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10 CFR 50
10 CFR 51
10 CFR 54

2130-05-20214

October 12, 2005

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Oyster Creek Generating Station
Facility Operating License No. DPR-16
NRC Docket No. 50-219

Subject: Response to NRC Request for Additional Information (RAI 2.5.1.19-1), dated September 28, 2005, Related to Oyster Creek Generating Station License Renewal Application (TAC NO. MC7624)

References: (1) "Application for Renewed Operating License," Oyster Creek Generating Station, dated July 22, 2005

(2) "Request for Additional Information (RAI) for the Review of the Oyster Creek Generating Station, License Renewal Application (TAC NO. MC7624)"

In Reference (2), the NRC requested additional information related to Section 2.5.1.19 of the Oyster Creek Generating Station License Renewal Application (LRA). In the RAI, the NRC expressed the need for additional information to evaluate the long-lived passive components of the Combustion Turbine Power Plant and any aging management programs and aging management reviews related to those components.

AmerGen has revised its approach to aging management for the Oyster Creek Station Blackout System Combustion Turbine Power Plant. Specifically, AmerGen has taken a more detailed approach to scoping, screening, aging management reviews and aging management programs.

A more detailed scoping system description has been provided, correlating to Section 2.5.1.19 of the Oyster Creek LRA for scoping and screening results. The expanded information was developed using the same methodology for scoping other Oyster Creek systems and component types and is consistent with other LRA system information such as that provided for the Emergency Diesel Generators. The electrical commodity groups for the Station Blackout System have been identified and evaluated for aging management review as was performed for Oyster Creek electrical commodities in Section 2.5.2 of the OC LRA. Appendix B of the Enclosure contains this information.

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Screening has been performed that itemizes the mechanical, electrical and structural component types that comprise the Combustion Turbine Power Plant at a detailed level, consistent with other license renewal systems such as the Emergency Diesel Generators. Appendix C of the Enclosure contains the results of the associated Aging Management Reviews.

Previously, AmerGen had proposed one Aging Management Program for the Combustion Turbine Power Plant that focused on reliability as determined by existing maintenance and testing activities. The new plan employs two electrical Aging Management Programs and one structural Aging Management Program. These program changes are described in Appendix D of the Enclosure. Further work is required to establish the Aging Management Programs for the mechanical components. This work will be completed and the information provided in a supplemental response no later than November 11, 2005.

This new approach reflects methodology similar to that applied to the Emergency Diesel Generator system. These Aging Management Reviews and Aging Management Programs will provide assurance that aging effects associated with the Station Blackout System will be managed consistent with the current licensing basis for the period of extended operation.

A summary of commitments, as was presented in Table A.5 of the Oyster Creek License Renewal Application, is presented in Appendix A of the Enclosure.

If you have any questions, please contact Fred Polaski, Manager License Renewal, at 610-765-5935.

I declare under penalty of perjury that the foregoing is true and correct.

Respectfully,

Executed on 10/12/2005

C. N. Swenson
Site Vice President
Oyster Creek Generating Station
AmerGen Energy Company, LLC

Enclosure: Response to Request for Additional Information

cc: Regional Administrator, USNRC Region I, w/o Enclosure
USNRC Project Manager, NRR - License Renewal, Safety
USNRC Project Manager, NRR - License Renewal, Environmental, w/o Enclosure
USNRC Project Manager, NRR - Senior Project Manager, Oyster Creek
USNRC Senior Resident Inspector, Oyster Creek, w/o Enclosure
Bureau of Nuclear Engineering, New Jersey Department of Environmental Protection
File No. 05040

Enclosure

Response to Request for Additional Information RAI 2.5.1.19-1
Oyster Creek Nuclear Generating Station
License Renewal Application (TAC No. MC7624)

Note: Section numbers within the Appendices of this Enclosure match the numbering protocol used within the License Renewal Application for ease of comparison.

Enclosure - Table of Contents

SUMMARY OF RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

RAI-2.5.1.19-1

The Combustion Turbine Power Plant was determined to be in scope for the purpose of license renewal. Table 3.6.2.1.1 refers to Section 2.5.1.19 for the purpose of Aging Management Evaluation. The NRC staff needs additional information to evaluate the long lived passive components of the Combustion Turbine Power Plant and any aging management programs and aging management reviews related to those components. You should use the same format and depth that you used in the diesel generator section of your application.

Response

AmerGen has revised its approach to aging management for the Oyster Creek Station Blackout System, Combustion Turbine Power Plant. Specifically, AmerGen has taken a more detailed approach to scoping, screening, aging management reviews and aging management programs, for long lived passive components, than was previously presented in the Oyster Creek License Renewal Application submittal for the Oyster Creek Station Blackout System, Combustion Turbine Power Plant. A summary of commitments, as was presented in Table A.5 of the Oyster Creek License Renewal Application is presented in Appendix A to this Enclosure.

Forked River Combustion Turbine Background

The Forked River Combustion Turbines (FRCTs), are owned, operated, and maintained by FirstEnergy and provide peak loading to the grid. Consistent with Oyster Creek Generating Station (OCGS) commitments, and as reviewed and approved by the NRC, the FRCTs provide a standby source of alternate AC power for the Oyster Creek station in the event of a Station Blackout (SBO). The FRCTs are located adjacent to the Oyster Creek switchyard outside the Oyster Creek plant protected area, in the Forked River site northwest of the reactor building and approximately one-quarter mile from the nearest safety related structure.

Revised Approach for Oyster Creek Station Blackout System, Combustion Turbine Power Plant

A more detailed scoping system description has been provided, correlating to section 2.5.1.19 of the Oyster Creek LRA for scoping and screening results. Sixteen (16) subsystem descriptions (e.g., fuel oil system, combustion turbine inlet and exhaust system, cooling water system), descriptions of combustion turbine structures and electrical commodities, and associated system boundary details have been added to the scoping information. The expanded information was developed using the same methodology for scoping other Oyster Creek systems and component types and is consistent with other LRA system information such as the Emergency Diesel Generators. The electrical commodity groups subject to aging management review, for the Station Blackout System, have been identified, as was performed for Oyster Creek electrical commodities in Section 2.5.2 of the OC LRA for scoping and screening results. See Appendix B to this Enclosure for revisions and supplemental information.

Screening has been performed that itemizes the mechanical, electrical and structural component types that comprise the Station Blackout System at a detailed level, consistent with other license renewal systems such as the Emergency Diesel Generators. Information provided for electrical commodities, mechanical components and structures in Tables 3.6.2.1.2A, 3.6.2.1.2B, and 3.6.2.1.2C, respectively, include Component Type, Intended Functions,

Material, Environment, and Aging Effects Requiring Management. Additionally, information for Aging Management Programs, NUREG-1800 Vol. 2 Item, Table 1 Item, and Notes (Tables 3.6.2.1.2A and 3.6.2.1.2C), as well as the associated Table 1 roll-ups (Tables 3.6.1A and 3.6.1C), have been provided for Station Blackout System electrical commodities and structures. Information for Aging Management Programs, NUREG-1800 Vol. 2 Item, Table 1 Item, and Notes (Table 3.6.2.1.2B) as well as the associated Table 1 roll-ups (Table 3.6.1B) will be provided later for mechanical systems and components. A revised Aging Management of Electrical Components for the Station Blackout System (Section 3.6.2.1.9) has been provided. See Appendix C to this Enclosure for revisions and supplements.

Aging Management Programs (AMPs) have been added and revised to incorporate the results of the more detailed aging management reviews. Aging Management Program 2.7, Periodic Monitoring of the Combustion Turbine Power Plant, has been deleted. Aging Management Program 1.31, Structures Monitoring Program for Oyster Creek Structures, was revised to include structures, structural components and phase bus enclosure assemblies at the FRCT. Aging Management Program 1.36, Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualifications, was revised to include inaccessible medium voltage cables associated with the Station Blackout System. Aging Management Program 1.37, Periodic Monitoring of Combustion Turbine Power Plant – Electrical, has been added to address the remaining Station Blackout System electrical commodities for which aging management is required. Associated tabulations of commitments in Table A.5, License Renewal Commitment List and Appendix B, Aging Management Programs were added or revised accordingly. Mechanical system and component Aging Management Programs will be provided later. See Appendix D to this Enclosure for revisions and supplements.

Previously, AmerGen had proposed one Aging Management Program that focused on reliability as determined by existing maintenance and testing activities. This program is replaced with two electrical Aging Management Programs and one structural Aging Management Program. Additional aging management programs required for the Station Blackout System mechanical components are under development and will be provided at a later date.

This approach reflects a methodology similar to that applied to the Emergency Diesel Generator system and was prepared in accordance with Oyster Creek procedures. These Aging Management Reviews and Aging Management Programs will provide assurance that aging effects associated with the Station Blackout System will be managed consistent with the current licensing basis for the period of extended operation.

Appendix A

Summary of Commitments

The following table identifies commitments made in this document. (This is the same information as that provided in Table A.5.) Any other actions discussed in the submittal represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.

Changes to commitments 31 and 36 from the original License Renewal Application are highlighted by bolding. Commitment 43 is a complete replacement for the previously submitted program and his shown in bold print. Commitments associated with new mechanical systems and component AMPs will be provided later.

