubing	Copper	Saturated air	Loss of material/ Pitting and crevice corrosion	Compressed Air Monitoring (B.1.16)	NUREG-1801 does not address copper components in a saturated air environment.
3.2.2.91	Tubing	Copper	Warm, moist air	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address copper components in a warm, moist air environment.
3.2.2.92	Tubing	Stainless Steel	25-288°C (77-550°F) demineralized water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non safety related components in a demineralized water environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.93	Tubing	Stainless Steel	288°C (550°F) reactor coolant water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non safety related components in a reactor coolant water environment.
3.2.2.94	Tubing	Stainless Steel	Air and steam up to 320°C (608°F) (Primarily Steam)	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address stainless steel tubing in an air and steam environment.
3.2.2.95	Tubing	Stainless Steel	Internal: occasional exposure to moist air; external: ambient plant air environment	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel components with an internal environment of occasional exposure to moist air and external environment of ambient plant air.
3.2.2.96	Tubing	Stainless Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel components in a lubricating oil environment.
3.2.2.97	Tubing	Stainless Steel	Saturated air	Loss of material/ Pitting and crevice corrosion	Compressed Air Monitoring (B.1.16)	NUREG-1801 does not address stainless steel components in a saturated air environment.
3.2.2.98	Tubing	Stainless Steel	Warm, moist air	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel tubing in a warm, moist air environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.99	Turbine Casings	Alloy Steel Casting (A217)	Air and steam up to 320°C (608°F)	Loss of material/ General, pitting, and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address alloy steel turbine casings in an air and steam environment.
3.2.2.100	Valves	Aluminum	25-288°C (77-550°F) demineralized water	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2)	NUREG-1801 does not address aluminum in a reactor grade water environment.
3.2.2.101	Valves	Brass or Bronze	Internal: occasional exposure to moist air; external: ambient plant air environment	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address brass or bronze components in a moist air or ambient plant air environment.
3.2.2.102	Valves	Brass or Bronze	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.2.2.103	Valves	Brass or Bronze	Saturated air	Loss of material/ Pitting and crevice corrosion	Compressed Air Monitoring (B.1.16)	NUREG-1801 does not address brass or bronze components in a saturated air environment.
3.2.2.104	Valves	Carbon Steel	25-288°C (77-550°F) demineralized water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non safety related components in a demineralized water environment.
3.2.2.105	Valves	Carbon Steel	Air	Loss of material/ General (carbon steel only) pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address carbon steel valves in an air environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.106	Valves	Carbon Steel	Air and steam up to 320°C (608°F) (Primarily Steam)	Loss of material/ Pitting and crevice corrosion	Water Chemistry (B.1.2)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.107	Valves	Carbon Steel	Air and steam up to 320°C (608°F)	Loss of material/ General (carbon steel only) pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address carbon steel valves in an air and steam environment.
3.2.2.108	Valves	Carbon Steel	Internal: occasional exposure to moist air; external: ambient plant air environment	Loss of material/ General (carbon steel only) pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address carbon steel valves with an internal exposure to occasional moisture and external exposure to plant air.
3.2.2.109	Valves	Carbon Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ General galvanic pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address BWR components in a lubricating oil environment.
3.2.2.110	Valves	Carbon Steel	Saturated air	Loss of material/ General and pitting corrosion	Compressed Air Monitoring (B.1.16)	NUREG-1801 does not address carbon steel components in a saturated air environment.
3.2.2.111	Valves	Carbon Steel	Treated water	Loss of material/ General, pitting, and crevice corrosion	Water Chemistry (B.1.2) and One-Time Inspection (B.1.23)	NUREG-1801 does not address non safety related components in a treated water environment.
3.2.2.112	Valves	Carbon Steel	Warm, moist air	Loss of material/ General (carbon steel only) pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address carbon steel valves in a warm, moist air environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.113	Valves	Carbon Steel	Wet Gas	Loss of material/ General (carbon steel only) pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address components in a wet gas environment.
3.2.2.114	Valves	Cast Iron	Internal: occasional exposure to moist air; external: ambient plant air environment	Loss of material/ General, pitting, and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address cast iron components in a moist air or ambient plant air environment.
3.2.2.115	Valves	Stainless Steel	25-288°C (77-550°F) demineralized water	Crack initiation and growth/ Stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non safety related components in a demineralized water environment.