Commitment	**Committed Date or Outage**	**One-Time Action (Yes/No)**	**Programmatic (Yes/No)**
31) Structures Monitoring Program Existing program is credited. The program includes elements of the Masonry Wall Program and the RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plants aging management program. The Structures Monitoring Program will be enhanced to include: 1. Buildings, structural components and commodities that are not in scope of maintenance rule but have been determined to be in the scope of license renewal. These include miscellaneous platforms, flood and secondary containment doors, penetration seals, sump liners, structural seals, and anchors and embedment. 2. Component supports, other than those in scope of ASME XI, Subsection IWF. 3. Inspection of external surfaces of mechanical components that are not covered by other programs, HVAC duct, damper housings, and HVAC closure bolting. Inspection and acceptance criteria of the external surfaces will be the same as those specified for structural steel components and structural bolting. 4. The visual inspection of insulated surfaces will require the removal of insulation. Removal of insulation will be on a sampling basis that bounds insulation material type, susceptibility of insulated piping or component material to potential degradations that could result from being in contact with insulation, and system operating temperature.	Prior to period of extended operation	No	Yes

Commitment	Committed Date or Outage	One-Time Action (Yes/No)	Programmatic (Yes/No)
5. Inspection of electrical panels and racks, junction boxes, instrument racks and panels, cable trays, offsite power structural components and their foundations, and anchorage. 6. Periodic sampling, testing, and analysis of ground water to confirm that the environment remains non-aggressive for buried reinforced concrete. 7. Periodic inspection of components submerged in salt water (Intake Structure and Canal, Dilution structure) and in the water of the fire pond dam, including trash racks at the Intake Structure and Canal. 8. Inspection of penetration seals, structural seals, and other elastomers for change in material properties. 9. Inspection of vibration isolators, associated with component supports other than those covered by ASME XI, Subsection IWF, for reduction or loss of isolation function. 10. The current inspection criteria will be revised to add loss of material, due to corrosion for steel components, and change in material properties, due to leaching of calcium hydroxide and aggressive chemical attack for reinforced concrete. Wooden piles and sheeting will be inspected for loss of material and change in material properties. 11. Periodic inspection of the Fire Pond Dam for loss of material and loss of form. 12. **Inspection of Station Blackout System structures, structural components, and phase bus enclosure assemblies.**			
36) Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is new. The program manages the aging of inaccessible medium-voltage cables that feed equipment performing license renewal intended functions. These cables may at times be exposed to moisture and are subjected to system voltage for more than 25% of the time. Manholes, conduits and sumps associated with these cables will be inspected for water collection every 2 years and drained as required. In addition, the cable circuits will be tested using a proven test for detecting deterioration of the insulation system due to wetting, such as power	Prior to period of extended operation	No	Yes

Commitment	Committed Date or Outage	One-Time Action (Yes/No)	Programmatic (Yes/No)
factor, partial discharge, or polarization index, as described in EPRI TR-103834-P1-2, or other testing that is state-of-the-art at the time the test is performed. The cables will be tested at least once every 10 years. **Inclusion of the 13.8 kV system circuits in this program reflects the scope expansion of the Station Blackout System electrical commodities.**			
43) Periodic Monitoring of Combustion Turbine Power Plant – Electrical **A new plant specific program is credited. The program will be used in conjunction with the existing Structures Monitoring Program and the new Inaccessible Medium Voltage Cables Not Subject to 10CFR50.59 Environmental Qualification Requirements program to manage aging effects for the electrical commodities that support FRCT operation. The Program consists of visual inspections of accessible electrical cables and connections exposed in enclosures, pits, manholes and pipe trench; visual inspection for water collection in manholes, pits, and trenches, located on the FRCT site, for inaccessible medium voltage cables; and visual inspection of accessible phase bus and connections and phase bus insulators/supports. The new program will be performed on a 2-year interval for manhole, pit and trench inspections, on a 5-year interval for phase bus inspections, and on a 10-year interval for cable and connection inspections.**	**Prior to period of extended operation**	**No**	**Yes**

Appendix B

Revised Text and Table for LRA Section 2.5.1.19, Station Blackout System

The existing text and table for 2.5.1.19 are revised in their entirety by the attached.

Supplemental Text and Table for LRA Section 2.5.2, Electrical Commodity Groups

A new section 2.5.2A, Electrical Commodity Groups, for the Station Blackout System, is provided as supplemental text and table to LRA Section 2.5.2.

2.5.1.19 Station Blackout System

System Purpose

The Station Blackout (SBO) System at Oyster Creek is an electrical supply system that provides Alternate AC (AAC) power to Oyster Creek Generating Station (OCGS) for the regulated event of loss of all AC power (10 CFR 50.63 - Station Blackout). The source of electrical power to the SBO system is the Forked River Combustion Turbines power plant, an electrical power plant that is owned, operated and maintained by FirstEnergy Corporation and designed for peak loading to the grid. FirstEnergy is a diversified energy company headquartered in Akron, Ohio. Its subsidiaries and affiliates are involved in the generation, transmission and distribution of electricity; marketing of natural gas; and energy management and other energy-related services. The Forked River Combustion Turbines (FRCTs) are made available by FirstEnergy to provide power during a station blackout event, in accordance with an Interconnection Agreement and supplemental Station Blackout Agreement with AmerGen. The Oyster Creek commitments for compliance with the station blackout rule, including the FRCT Alternate AC power source, was reviewed and approved by the NRC in their Safety Evaluation enclosed with NRC letter dated August 23, 1991, and Supplemental Safety Evaluation enclosed with NRC letter dated February 12, 1992.

The purpose of the Station Blackout System is to independently provide sufficient power to energize all equipment required to achieve and maintain the plant in a safe shutdown condition following a station blackout event. The FRCTs are located adjacent to the Oyster Creek switchyard outside the Oyster Creek plant protected area, in the Forked River site northwest of the reactor building and approximately one-quarter mile from the nearest safety related structure. The FRCTs are designed to be available within one hour of the onset of a station blackout event, and provide adequate Alternate AC power for the duration of the SBO coping period. Recovery from the station blackout event is complete upon restoration of normal offsite AC power from the Offsite Power System.

System Operation

The SBO System is comprised of the Forked River Combustion Turbines power plant and associated electrical connection to OCGS. The connection between OCGS and the FRCTs utilizes an independent connection diverse from the normal connection to the regional transmission grid. 13.8 kV power from the FRCTs is routed through a dedicated underground duct bank to the load break switches and SBO transformer located on site, and then through a cable trench to the switchgear breaker connection to the 4160V AC Bus 1B. In the event of a Station Blackout at OCGS, one of the combustion turbines is disconnected from the regional transmission system, connected to the OCGS SBO transformer by closure of appropriate load break switches and breakers, started and operated to provide AC power to OCGS to cope with the station blackout. The SBO transformer, control panel, load break switches and the switchgear circuit breakers are dependant upon the 125V Station DC System.

The FRCT facility consists of two combustion turbine/generator plants, CT-1 and CT-2. Each combustion turbine power plant is comprised of supporting auxiliary systems and the following component assemblies: 1) a single-shaft combustion turbine, 2) a synchronous generator, 3) generator accessories, and 4) a starting diesel engine. The following supporting auxiliary systems are either wholly or in part required to operate to support the FRCT intended function

of supplying electrical power during an SBO event:

Fuel Oil System:

The fuel oil system supplies No. 2 fuel oil to the combustion turbines. The system extends from the fuel oil tank truck unloading connection to the fuel oil supply to the combustion turbines. No. 2 fuel oil is unloaded from a fuel oil tank truck to a sub-surface unloading tank. Two (2) fuel oil unloading pumps take suction on the unloading tank and discharge to the fuel oil storage tank. Skid-mounted fuel oil forwarding pumps take suction on the storage tank and discharge through an electric heater and duplex filter units to the associated combustion turbine. Once at the combustion turbine, the fuel oil is further filtered then divided into ten (10) equal parts for distribution to the combustion chambers at the required pressure and flowrate.

The fuel oil unloading tank and pumps, and the piping and components associated with the transfer of oil from the unloading tank to the fuel oil storage tank are not in scope, as the fuel oil storage tank is administratively maintained with sufficient fuel oil capacity for the mitigation of an SBO event. The fuel oil system also receives combustion turbine false start drains. From each combustion turbine, drains flow into the associated false start drain tank. A sump pump mounted on the top of each drain tank discharges to the fuel oil storage tank. This false start drain portion of the fuel oil system is not credited for the mitigation of an SBO event and also is not in scope.

Combustion Turbine Inlet and Exhaust System:

The Inlet and Exhaust system provides clean and dry combustion air to the turbine compressor inlet, and provides an exhaust path to atmosphere for the hot turbine exhaust gasses. The air inlet system consists of a three-stage elevated inlet filter compartment connected to the turbine air inlet plenum via stainless steel inlet ducting. The inlet filter compartment includes an inlet screen, moisture separator and filters. The inlet ductwork connecting the inlet compartment with the turbine compressor consists of an expansion joint, a silencer section and acoustically lined transition ductwork. The exhaust system consists of an exhaust plenum, a transition duct, a sound attenuating silencer, expansion joints and the exhaust stack.

Cooling Water (Glycol) System:

The Cooling Water System is a pressurized closed-loop system designed to accommodate the heat dissipation requirements of the combustion turbine and generator lubrication system, the diesel engine cooling system, the turbine supports, flame detectors, atomizing air and the generator cooling system. The cooling water system is comprised of both on-skid and off-skid mounted components. The on-skid components consist of the lube oil heat exchangers located inside the turbine accessory skid base, the atomizing air cooler located below the turbine combustion section, the flame detectors located on the turbine combustion section, the turbine support legs, the generator coolers located inside the generator enclosure, and associated piping, valves and orifices. The off-skid components include an industrial-type water cooling module, circulating water pumps, diesel engine jacket cooling heat exchanger, valves, piping and orifices.

Cooling and Sealing Air System:

The Cooling and Sealing Air System provides the necessary air flow from the combustion

turbine compressor to other parts of the turbine rotor and stator to cool these parts and to provide bearing sealing under normal turbine operation. This discharge (bleed) air from the combustion turbine compressor is also used as a source of control air for air-operated valves. The system also includes two externally mounted motor-driven fans, ductwork, piping, and associated components which provide turbine shell and exhaust frame cooling.

HVAC System:

The combustion turbine and accessory compartments each include heating and ventilation. Heating consists of a thermostatically controlled electric heater in each compartment. The ventilation is by two roof mounted ventilation fans for each compartment, with associated backdraft dampers, fire dampers and ductwork. The generator compartment includes cooling coils supplied by the Cooling Water (Glycol) System. Additionally, ventilation is provided for the reduction gear and generator auxiliaries compartments, consisting of fans, filters, ductwork, dampers, louvers and birdscreens.

Combustion Turbine Structures:

The Combustion Turbine Structures consist of enclosures, piping supports, component supports, electrical conduits and their supports, cable trays and their supports, panels and enclosures, concrete foundations, a cable and piping trench, duct bank, and manholes. The structures are owned, maintained, and operated by FirstEnergy.

The enclosures, or compartments, are prefabricated and supplied with the equipment skids. They are constructed from steel panels and steel roof, stiffened with welded steel frames, and supported on reinforced concrete slab on grade or on creosote treated timber piles. The enclosures include compartments for the two combustion turbines, generator accessory compartment, enclosure for fuel oil forwarding skid, the fuel forwarding motor control center MCC1/MCC2, and electrical panels and enclosure. The enclosures are thermally designed and built for all-weather conditions and provided with doors and removable panels for easy access to the components. Enclosures for the combustion turbines are provided with acoustical insulation in addition to thermal insulation.

Other structural components included in this system consist of supports for the combustion turbines, piping supports, component supports, exhaust system supports, cooling system supports, electrical panels and enclosures, enclosure and tank foundations, cable trays and their supports, electrical conduits and their supports, manholes, duct bank, and a pipe and cable trench.

Combustion Turbine Electrical Commodities:

The Combustion Turbine Electrical Commodities in scope of license renewal consist of electrical cables and connections, fuse holders, terminal blocks, phase bus, cable connections (metallic parts), high voltage insulators and transmission conductors and connectors. There are no electrical penetrations, switchyard bus, or wooden utility poles in scope of license renewal at the Forked River site.

The only connection to the Oyster Creek site is a 13.8 kV power circuit and associated control cables that provide alternate AC power for a Station Blackout event. These SBO cables run from the Forked River site through dedicated manholes and duct banks to an on-site transfer

switch and step-down transformer.

Most cabling at the Forked River site is run in underground conduit between prefabricated enclosures, or compartments. The exception is cabling that runs to the fuel oil forwarding skids and associated motor control centers partly in a pipe trench. Within the prefabricated enclosures, cabling is run in hard and flexible conduit directly to the connected devices. None of the enclosures containing cabling contain adverse localized environments.

Lube Oil System:

The lube oil system is a closed-loop forced feed system which includes an oil reservoir fabricated as part of the turbine base, main (gear driven), auxiliary (ac), and emergency (dc) oil pumps, heat exchangers, filters, piping, valves, and piping and piping components. The system supplies pressurized oil flow to the bearing header, reduction gear, accessory gear, and hydraulic supply system, and includes an immersion heater in the reservoir to keep the oil viscosity in the proper range during period of CT inactivity.

Hydraulic Supply System:

The hydraulic supply system supplies fluid under pressure for operating control components for the turbine fuel system and the variable inlet guide vane mechanism. The system includes supply pumps, filters, manifold assembly, and associated piping, valves, and piping components.

Trip Oil System:

The hydraulic trip oil system is used for abnormal and emergency shutdown functions of the turbine as well as the hydraulic signal to the fuel stop valve for normal turbine startup and shutdown. Lube oil from the turbine bearing header is used, and when signaled to trip due to overspeed or manually shutdown, fluid pressure is dumped and the fuel stop valve closes.

Atomizing Air System:

The atomizing air system provides sufficient pressurized air to the atomizing air chamber of the fuel nozzle body to adequately break the fuel oil spray into a fine mist as it enters the combustion chamber. Compressed air bled from the turbine compressor is cooled in a heat exchanger and then enters the main atomizing air compressor. Output of the main compressor provides the required atomizing air, supplied to the atomizing air manifold piping and to the individual fuel nozzles. When the turbine is first fired, the starting (booster) air compressor driven by the diesel starting engine supplies filtered, compressed air to the main atomizing compressor until the supply of bleed air from the CT compressor is sufficient.

The following auxiliary systems are not required to operate to support the intended function of the FRCT to provide electrical power during an SBO event and are not in scope:

Water Injection System:

The water injection system provides the necessary flow of water to the turbine fuel at the point of injection to reduce the level of nitrogen oxides (NOx) in the exhaust to within State and

Federal limits. The system pumps water from the demineralized water source to the fuel supply by means of pumps and regulating valves mounted on the Water Injection System skid. The flow of water is regulated as a function of fuel flow to the turbine combustion system. The Water Injection Control system monitors several parameters to ensure the injection flow rate is appropriate for load conditions and generates alarms when conditions are off-normal.

The system is used for reducing nitrogen oxide production during normal operation of the CT; however, water injection is not required for proper combustion at the turbine and production of adequate electrical power during a SBO event.

Fire Protection System:

The Forked River Combustion Turbine Power Plant includes Halon, foam and water based fire protection systems. These systems are not required for operation of the combustion turbines during a station blackout event at Oyster Creek. These systems are not described in the Oyster Creek Fire Hazards Analysis Report (FHAR) and are not credited to demonstrate compliance with 10 CFR 50.48 in the Oyster Creek current license basis. Therefore, these fire protection systems associated with the Forked River Combustion Turbine Power Plant are not in scope for license renewal.

Natural Gas Supply System:

The combustion turbines can operate using either number 2 fuel oil or compressed (300 psi) natural gas. The fuel supply can be swapped with the unit in operation. The fuel supply will automatically switch from gas to oil on low gas supply header pressure. The compressed gas supply may not be available during a station blackout event. A fuel oil supply sufficient to operate a combustion turbine for the required station blackout duration is maintained in the fuel oil storage tank at all times. Therefore, the natural gas supply is not required for combustion turbine operation during a station blackout event and is not in scope for license renewal.

Demineralized Water System:

The Demineralized Water System produces demineralized water from raw water and stores the demineralized water for distribution to the Water Injection system. Raw water is processed through a mobile demineralizer and sent to the demineralized water storage tank. Transfer pumps distribute the demineralizer water from the demineralized water storage tank to the combustion turbine Water Injection System. Additionally, the Demineralized Water System provides a backup water source for the fire protection system.

Operation of the Demineralized Water System to support the Water Injection System and provide a backup fire protection source is not required during an SBO event.

Water Wash System:

The Water Wash System provides a means of cleaning the compressor blades and bell housing of dry or wet contaminants that may pass through inlet air filtration and accumulate over time on the compressor, potentially affecting the combustion turbine performance. The system uses water and detergent, pumped through a motor operated injection valve to a compressor water manifold and eight spray nozzles located in the compressor inlet bellmouth.

The Water Wash System is used periodically when the combustion turbine is shutdown to remove any potential accumulation of contaminants.

Operation of the system is not required for the FRCT to perform its intended function of supplying electrical power during an SBO event.

Raw Water System:

The Raw Water System provides water storage and distribution of raw water for other plant systems. The Raw Water System supplies water to the raw water storage tank, the plant mobile demineralizer, and the combustion turbine area fire protection system. The Raw Water System consists of pumping stations for supplying water from underground wells to the raw water storage tank and metering of water taken from each well.

Operation of the Raw Water System is not required as neither demineralized water nor the combustion turbine area fire protection system is required for the FRCT to perform its intended function of supplying electrical power during an SBO event.

Waste Drains System:

The Waste Drains System collects rainfall runoff water that can be potentially contaminated with oil (oily water) from combustion turbine area sumps. The potentially oily water is delivered to an oil water separator which discharges water into a basin, and collects the separated oil for disposal. The series of sumps and vaults that comprise the Waste Drains System are designed to contain major oil spills if they occur.

Operation of the Waste Drains System is not required for the FRCT to perform its intended function of supplying electrical power during an SBO event.

System Boundary

The Station Blackout System boundary begins at the Forked River Combustion Turbines power plant, and continues through the output breakers, through the 13.8 kV cables and underground duct bank to the load break switches, the SBO transformer, and ends at the switchgear circuit breaker that connects to the OCNGS 4160V AC System. It includes the Forked River Combustion Turbines power plant, circuit breakers, load break switches, transformers, relays, control switches, cables, conduits, connectors and miscellaneous components. Also included in the boundary are the 13.8 kV cables to the Bank 9 and 10 step-up transformers and the high voltage insulators and transmission conductor connecting them to the 230kV substation.

The FRCT facility consists of two combustion turbine/generator assemblies, CT-1 and CT-2. Each combustion turbine assembly is comprised of supporting auxiliary systems and the following component assemblies: 1) a single-shaft combustion turbine, 2) a synchronous generator, 3) generator accessories, and 4) a starting diesel engine. Included with these component assemblies are directly attached components integral to the component assembly such as piping, starters, turbochargers, and sumps. Auxiliary systems are either wholly or in part required to operate to support the FRCT intended function of supplying electrical power during an SBO event:

Fuel Oil System: The portion in scope begins with the fuel oil storage tank and continues

through the forwarding pumps, the fuel oil heater, duplex filter units, and associated piping and components to the combustion turbine.

Inlet and Exhaust System: The inlet portion of the system includes the inlet screen, moisture separator, filters, and ductwork connecting the inlet compartment with the turbine compressor including the expansion joint, silencer, and acoustic lining. The exhaust system begins with the exhaust frame and plenum, transition duct, sound attenuating silencer, expansion joints and the exhaust stack.

Cooling Water (Glycol) System: The cooling water system includes the industrial-type water cooling module, circulating water pumps, diesel engine jacket cooling heat exchanger, generator cooler, atomizing air cooler, lube oil heat exchangers, turbine support legs, flame detectors and associated piping, valves, and orifices.

Cooling and Sealing Air System: The system begins with the inlet ductwork, contains the external blowers, and continues through the discharge piping to the turbine exhaust frame, including associated piping and components.

Lube Oil System: The system begins with the reservoir integral to the turbine base and includes the gear driven main pump, ac-driven auxiliary submerged pump, and dc-driven emergency submerged pump, with connecting piping, valves, and components. Two heat exchangers are installed horizontally through the side of the reservoir tank. Main oil filters are installed after the heat exchangers, and trip oil supply filters are installed in the supply to the trip oil system.

Hydraulic Supply System: The system begins with the attachment to the lube oil system's bearing header. The shaft-driven main hydraulic supply pump, or the motor-driven auxiliary pump when the main pump speed is not sufficient to maintain adequate pressure, supplies hydraulic fluid to the hydraulic manifold and through filters to various control components via interconnecting valves, piping, and piping components.

Trip Oil System: The system begins with the attachment to the lube oil system's bearing header, and passes through a pressure-reducing orifice via piping, valves, and piping components to the overspeed trip device and then to the fuel stop valve.

Atomizing Air System: The system begins with the atomizing air extraction manifold piping mounted on the CT compressor casing and continues via piping, valves, and piping components through the heat exchanger to the main atomizing air compressor, and then through the atomizing air distribution piping to the individual fuel nozzles. Filtered air is drawn into the starting (booster) atomizing air compressor and directed via piping, valves, and piping accessories to the main atomizing air compressor inlet for use when the CT compressor supply is insufficient, as during CT startup.

HVAC System: The boundary of the system includes the ventilation fans, dampers, ductwork, filters, and screens associated with the equipment compartments.

Combustion turbine electrical commodities are in scope. See LRA Table 2.5.2A Electrical Commodity Groups - Station Blackout System.

Also in scope are the combustion turbine structures.

Not included within the scope of the SBO System are portions of the Fuel Oil System consisting of the fuel oil unloading tank and pumps, and the piping and components associated with transfer of oil from the unloading tank to the fuel oil storage tank.

Not included within the scope of the SBO System are the 4160V AC, 125V Station DC and Offsite Power Systems, which are separately evaluated as license renewal systems. Portions of the Offsite Power System are used to recover from a station blackout event and restore normal power, as further described in the Offsite Power System scoping discussion in LRA Section 2.5.1.13.

Not included in the scoping boundary of the SBO System are the following FRCT systems, whose operation is not required to support the SBO System intended function:

Water Injection System
Fire Protection System (FRCT area)
Natural Gas Supply System
Demineralized Water System
Water Wash System
Raw Water System
Waste Drains System

For additional detail, see UFSAR Section 8.3.4 and 15.9.

Reason for Scope Determination

The Station Blackout System is not in scope under 10 CFR 54.4(a)(1) because no portions of the system are safety related or relied on to remain functional during and following design basis events. It is not in scope under 10 CFR 54.4(a)(2) because failure of non-safety related portions of the system will not prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). The Station Blackout System meets 10 CFR 54.4(a)(3) because it is relied upon in the safety analyses and plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (10 CFR 50.63). The Station Blackout System is not relied upon in any safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49). or ATWS (10 CFR 50.62).