3.2.2.116	Valves	Stainless Steel	288°C (550°F) reactor coolant water	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address non safety related components in a reactor coolant water environment.
3.2.2.117	Valves	Stainless Steel	Air	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel valves in an air environment.
3.2.2.118	Closure Bolting	Low-Alloy Steel	Air, moisture, and humidity less than 100°C (212°F)	Loss of material/ General corrosion and wear	Bolting Integrity (B.1.12)	NUREG-1801 does not address closure bolting for low pressure, low temperature indoor system applications.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.119	Valves	Stainless Steel	Air and steam up to 320°C (608°F) (Primarily Steam)	Crack initiation and growth/ Stress corrosion cracking intergranular stress corrosion cracking	Water Chemistry (B.1.2)	NUREG-1801 does not address stainless steel valves in an air and steam environment.
3.2.2.120	Valves	Stainless Steel	Internal: occasional exposure to moist air; external: ambient plant air environment	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel components with an internal exposure to occasional moisture and external exposure to plant air.
3.2.2.121	Valves	Stainless Steel	Lubricating oil (with contaminants and/or moisture)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel components in a lubricating oil environment.
3.2.2.122	Valves	Stainless Steel	Saturated air	Loss of material/ Pitting and crevice corrosion	Compressed Air Monitoring (B.1.16)	NUREG-1801 does not address stainless steel components in a saturated air environment.
3.2.2.123	Valves	Stainless Steel	Warm, moist air	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address stainless steel valves in a warm, moist air environment.
3.2.2.124	Valves	Stainless Steel	Wet Gas	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address components in a wet gas environment.
3.2.2.125	Dampeners	Stainless Steel	Air and steam up to 320°C (608°F) (Primarily Air)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address loss of material in an air and steam environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.126	Piping and Fittings	Carbon Steel	Air and steam up to 320°C (608°F) (Primarily Air)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.127	Restricting Orifices	Cast Iron	Internal: occasional exposure to moist air; external: ambient plant air environment	Loss of material/ General corrosion, pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address cast iron components in a moist air or ambient plant air environment.
3.2.2.128	Restricting Orifices	Carbon Steel	Air and steam up to 320°C (608°F) (Primarily Air)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.129	Rupture Discs	Stainless Steel	Air and steam up to 320°C (608°F) (Primarily Air)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.130	Tanks	Carbon Steel	Air and steam up to 320°C (608°F) (Primarily Air)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.131	Traps	Carbon Steel	Air and steam up to 320°C (608°F) (Primarily Air)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.132	Tubing	Stainless Steel	Air and steam up to 320°C (608°F) (Primarily Air)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address loss of material in an air and steam environment.

Table 3.2-2 Aging management review results for the engineered safety features that are not addressed in NUREG-1801 (Continued)

Ref No	Component Group	Material	Environment	Aging Effect/ Mechanism	Aging Management Program	Discussion
3.2.2.133	Valves	Carbon Steel	Air and steam up to 320°C (608°F) (Primarily Air)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.134						Line left intentionally blank.
3.2.2.135	Valves	Stainless Steel	Air and steam up to 320°C (608°F) (Primarily Air)	Loss of material/ Pitting and crevice corrosion	One-Time Inspection (B.1.23)	NUREG-1801 does not address loss of material in an air and steam environment.
3.2.2.136						Line left intentionally blank.
3.2.2.137	Component External Surfaces (piping and fittings, filters/strainers, flow orifices, heat exchangers, pumps, restricting orifices, tanks, thermowells, valves, sight glasses, tubing, isolation barriers, traps, isolation condensers, ECCS suction headers, flow elements)	Carbon Steel	Air, moisture, and humidity < 100°C (212°F)	Loss of material/ General corrosion	Bolting Integrity (B.1.12) and Structures Monitoring Program (B.1.30)	NUREG-1801 does not address carbon steel component external surfaces in an indoor environment. Bolting Integrity (B.1.12) is used to manage piping and fittings, filter/strainers, flow orifices, heat exchangers, pumps, restricting orifices, tanks, thermowells, valves, sight glasses, tubing, turbine casings, isolation barriers, traps, isolation condensers, ECCS suction headers, flow elements, and accumulators. In addition, Structures Monitoring Program (B.1.30) inspects piping adjacent to selected supports.