System Intended Functions

1. Relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the commission's regulations for Station Blackout (10 CFR 50.63). (Provides AAC power for SBO coping period.) 10 CFR 54.4(a)(3)

UFSAR References

8.3.4
15.9

License Renewal Boundary Drawings

LR-BR-3000

Table 2.5.1.19 **Station Blackout System - Mechanical**
Components Subject to Aging Management Review

Component Type	Intended Functions
Bird Screen	Filter
Closure bolting	Mechanical Closure
Combustion Turbine Casing	Pressure Boundary
Damper housing	Pressure Boundary
Ductwork	Pressure Boundary
Electric Heater (Fuel Forwarding Skid)	Heat Transfer
	Pressure Boundary
Exhaust Stack	Pressure Boundary
Expansion Joint	Pressure Boundary
Fan Housing	Pressure Boundary
Filter Housing	Pressure Boundary
Filter Housing (Fuel Forwarding Skid Outlet)	Pressure Boundary
Filter Housing (Lube Oil)	Pressure Boundary
Flexible Connection	Pressure Boundary
Flow Element (Fuel Forwarding Skid)	Pressure Boundary
Flow Meter	Pressure Boundary
Gauge Snubber	Pressure Boundary
Heat Exchangers (Atomizing Air)	Heat Transfer
	Pressure Boundary
Heat Exchangers (Cooling Tower)	Heat Transfer
	Pressure Boundary
Heat Exchangers (Diesel Jacket Cooling)	Heat Transfer
	Pressure Boundary
Heat Exchangers (Flame Detector)	Heat Transfer
	Pressure Boundary
Heat Exchangers (Generator)	Heat Transfer
	Pressure Boundary
Heat Exchangers (Lube Oil)	Heat Transfer
	Pressure Boundary
Heat Exchangers (Support Leg)	Heat Transfer
	Pressure Boundary
Louvers	Pressure Boundary
Muffler	Pressure Boundary
Piping and fittings	Pressure Boundary
Pump Casing (CCW)	Pressure Boundary
Pump Casing (Fuel Forwarding)	Pressure Boundary
Pump Casing (Hyd Oil)	Pressure Boundary
Pump Casing (Lube Oil)	Pressure Boundary
Restricting Orifice	Pressure Boundary
	Throttle
Sight Glasses	Pressure Boundary
Strainer (Fuel Forwarding Skid Inlet)	Filter

Strainer Body	Pressure Boundary
Tanks (CCW)	Pressure Boundary
Tanks (Fuel Oil)	Pressure Boundary
Tanks (Lube Oil)	Pressure Boundary
Thermowell	Pressure Boundary
Valve Body	Pressure Boundary

The aging management review results for these components are provided in Table 3.6.2.1.2B Station Blackout System - Mechanical -Summary of Aging Management Evaluation

Table 2.5.1.19 **Station Blackout System - Structural Components**
Components Subject to Aging Management Review

Component Type	Intended Functions
Building concrete at locations of expansion and grouted anchors; grouted pads for support base plates	Structural Support
Cable trays	Structural Support
Concrete embedment	Structural Support
Conduits	Enclosure Protection
	Structural Support
Doors	Enclosure Protection
Enclosures (combustion turbines, generator accessory, control room, fuel oil forwarding skid)	Enclosure Protection
	Structural Support
Equipment foundation (above and below grade)	Structural Support
Panels and enclosures	Enclosure Protection
	Structural Support
Piles (turbine generator, exhaust stack)	Structural Support
Reinforced concrete foundation (enclosures slab, tanks, supports); above and below grade	Structural Support
Reinforced concrete trench, manhole, ductbank (above and below grade)	Enclosure Protection
	Structural Support
Seals, Gaskets	Enclosure Protection
Structural bolts	Structural Support
Supports for cable trays (support members, welds, bolted connections, support anchorage)	Structural Support
Supports for combustion turbines (skid, turbine support legs)	Structural Support
Supports for conduits (support members, welds, bolted connections, support anchorage)	Structural Support
Supports for cooling system, exhaust system, ductwork (support members, welds, bolted connections, support anchorage)	Structural Support
Supports for panels and enclosures (support members, welds, bolted connections, support anchorage)	Structural Support

Supports for piping and components (support members, welds, bolted connections, support anchorage)	Structural Support

The aging management review results for these components are provided in Table 3.6.2.1.2C Station Blackout System - Structural Components -Summary of Aging Management Evaluation

2.5.2A ELECTRICAL COMMODITY GROUPS FOR THE STATION BLACKOUT SYSTEM

2.5.2A.1 Identification of Electrical Commodity Groups

The first step of the screening process for electrical components involved using plant documentation to identify the electrical component types within the electrical, mechanical and civil/structural systems based on plant design documentation, drawings, the CRL, and by interfacing with the parallel mechanical and civil screening efforts. These component types were grouped into a smaller set of electrical commodity groups identified from a review of NEI 95-10 Appendix B, NUREG-1801 and information from previous License Renewal applications. The electrical commodity groups identified for the Oyster Creek Station Blackout System are listed in the table below. This list includes all electrical commodity groups listed in NEI 95-10 Appendix B in addition to commodity groups added per NUREG-1801 or unique to Oyster Creek.

ELECTRICAL COMMODITY GROUPS FOR SYSTEMS AND STRUCTURES

Alarm Units	High Voltage Insulators	Regulators	Transmission Conductors & Connections
Analyzers	Indicators	Relays	Uninsulated Ground Conductors
Annunciators	Insulated Cables & Connections	Detectors (RTDs, etc.)	Wooden Utility Poles
Batteries	Inverters	Sensors	Cable Connections (metallic parts)
Chargers	Isolators	Solenoid Operators	Transformers
Circuit Breakers	Light Bulbs	Signal Conditioners	
Converters	Load Centers	Solid State Devices	
Communication Equipment	Loop Controllers	Splices	

Electrical Controls and Panel Internal Component Assemblies	Meters	Surge Arresters	
Electrical Penetrations	Motor Control Centers	Switches	
Elements	Motors	Switchgear	
Fuses	Phase Bus	Switchyard Bus	
Fuse Holders (NUREG 1801)	Power Distribution Panels	Terminal Blocks	
Generators	Power Supplies	Thermocouples	
Heat Tracing	Radiation Monitors	Transducers	
Heaters	Recorders	Transmitters	

2.5.2A.2 Application of Screening Criterion 10 CFR 54.21(a)(1)(i) to the Electrical Commodity Groups

Following the identification of the electrical commodity groups, the criteria of 10 CFR 54.21(a)(1)(i) were applied to identify commodity groups that perform their intended functions without moving parts or without a change in configuration or properties. The following electrical component commodity groups were determined to meet the screening criteria of 10 CFR 54.21(a)(1)(i).

- Cable Connections (Metallic Parts)
- Electrical Penetrations
- Fuse Holders
- High Voltage Insulators
- Insulated Cables and Connections
- Phase Bus
- Splices
- Switchyard Bus
- Terminal Blocks
- Transmission Conductors and Connections
- Uninsulated Ground Conductors
- Wooden Utility Poles

2.5.2A.3 Elimination of Commodity Groups With No License Renewal Intended Functions

The following electrical commodity groups were eliminated for the reasons stated:

- Electrical Penetrations:
  Because the Oyster Creek Station Blackout System has no associated containment, there are no containment electrical penetrations associated with the Forked River Combustion Turbines (FRCTs). Therefore, no aging management review is required.
- Fuse Holders:
  The FRCT fuse holders are located within panels such as those located in the Control Rooms for each combustion turbine. As such, they are part of an active component. Therefore, no aging management review is required.
- Splices:
  There are no cable splices known to exist at the FRCT. Standard construction practices require continuous cable pulls. Because no failures of cables have occurred during the life of the units, post-construction splices to replace damaged cable have not been made. Therefore, no aging management review is required
- Switchyard Bus:
  There is no switchyard bus associated with the Oyster Creek Station Blackout System. 13.8 kV connections from the generator to the station are via underground cables. Switchyard bus associated with the connections to the 230 kV switchyard is not included within the license renewal boundary for the Oyster Creek Station Blackout System. Therefore, no aging management review is required.
- Terminal Blocks:
  No terminal blocks are located outside of active components such as control panels, motors, or switchgear. Therefore, no aging management review is required.
- Wooden Utility Poles:
  There are no wooden utility poles associated with supplying SBO power to Oyster Creek. The 13.8 kV connections from the FRCTs to Oyster Creek are made via underground cable. Wooden poles provide motive power to the cooling fans on 230 kV transformer banks 9 and 10. However, the 230 kV transformer banks 9 and 10 will not be loaded following receipt of an SBO signal, because the switches connecting the FRCTs to the grid will be open. Therefore, no aging management review is required.

2.5.2A.4 Application of Screening Criterion 10 CFR 54.21(a)(1)(ii) to Electrical Commodity Groups

10 CFR 54.21(a)(1)(ii) allows the exclusion of those component commodity groups that are subject to replacement based on a qualified life or specified time period. The only electrical components identified for exclusion by the criteria of §54.21(a)(1)(ii) are electrical components included in the Oyster Creek Environmental Qualification (EQ) Program. This is because electrical components included in the EQ Program have defined qualified lives and are

replaced prior to the expiration of their qualified lives. No electrical components for the Oyster Creek Station Blackout System are within the Oyster Creek EQ Program.

The remaining commodity groups are not in the EQ Program and require an AMR. These commodity groups are discussed below.

2.5.2A.5 Electrical Commodity Groups Subject to Aging Management Review

The electrical commodity groups subject to aging management review are identified in Table 2.5.2A, along with the associated intended functions. These electrical commodity groups are further described below.

2.5.2A.5.1 Cable Connections (Metallic Parts)

The cable connections commodity group includes the metallic portions of cable connections. The metallic connections evaluated include splices, threaded connectors, compression type termination lugs and terminal blocks. Cable connections meet the screening criteria of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

2.5.2A.5.2 High Voltage Insulators

High voltage insulators are provided on the circuits from the FRCTs to the 230 kV switchyard during normal operations. During a station blackout, FRCT circuits with high voltage insulators are energized and connected to the circuits providing alternate ac power. Therefore, high voltage insulators meet the screening criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

2.5.2A.5.3 Insulated Cables and Connectors

The insulated cables and connections commodity group was broken down for aging management review of insulation into subcategories based on their treatment in NUREG 1801:

- Insulated Cables and Connections
- Insulated Cables and Connections Used In Instrumentation Circuits
- Insulated Inaccessible Medium Voltage Cables

The types of connection insulation included in this review include connectors. Fuse holders, splices and terminal blocks were reviewed separately. There are no nuclear instrumentation circuits at the FRCTs; therefore, no further evaluation, or aging management review of nuclear instrumentation circuit insulation for cables and connections is required.

FRCT insulated cables and connections inside the enclosure of an active device (e.g., motor leads and connections, and cables and connections internal to relays, chargers, switchgear, transformers, power supplies, etc.) are maintained along with the other subcomponents and piece-parts inside the active component and are not therefore subject to aging management review.

Therefore, insulated cables and connectors meet the screening criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

2.5.2A.5.4 Phase Bus

13.8 kV non-segregated bus bars connect the generator in the Generator Module to a pair of in-line breakers in the Generator Accessory Modules. The bus bars are supported by ceramic insulators. Materials are as described in the EPRI electrical handbook. A bus enclosure covers the bus bars in the space between the Generator and Generator Accessory Modules. Therefore, phase bus meets the screening criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

2.5.2A.5.5 Transmission Conductors and Connectors

Transmission conductors provide a portion of the circuits used to supply power from the FRCTs to the 230 kV switchyard during normal operations. During a station blackout, FRCT circuits with transmission conductors and connectors are energized and connected to the circuits providing alternate ac power. Therefore, transmission conductors and connectors meet the screening criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

2.5.2A.5.6 Uninsulated Ground Conductors

The uninsulated ground conductors commodity group is comprised of grounding cable and associated connectors. Uninsulated ground conductors meet the screening criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an aging management review.

Table 2.5.2A **Station Blackout System - Electrical Commodities**
Components Subject to Aging Management Review

Component Type	Intended Functions
Cable Connections (Metallic Parts)	Electrical Continuity
High Voltage Insulators	Insulation - Electrical
Insulated Cables and Connections	Electrical Continuity
Insulated Inaccessible Medium-Voltage Cables	Electrical Continuity
Phase Bus and Connections	Electrical Continuity
Phase Bus Enclosure Assemblies	Enclosure Protection
Phase Bus Insulators	Insulation - Electrical
Transmission Conductors and Connections	Electrical Continuity
Uninsulated Ground Conductors	Electrical Continuity

The aging management review results for these components are provided in Table 3.6.2.1.2A Station Blackout System - Electrical Commodities -Summary of Aging Management Evaluation

Appendix C

Revised Text for LRA Section 3.6.2.1.9, Station Blackout System

Supplemental Tables 3.6.1A and 3.6.1C

These tables are the "Table 1s" for the Station Blackout System. For simplicity, these tables include only those line items that are applicable to the Station Blackout System. Further evaluation, rather than being discussed in separate paragraphs, is included in the tables in the last column, entitled "Discussion/Further Evaluation." Note that the Table 1 (3.6.1B) for Station Blackout System mechanical systems and components will be provided later.

Supplemental Tables 3.6.2.1.2A, 3.6.2.1.2B and 3.6.2.1.2C

Note that in Table 3.6.2.1.2B, the Aging Management Programs, NUREG-1800 Vol. 2 Item, Table 1 Item, and Notes for the mechanical systems and components will be provided later.

3.6.2.1.9 Station Blackout System

Materials

The materials of construction for the Station Blackout System Electrical Commodities are:

- Aluminum
- Carbon and low alloy steel
- Cement
- Copper
- Elastomer
- Galvanized steel
- Malleable iron
- Porcelain, various metals, thermo-plastic organic polymers
- Various metals used for electrical connections
- Various organic polymers, e.g., EPR

The materials of construction for the Station Blackout System Mechanical Systems are:

- Alloy Steel
- Aluminum
- Bronze
- Carbon and low alloy steel
- Cast Iron
- Copper
- Copper Alloy
- Elastomer
- Glass
- Stainless Steel

The materials of construction for the Station Blackout System Structures are:

- Carbon and low alloy steel
- Concrete
- Elastomer
- Galvanized steel
- Grout
- Wood

Environments

The Station Blackout System Electrical Commodities are exposed to the following environments:

- Adverse Localized Environment
- Indoor Air
- Outdoor Air

The Station Blackout System Mechanical Systems are exposed to the following environments:

- Closed Cooling Water
- Combustion Turbine Exhaust Gases
- Diesel Engine Exhaust Gases
- Fuel Oil
- Indoor Air
- Lubricating Oil
- Outdoor Air
- Soil

The Station Blackout System Structures are exposed to the following environments:

- Closed Cooling Water
- Concrete
- Indoor Air
- Outdoor Air
- Soil

Aging Effects Requiring Management

The following aging effects associated with Station Blackout System Electrical Commodities require management:

- Change in Material Properties
- Corrosion, loosening of bolted connections due to thermal cycling and ohmic heating
- Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure due to thermal/ thermoxidative degradation of organics; radiolysis and photolysis (ultraviolet [UV] sensitive materials only) of organics; radiation-induced oxidation; and moisture intrusion.
- Localized damage and breakdown of insulation leading to electrical failure / moisture intrusion, water trees
- Loss of material

The following aging effects associated with Station Blackout System Mechanical Systems require management:

- Change in Material Properties
- Cracking Initiation and Growth
- Loss of Material
- Loss Of Preload
- Reduction of Heat Transfer

The following aging effects associated with Station Blackout System Structures require management:

- Change in Material Properties
- Cracking
- Loss of Material
- Loss of Preload
- Reduction in Anchor Capacity Due to Local Concrete Degradation

Aging Management Programs

The following aging management programs manage the aging effects for the Station Blackout System:

- Periodic Monitoring of Combustion Turbine Power Plant – Electrical
- Structures Monitoring Program
- Inaccessible Medium Voltage Cables Not Subject to 10CFR50.49 Environmental Qualification Requirements
- Aging Management Programs for mechanical systems and components will be provided later.

Table 3.6.2.1.2A and C summarizes the results of the aging management review of the Station Blackout System Electrical Commodities and Structures, respectively. Table 3.6.2.1.2B, currently under development to be provided later, will summarize the results of the aging management review of the Station Blackout System Mechanical Components.

Table 3.6.1A Summary of Aging Management Evaluations for the Station Blackout System – Electrical

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion / Further Evaluation
3.6.1-1	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental qualification of electric components	Yes, TLAA	Not applicable. FRCT contains no components subject to 10 CFR 50.49 EQ requirements
3.6.1-2	Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure due to thermal/ thermoxidative degradation of organics; radiolysis and photolysis (ultraviolet [UV] sensitive materials only) of organics; radiation-induced oxidation; and moisture intrusion	Aging management program for electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	No	The Periodic Monitoring of Combustion Turbine Power Plant – Electrical Program, B.1.37, will be used to inspect cable and connection insulation to identify and assess aging effects that may be occurring due to the existence of adverse localized environments. FRCT has no fuse holders or terminal blocks outside larger, active components such as control panels or motor control centers.

Table 3.6.1A Summary of Aging Management Evaluations for the Station Blackout System – Electrical

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion / Further Evaluation
3.6.1-3	Electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance (IR)	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure due to thermal/thermoxidative degradation of organics; radiation-induced oxidation; and moisture intrusion	Aging management program for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements	No	Not applicable. FRCT has no instrumentation circuits as defined in NUREG-1801 Section XI.E2.
3.6.1-4	Inaccessible medium-voltage (2 kV to 15 kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	Formation of water trees, localized damage leading to electrical failure (breakdown of insulation); water trees due to moisture intrusion	Aging management program for inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG-1801. The Inaccessible Medium Voltage Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements program, B.1.36, will be used to inspect inaccessible medium voltage cable and connection insulation to identify and assess aging effects that may be occurring due to the existence of adverse localized environments.
3.6.1-5	PWR Only				

Table 3.6.1A Summary of Aging Management Evaluations for the Station Blackout System – Electrical

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion / Further Evaluation
3.6.1-6	Fuse holders (metallic clamp)	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Aging management program for fuse holders	No	Not applicable. FRCT has no fuse holders other than those located within a larger active component such as a control panel.
3.6.1-7	Phase bus - Bus/connections	Loosening of bolted connections due to thermal cycling and ohmic heating	Aging management program for bus duct	No	The Periodic Monitoring of Combustion Turbine Power Plant – Electrical Program, B.1.37, will be used to inspect phase bus associated connections and insulators to identify and assess aging effects.
3.6.1-8	Phase bus – Insulation/insulators	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure due to thermal/ thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation; moisture/debris intrusion, and ohmic heating	Aging management program for bus duct	No	The Periodic Monitoring of Combustion Turbine Power Plant – Electrical Program, B.1.37, will be used to inspect phase bus and associated connections and insulators to identify and assess aging effects.

Table 3.6.1A Summary of Aging Management Evaluations for the Station Blackout System – Electrical

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion / Further Evaluation
3.6.1-9	Phase bus – Enclosure assemblies	Loss of material due to general corrosion	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program will be used to monitor Phase Bus Enclosures and associated seals & gaskets.
3.6.1-10	Phase bus – Enclosure assemblies	Hardening and loss of strength/ elastomers degradation	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program will be used to monitor Phase Bus Enclosures and associated seals & gaskets.
3.6.1-11	High voltage insulators	Degradation of insulation quality due to presence of any salt deposits and surface contamination; Loss of material caused by mechanical wear due to wind blowing on transmission conductors	Plant specific	Yes, plant specific	NUREG-1801 aging effect is not applicable to FRCT. The evaluation in Oyster Creek LRA Subsection 3.6.2.2.5 is applicable to FRCT high voltage insulators.

Table 3.6.1A Summary of Aging Management Evaluations for the Station Blackout System – Electrical

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion / Further Evaluation
3.6.1-12	Transmission conductors and connections, Switchyard bus and connections	Loss of material due to wind induced abrasion and fatigue; Loss of conductor strength due to corrosion; Increased resistance of connection due to oxidation or loss of pre-load	Plant specific	Yes, plant specific	NUREG-1801 aging effect is not applicable to FRCT. The evaluation in Oyster Creek LRA Subsection 3.6.2.2.6 is applicable to FRCT transmission conductors and connections. FRCT has no switchyard bus and connections in scope of license renewal.
3.6.1-13	Cable Connections (Metallic parts)	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Aging management program for electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements	No	NUREG-1801 aging effect is not applicable to FRCT. The evaluation in Oyster Creek LRA Subsection 3.6.2.3.3 is applicable to FRCT cable connections.
3.6.1-14	Fuse Holders (Not Part of a Larger Assembly) Insulation material	None	None	N/A	Not applicable. FRCT has no fuse holders other than those located within a larger active component such as a control panel.

Table 3.6.1C Summary of Aging Management Evaluations for the Station Blackout System – Structural					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion/Further Evaluation**
3.3.1-35	Steel closure bolting exposed to air – indoor uncontrolled (external)	Loss of material due to general, pitting and crevice corrosion, loss of preload due to stress relaxation	Bolting Integrity	No	The Structures Monitoring Program, B.1.31, will be used to manage loss of material and loss of preload in structural bolting exposed to an indoor air (external) environment.
3.3.1-36	Steel bolting exposed to air – outdoor (external)	Loss of material due to general, pitting and crevice corrosion	Bolting Integrity	No	The Structures Monitoring Program, B.1.31, will be used to manage loss of material in structural bolting exposed to an outdoor air (external) environment.
3.3.1-46	Elastomer fire barrier penetration seals exposed to air – outdoor or indoor uncontrolled	Increased elastomer hardness, shrinkage and loss of strength due to weathering	Fire Protection	No	The Structures Monitoring Program, B.1.31, will be used to manage change in material properties of structural seals and gaskets exposed to indoor air, and outdoor air environments.
3.3.1-74	Galvanized steel piping, piping components, and piping elements exposed to air – indoor uncontrolled	None	None	NA – No AEM or AMP	Consistent with NUREG-1801

Table 3.6.1C Summary of Aging Management Evaluations for the Station Blackout System – Structural					
Item Number	**Component**	**Aging Effect/Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion/Further Evaluation**
3.3.1-78	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.5.1-21	All Groups except Group 6: accessible and inaccessible interior/exterior concrete, steel & Lubrite components	All types of aging effects	Structures Monitoring	No, if within the scope of the applicant's structures monitoring program and a plant-specific aging management program is required for inaccessible areas as stated	Consistent with NUREG-1801. The Structures Monitoring Program, B.1.31, will be used to manage aging effects of all Groups of structures and components, except Group 6, in all environments including inaccessible areas.
3.5.1-27	Groups 1-3, 5, 7-9: Foundation	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring	No, if within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. The Structures Monitoring Program, B.1.31, will be used to manage cracks and distortion due to increase in component stress level from settlement.
3.5.1-33	All Groups: support members: anchor bolts, concrete surrounding anchor bolts, welds, grout pad, bolted connections, etc.	Aging of component supports	Structures Monitoring	No, if within the scope of the applicant's structures monitoring program	The Structures Monitoring Program, B.1.31, will be used to manage aging effects of component support members, conduits, and cable trays.

Table 3.6.2.1.2A
Station Blackout System - Electrical Commodities
Summary of Aging Management Evaluation

Table 3.6.2.1.2A Station Blackout System - Electrical Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1A)	Notes
Cable Connections (Metallic Parts)	Electrical Continuity	Various metals used for electrical connections	Indoor Air (External)	None	None	VI.A-1 (LP-12)	3.6.1-13	I, 1
			Outdoor Air (External)	None	None	VI.A-1 (LP-12)	3.6.1-13	I, 1
High Voltage Insulators	Insulation - Electrical	Porcelain, malleable iron, aluminum, galvanized steel, cement	Outdoor Air (External)	None	None	VI.A-10 (LP-11)	3.6.1-11	I, 8
						VI.A-9 (LP-07)	3.6.1-11	I, 7

Table 3.6.2.1.2A Station Blackout System - Electrical Commodities (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1A)	Notes
Insulated Cables and Connections	Electrical Continuity	Various organic polymers (e.g., EPR)	Adverse Localized Environment (Electrical Only) (External)	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation of organics (Thermal/ thermoxidative), radiolysis and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation, and moisture intrusion	Periodic Monitoring of Combustion Turbine Power Plant (B.1.37) - Electrical	VI.A-2 (L-01)	3.6.1-2	E, 2
Insulated Inaccessible Medium-Voltage Cables	Electrical Continuity	Various organic polymers (e.g., EPR)	Adverse Localized Environment (Electrical Only) (External)	Localized damage and breakdown of insulation leading to electrical failure / moisture infusion, water trees	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.1.36)	VI.A-4 (L-03)	3.6.1-4	A, 3
Phase Bus and Connections	Electrical Continuity	Copper	Indoor Air (External)	Corrosion, loosening of bolted connections due to thermal cycling and ohmic heating	Periodic Monitoring of Combustion Turbine Power Plant (B.1.37) - Electrical	VI.A-11 (LP-04)	3.6.1-7	E, 5
Phase Bus Enclosure Assemblies	Enclosure Protection	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material	Structures Monitoring Program (B.1.31)	VI.A-13 (LP-06)	3.6.1-9	A, 6
			Outdoor Air (External)	Loss of Material	Structures Monitoring Program (B.1.31)	VI.A-13 (LP-06)	3.6.1-9	A, 6
		Elastomer	Indoor Air (Internal)	Change in Material Properties	Structures Monitoring Program (B.1.31)	VI.A-12 (LP-10)	3.6.1-10	A

Table 3.6.2.1.2A Station Blackout System - Electrical Commodities (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1A)	Notes
Phase Bus Enclosure Assemblies		Elastomer	Outdoor Air (External)	Change in Material Properties	Structures Monitoring Program (B.1.31)	VI.A-12 (LP-10)	3.6.1-10	A
Phase Bus Insulators	Insulation - Electrical	Porcelain, Various Metals, Thermo-plastic organic polymers	Indoor Air (External)	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ thermal/thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation; moisture/debris intrusion, and ohmic heating	Periodic Monitoring of Combustion Turbine Power Plant (B.1.37) - Electrical	VI.A-14 (LP-05)	3.6.1-8	E
Transmission Conductors and Connections	Electrical Continuity	Aluminum, Steel	Outdoor Air (External)	None	None	VI.A-16 (LP-08)	3.6.1.12	I, 9
Uninsulated Ground Conductors	Electrical Continuity	Copper	Indoor Air (External)	None	None			J, 4
			Outdoor Air (External)	None	None			J, 4

Notes	Definition of Note
A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1. FRCT electrical cable connections (metallic parts) do not experience the aging effects identified in NUREG 1801. The evaluation provided in Oyster Creek LRA Subsection 3.6.2.3.3 is applicable to FRCT.
2. FRCT insulated cables and connections inside enclosures are run in hard or flexible conduit directly to the load device and are not accessible for visual inspection. The only high temperature adverse localized environment identified is the turbine compartment in which no cables are located. The starting diesel operates for a short period during plant startup, therefore the starting diesel compartment is not considedered an adverse environment. There are no radiation sources at the FRCT site.
3. FRCT includes a pair of 13.8kV underground circuits to the Oyster Creek site and a pair of 13.8 kV circuits to Transformer Banks 9 & 10 feeding the 230 kV substation. These circuits are continually energized to ensure the reliability of the AAC source.
4. FRCT uninsulated ground conductors do not experience aging effects requiring management. The evaluation presented in Oyster Creek LRA Subsection 3.6.2.3.4 is applicable to FRCT.
5. FRCT phase busses are coated to prevent oxidation, and connections are taped. Heating caused by corrosion or loosening of bolted connections would cause degradation of the tape covering which is detectable during a visual inspection.
6. FRCT phase bus enclosures provide enclosure protection only.
7. FRCT high voltage insulators do not experience degradation of insulator quality identified in NUREG-1801. The evaluation provided in Oyster Creek LRA Subsection 3.6.2.2.5 is applicable to FRCT.

8. FRCT high voltage insulators do not experience loss of material and mechanical wear identified in NUREG-1801. The evaluation provided in Oyster Creek LRA Subsection 3.6.2.2.5 is applicable to FRCT.
9. FRCT transmission conductor does not experience the aging effects identified in NUREG-1801. The evaluation provided in Oyster Creek LRA Subsection 3.6.2.2.6

Table 3.6.2.1.2B
Station Blackout System - Mechanical
Summary of Aging Management Evaluation

Table 3.6.2.1.2B Station Blackout System - Mechanical

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bird Screen	Filter	Carbon and low alloy steel	Indoor Air (External)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Closure bolting	Mechanical Closure	Alloy Steel	Indoor Air (External)	Loss of Material	Later			
				Loss Of Preload	Later			
			Outdoor Air (External)	Loss of Material	Later			
				Loss Of Preload	Later			
		Carbon and low alloy steel	Indoor Air (External)	Loss of Material	Later			
				Loss Of Preload	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure bolting	Mechanical Closure	Carbon and low alloy steel	Outdoor Air (External)	Loss of Material	Later			
				Loss Of Preload	Later			
		Stainless Steel	Indoor Air (External)	Loss Of Preload	Later			
			Outdoor Air (External)	Loss of Material	Later			
				Loss Of Preload	Later			
Combustion Turbine Casing	Pressure Boundary	Carbon and low alloy steel	Combustion Turbine Exhaust Gases (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			
Damper housing	Pressure Boundary	Carbon and low alloy steel	Indoor Air (External)	Loss of Material	Later			
			Indoor Air (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Ductwork	Pressure Boundary	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
		Stainless Steel	Combustion Turbine Exhaust Gases (Internal)	Cracking Initiation and Growth	Later			
				Loss of Material	Later			
			Indoor Air (External)	None	Later			
			Indoor Air (Internal)	None	Later			
			Outdoor Air (External)	Loss of Material	Later			
Electric Heater (Fuel Forwarding Skid)	Heat Transfer	Carbon and low alloy steel	Fuel Oil (Internal)	Reduction of Heat Transfer	Later			
	Pressure Boundary	Carbon and low alloy steel	Fuel Oil (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Exhaust Stack	Pressure Boundary	Stainless Steel	Combustion Turbine Exhaust Gases (Internal)	Cracking Initiation and Growth	Later			
				Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Expansion Joint	Pressure Boundary	Carbon and low alloy steel (Fuel Oil System)	Fuel Oil (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
		Elastomer (Fuel Oil System)	Fuel Oil (Internal)	Change in Material Properties	Later			
			Outdoor Air (External)	Change in Material Properties	Later			
		Stainless Steel (CT Inlet & Exhaust Air System)	Combustion Turbine Exhaust Gases (Internal)	Cracking Initiation and Growth	Later			
				Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fan Housing	Pressure Boundary	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Filter Housing	Pressure Boundary	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Filter Housing (Fuel Forwarding Skid Outlet)	Pressure Boundary	Carbon and low alloy steel	Fuel Oil (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Filter Housing (Lube Oil)	Pressure Boundary	Carbon and low alloy steel	Indoor Air (External)	Loss of Material	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
Flexible Connection	Pressure Boundary	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Flexible Connection	Pressure Boundary	Elastomer	Indoor Air (Internal)	Change in Material Properties	Later			
			Outdoor Air (External)	Change in Material Properties	Later			
		Stainless Steel	Indoor Air (External)	None	Later			
			Indoor Air (Internal)	None	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
Flow Element (Fuel Forwarding Skid)	Pressure Boundary	Carbon and low alloy steel	Fuel Oil (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			
Flow Meter	Pressure Boundary	Carbon and low alloy steel	Fuel Oil (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Gauge Snubber	Pressure Boundary	Stainless Steel	Fuel Oil (Internal)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Gauge Snubber	Pressure Boundary	Stainless Steel	Indoor Air (External)	None	Later			
			Outdoor Air (External)	Loss of Material	Later			
Heat Exchangers (Atomizing Air)	Heat Transfer	Copper Alloy	Closed Cooling Water (Internal)	None	Later			
			Indoor Air (External)	Reduction of Heat Transfer	Later			
	Pressure Boundary	Carbon and low alloy steel (shell)	Indoor Air (External)	Loss of Material	Later			
			Indoor Air (Internal)	Loss of Material	Later			
		Carbon and low alloy steel (tube side components)	Closed Cooling Water (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			
		Copper Alloy (tubes & tubesheet)	Closed Cooling Water (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers (Cooling Tower)	Heat Transfer	Aluminum (fins)	Outdoor Air (External)	Reduction of Heat Transfer	Later			
		Copper (tubes)	Closed Cooling Water (Internal)	None	Later			
			Outdoor Air (External)	Reduction of Heat Transfer	Later			
	Pressure Boundary	Carbon and low alloy steel (tube side components)	Closed Cooling Water (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
		Copper (tubes)	Closed Cooling Water (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Heat Exchangers (Diesel Jacket Cooling)	Heat Transfer	Copper Alloy (tubes)	Closed Cooling Water (External)	None	Later			
			Closed Cooling Water (Internal)	None	Later			
	Pressure Boundary	Carbon and low alloy steel (shell)	Closed Cooling Water (Internal)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers (Diesel Jacket Cooling)	Pressure Boundary	Carbon and low alloy steel (shell)	Outdoor Air (External)	Loss of Material	Later			
		Copper Alloy (tubes)	Closed Cooling Water (External)	Loss of Material	Later			
			Closed Cooling Water (Internal)	Loss of Material	Later			
Heat Exchangers (Flame Detector)	Heat Transfer	Carbon and low alloy steel	Closed Cooling Water (Internal)	None	Later			
	Pressure Boundary	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			
Heat Exchangers (Generator)	Heat Transfer	Aluminum (fins)	Indoor Air (External)	Reduction of Heat Transfer	Later			
		Copper Alloy (tubes)	Closed Cooling Water (Internal)	None	Later			
			Indoor Air (External)	Reduction of Heat Transfer	Later			
	Pressure Boundary	Carbon and low alloy steel (water box)	Closed Cooling Water (Internal)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers (Generator)	Pressure Boundary	Carbon and low alloy steel (water box)	Indoor Air (External)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
		Copper Alloy (tubes)	Closed Cooling Water (Internal)	Loss of Material	Later			
			Indoor Air (External)	None	Later			
Heat Exchangers (Lube Oil)	Heat Transfer	Copper Alloy (fins)	Lubricating Oil (External)	Reduction of Heat Transfer	Later			
		Copper Alloy (tubes)	Closed Cooling Water (Internal)	None	Later			
			Lubricating Oil (External)	Reduction of Heat Transfer	Later			
	Pressure Boundary	Carbon and low alloy steel (shell)	Indoor Air (External)	Loss of Material	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
		Carbon and low alloy steel (tubesheet)	Closed Cooling Water (Internal)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers (Lube Oil)	Pressure Boundary	Carbon and low alloy steel (tubesheet)	Lubricating Oil (External)	Loss of Material	Later			
		Copper Alloy (tubes)	Closed Cooling Water (Internal)	Loss of Material	Later			
			Lubricating Oil (External)	Loss of Material	Later			
Heat Exchangers (Support Leg)	Heat Transfer	Carbon and low alloy steel	Closed Cooling Water (Internal)	None	Later			
	Pressure Boundary	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			
Louvers	Pressure Boundary	Aluminum	Indoor Air (External)	None	Later			
			Outdoor Air (External)	Loss of Material	Later			
Muffler	Pressure Boundary	Carbon and low alloy steel	Diesel Engine Exhaust Gases (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping and fittings	Pressure Boundary	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Diesel Engine Exhaust Gases (Internal)	Loss of Material	Later			
			Fuel Oil (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			
			Indoor Air (Internal)	Loss of Material	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
			Soil (External)	Loss of Material	Later			
		Stainless Steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Fuel Oil (Internal)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping and fittings	Pressure Boundary	Stainless Steel	Indoor Air (External)	None	Later			
			Indoor Air (Internal)	None	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Pump Casing (CCW)	Pressure Boundary	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Pump Casing (Fuel Forwarding)	Pressure Boundary	Cast Iron	Fuel Oil (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			
Pump Casing (Hyd Oil)	Pressure Boundary	Carbon and low alloy steel	Indoor Air (External)	Loss of Material	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pump Casing (Lube Oil)	Pressure Boundary	Cast Iron	Lubricating Oil (External)	Loss of Material	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
Restricting Orifice	Pressure Boundary	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
		Stainless Steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Fuel Oil (Internal)	Loss of Material	Later			
			Indoor Air (External)	None	Later			
			Indoor Air (Internal)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice	Pressure Boundary	Stainless Steel	Outdoor Air (External)	Loss of Material	Later			
	Throttle	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
		Stainless Steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Fuel Oil (Internal)	Loss of Material	Later			
			Indoor Air (Internal)	Loss of Material	Later			
Sight Glasses	Pressure Boundary	Glass	Closed Cooling Water (Internal)	None	Later			
			Outdoor Air (External)	None	Later			
Strainer (Fuel Forwarding Skid Inlet)	Filter	Stainless Steel	Fuel Oil (External)	Loss of Material	Later			
Strainer Body	Pressure Boundary	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer Body	Pressure Boundary	Carbon and low alloy steel	Fuel Oil (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Tanks (CCW)	Pressure Boundary	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Tanks (Fuel Oil)	Pressure Boundary	Carbon and low alloy steel	Fuel Oil (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
Tanks (Lube Oil)	Pressure Boundary	Carbon and low alloy steel	Indoor Air (External)	Loss of Material	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
Thermowell	Pressure Boundary	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure Boundary	Carbon and low alloy steel	Indoor Air (External)	Loss of Material	Later			
		Stainless Steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Fuel Oil (Internal)	Loss of Material	Later			
			Indoor Air (External)	None	Later			
			Outdoor Air (External)	Loss of Material	Later			
Valve Body	Pressure Boundary	Bronze	Closed Cooling Water (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
		Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material	Later			
			Fuel Oil (Internal)	Loss of Material	Later			
			Indoor Air (External)	Loss of Material	Later			

Table 3.6.2.1.2B Station Blackout System - Mechanical (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve Body	Pressure Boundary	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			
		Stainless Steel	Fuel Oil (Internal)	Loss of Material	Later			
			Indoor Air (External)	None	Later			
			Indoor Air (Internal)	None	Later			
			Lubricating Oil (Internal)	Loss of Material	Later			
			Outdoor Air (External)	Loss of Material	Later			

Notes	Definition of Note
A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1. The applicable mechanical aging management programs and associated "Table 1" rollup Table 3.6.1B will be provided later.

Table 3.6.2.1.2C
Station Blackout System - Structural Components
Summary of Aging Management Evaluation

Table 3.6.2.1.2C Station Blackout System - Structural Components

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Building concrete at locations of expansion and grouted anchors; grouted pads for support base plates	Structural Support	Concrete; grout	Indoor Air	Reduction in Anchor Capacity Due to Local Concrete Degradation	Structures Monitoring Program (B.1.31)	III.B2-1 (T-29)	3.5.1-33	A
						III.B3-1 (T-29)	3.5.1-33	A
						III.B4-1 (T-29)	3.5.1-33	A
			Outdoor Air	Reduction in Anchor Capacity Due to Local Concrete Degradation	Structures Monitoring Program (B.1.31)	III.B2-1 (T-29)	3.5.1-33	A
						III.B3-1 (T-29)	3.5.1-33	A
						III.B4-1 (T-29)	3.5.1-33	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Cable trays	Structural Support	Galvanized Steel	Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.B2-6 (TP-6)	3.5.1-33	C
Concrete embedment	Structural Support	Carbon and low alloy steel	Concrete	None	None	VII.J-24 (AP-3)	3.3.1-78	C
			Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
Conduits	Enclosure Protection	Galvanized Steel	Concrete (External)	None	None	VII.J-24 (AP-3)	3.3.1-78	C
			Indoor Air	None	None	VII.J-8 (AP-13)	3.3.1-74	C
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.B2-6 (TP-6)	3.5.1-33	C
	Structural Support	Galvanized Steel	Concrete (External)	None	None	VII.J-24 (AP-3)	3.3.1-78	C
			Indoor Air	None	None	VII.J-8 (AP-13)	3.3.1-74	C
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.B2-6 (TP-6)	3.5.1-33	C

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Doors	Enclosure Protection	Carbon and low alloy steel	Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
Enclosures (combustion turbines, generator accessory, control room, fuel oil forwarding skid)	Enclosure Protection	Carbon and low alloy steel	Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
	Structural Support	Carbon and low alloy steel	Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Equipment foundation (above and below grade)	Structural Support	Carbon and low alloy steel	Concrete	None	None	VII..J-24 (AP-3)	3.3.1-78	C
			Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
		Concrete	Indoor Air	Change in Material Properties	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
			Indoor Air	Cracking	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Equipment foundation (above and below grade)	Structural Support	Concrete	Indoor Air	Cracking	Structures Monitoring Program (B.1.31)	III.A3-2 (T-03)	3.5.1-21	A
				Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
			Outdoor Air	Change in Material Properties	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
				Cracking	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
					Structures Monitoring Program (B.1.31)	III.A3-2 (T-03)	3.5.1-21	A
					Structures Monitoring Program (B.1.31)	III.A3-6 (T-01)	3.5.1-21	A
				Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
					Structures Monitoring Program (B.1.31)	III.A3-6 (T-01)	3.5.1-21	A
			Soil	Cracking	Structures Monitoring Program (B.1.31)	III.A3-3 (T-08)	3.5.1-27	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Panels and enclosures	Enclosure Protection	Carbon and low alloy steel	Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
	Structural Support	Carbon and low alloy steel	Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
Piles (turbine generator, exhaust stack)	Structural Support	Wood (Creosote treated)	Soil	Change in Material Properties	Structures Monitoring Program (B.1.31)			J, 2
				Loss of Material	Structures Monitoring Program (B.1.31)			J, 2
Reinforced concrete foundation (enclosures slab, tanks, supports); above and below grade	Structural Support	Concrete	Indoor Air	Change in Material Properties	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
				Cracking	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Reinforced concrete foundation (enclosures slab, tanks, supports); above and below grade	Structural Support	Concrete	Indoor Air	Cracking	Structures Monitoring Program (B.1.31)	III.A3-2 (T-03)	3.5.1-21	A
				Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
			Outdoor Air	Change in Material Properties	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
				Cracking	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
					Structures Monitoring Program (B.1.31)	III.A3-2 (T-03)	3.5.1-21	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Reinforced concrete foundation (enclosures slab, tanks, supports); above and below grade	Structural Support	Concrete	Outdoor Air	Cracking	Structures Monitoring Program (B.1.31)	III.A3-6 (T-01)	3.5.1-21	A
				Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
					Structures Monitoring Program (B.1.31)	III.A3-6 (T-01)	3.5.1-21	A
			Soil	Cracking	Structures Monitoring Program (B.1.31)	III.A3-3 (T-08)	3.5.1-27	A
Reinforced concrete trench, manhole, ductbank (above and below grade)	Enclosure Protection	Concrete	Outdoor Air	Change in Material Properties	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
				Cracking	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Reinforced concrete trench, manhole, ductbank (above and below grade)	Enclosure Protection	Concrete	Outdoor Air	Cracking	Structures Monitoring Program (B.1.31)	III.A3-2 (T-03)	3.5.1-21	A
						III.A3-6 (T-01)	3.5.1-21	A
				Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
						III.A3-6 (T-01)	3.5.1-21	A
			Soil	Cracking	Structures Monitoring Program (B.1.31)	III.A3-3 (T-08)	3.5.1-27	A
	Structural Support	Concrete	Outdoor Air	Change in Material Properties	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
				Cracking	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Reinforced concrete trench, manhole, ductbank (above and below grade)	Structural Support	Concrete	Outdoor Air	Cracking	Structures Monitoring Program (B.1.31)	III.A3-2 (T-03)	3.5.1-21	A
						III.A3-6 (T-01)	3.5.1-21	A
				Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-10 (T-04)	3.5.1-21	A
						III.A3-6 (T-01)	3.5.1-21	A
			Soil	Cracking	Structures Monitoring Program (B.1.31)	III.A3-3 (T-08)	3.5.1-27	A
Seals, Gaskets	Enclosure Protection	Elastomer	Indoor Air	Change in Material Properties	Structures Monitoring Program (B.1.31)	VII.G-1 (A-19)	3.3.1-46	E, 3
			Outdoor Air	Change in Material Properties	Structures Monitoring Program (B.1.31)	VII.G-2 (A-20)	3.3.1-46	E, 3
Structural bolts	Structural Support	Carbon and low alloy steel	Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	VII.I-4 (AP-27)	3.3.1-35	E, 3

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Structural bolts	Structural Support	Carbon and low alloy steel	Indoor Air	Loss Of Preload	Structures Monitoring Program (B.1.31)	VII.I-5 (AP-26)	3.3.1-35	E, 3
		Galvanized Steel	Indoor Air	Loss Of Preload	Structures Monitoring Program (B.1.31)	VII.I-5 (AP-26)	3.3.1-35	E, 3
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	VII.I-1 (AP-28)	3.3.1-36	E, 3
				Loss Of Preload	Structures Monitoring Program (B.1.31)			H, 3
Supports for cable trays (support members, welds, bolted connections, support anchorage)	Structural Support	Galvanized Steel	Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.B2-6 (TP-6)	3.5.1-33	A
Supports for combustion turbines (skid, turbine support legs)	Structural Support	Carbon and low alloy steel	Closed Cooling Water (Internal)	Loss of Material				1
			Indoor Air (External)	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Supports for conduits (support members, welds, bolted connections, support anchorage)	Structural Support	Carbon and low alloy steel	Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
		Galvanized Steel	Indoor Air	None	None	III.B2-4 (TP-8)	3.5.1-33	I, 4
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.B2-6 (TP-6)	3.5.1-33	A
Supports for cooling system, exhaust system, ductwork (support members, welds, bolted connections, support anchorage)	Structural Support	Galvanized Steel	Outdoor Air (External)	Loss of Material	Structures Monitoring Program (B.1.31)	III.B2-6 (TP-6)	3.5.1-33	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Supports for panels and enclosures (support members, welds, bolted connections, support anchorage)	Structural Support	Carbon and low alloy steel	Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.B2-9 (T-30)	3.5.1-33	A
			Outdoor Air	Loss of Material		III.A3-12 (T-11)	3.5.1-21	A
		Galvanized Steel	Indoor Air	None	None	III.B3--2 (TP-8)	3.5.1-33	I, 4
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.B2-6 (TP-6)	3.5.1-33	A

Table 3.6.2.1.2C Station Blackout System - Structural Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item (3.6.1C)	Notes
Supports for piping and components (support members, welds, bolted connections, support anchorage)	Structural Support	Carbon and low alloy steel	Indoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.B2-9 (T-30)	3.5.1-33	A
			Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.A3-12 (T-11)	3.5.1-21	A
		Galvanized Steel	Outdoor Air	Loss of Material	Structures Monitoring Program (B.1.31)	III.B2-6 (TP-6)	3.5.1-33	A

Notes	Definition of Note
A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
H	Aging effect not in NUREG-1801 for this component, material and environment combination.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1. The combustion turbine supports legs are provided with a water jacket through which cooling water is circulated to minimize thermal expansion and to assist in maintaining alignment between the turbine and the generator. The appropriate aging management programs will be identified and included with the mechanical aging management programs, to be provided later.

2. The foundation piles are inaccessible and will not be inspected directly. Instead the foundation will be visually inspected for cracking and distortion due to increased stress levels from settlement that may result from degradation of the piles.

3. Structures Monitoring Program is the applicable aging management program for this component.

4. Galvanic corrosion occurs when two or more metal of differing electrochemical potential are in electrical contact in the presence of an electrolyte. Galvanized structural members are not combined with metals of differing electrical potential.

Appendix D

Revised Text for LRA Appendix A, NUREG-1801 Aging Management Programs for:

- 1.31, Structures Monitoring Program
- 1.36, Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- 1.37, Periodic Monitoring of Combustion Turbine Power Plant – Electrical

Changes for A.1.31 and A.1.36 are denoted by bolding. A.1.37 is a new program. Note that new commitments associated with mechanical Station Blackout System components will be provided later.

Revised and Supplement Line Items for LRA Table A.5

Changes for line items 31 and 36 are denoted by bolding. Line item 43 has been revised in its entirely. Note that commitments for the mechanical systems/components will be provided later.

Revised Text for LRA Appendix B AMPs for 1.31, 1.36 and 1.37

Changes for B.1.31 and B.1.36 are denoted by bolding. B.1.37 is a new program. Note that the mechanical systems/components AMPs will be provided later.

A.1.31 STRUCTURES MONITORING PROGRAM

The Structures Monitoring Program is an existing program that was developed to implement the requirements of 10 CFR 50.65 and is based on NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Revision 2 and Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Revision 2. The program includes elements of the Masonry Wall Program and the RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plants aging management program.

The program relies on periodic visual inspections to monitor the condition of structures and structural components, structural bolting, component supports, masonry block walls, water-control structures, the Fire Pond Dam, exterior surfaces of mechanical components that are not covered by other programs, and HVAC ducts, damper housings, and HVAC closure bolting. The program relies on procurement controls and installation practices, defined in plant procedures, to ensure that only approved lubricants and proper torque are applied to bolting in scope of the program.

The scope of the program will be enhanced to include structures and structural components that are not currently monitored, **including Station Blackout System structures and phase bus enclosure assemblies**; but determined to be in the scope of license renewal, submerged structures, component supports not covered by other programs, the Fire Pond Dam, exterior surfaces of mechanical components that are not covered by other programs, and exterior surfaces of HVAC ducts, damper housings, and closure bolting. The program will also be enhanced to require removal of piping and component insulation on a sampling basis to allow visual inspection of insulated surfaces. The program will also be enhanced to require sampling and testing of groundwater every 4 years to confirm that the soil environment is non-aggressive to below-grade concrete structures. The enhancements will be made prior to entering the period of extended operation.

Inspection criteria will be enhanced to provide reasonable assurance that change in material properties, cracking, loss of material, loss of form, reduction or loss of isolation function, reduction in anchor capacity due local degradation, and loss of preload are adequately managed so that the intended functions of structures and components within the scope of the program are maintained consistent with the current licensing basis during the period of extended operation.

Inspection frequency is every four (4) years; except for submerged portions of the water- control structures, which will be inspected when dewatered or on a frequency not to exceed ten (10) years. The program contains provisions for more frequent inspections to ensure that observed conditions that have the potential for impacting an intended function are evaluated or corrected in accordance with the corrective action process.

A.1.36 Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements aging management program is a new program that will be used to manage the aging of medium-voltage **(2.3 kV, 4.1 kV and 13.8 kV)** cable circuits at Oyster Creek. These cables may at times be exposed to moisture and may be subjected to system voltage for more than 25% of the time. Manholes, conduits and sumps associated with these cable circuits will be inspected for water collection at least once every 2 years and drained as required. The first inspections will be completed prior to the period of extended operation. In addition, the cable circuits will be tested using a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, or polarization index, as described in EPRI TR-103834-P1-2, or other testing that is state-of-the-art at the time the test is performed. The cable circuits will be tested at least once every 10 years. This new program will be implemented prior to the period of extended operation. Inclusion of the 13.8 kV system circuits in this program reflects the scope expansion of the Station Blackout System electrical commodities.

A.1.37 Periodic Monitoring of Combustion Turbine Power Plant - Electrical

The new Periodic Monitoring of Combustion Turbine Power Plant - Electrical Program will be used in conjunction with the existing Structures Monitoring Program and the new Inaccessible Medium Voltage Cables Not Subject to 10CFR50.49 Environmental Qualification Requirements program to manage aging effects for the electrical commodities that support Forked River Combustion Turbine (FRCT) operation. The Program consists of visual inspection of accessible electrical cables and connections exposed in enclosures, pits, manholes, and pipe trench for embrittlement, discoloration, cracking or surface contamination; visual inspection of manholes, pits and cable trenches, located on the FRCT site, for inaccessible medium voltage cables, for water collection; and visual inspections of accessible phase bus and connections and phase bus insulators for melting or other signs of heat effects on the tape covering bus connections, cracking of thermoplastic, or degradation of insulators. Phase Bus Enclosures will be inspected by the existing Structures Monitoring Program for signs of corrosion. The inaccessible medium voltage cables circuits supporting the FRCT, and the associated manholes, pits and trenches located on the Oyster Creek site, will be tested or inspected by the new Inaccessible Medium Voltage Cables Not Subject to 10CFR50.49 Environmental Qualification Requirements program for signs of insulation degradation and for prevention of wetted environments. The new combustion turbine power plant – electrical program will be implemented prior to the period of extended operation. Manhole, pit and trench inspections for manholes, pits and trenches located on the FRCT site will be performed at least once every 2 years for accumulation of water, and the frequency will be adjusted based on the results obtained. Cable and connection inspections will be implemented prior to the period of extended operation with a frequency of at least once every 10 years. Accessible phase bus and connection and phase bus insulator inspections will be performed at least once every 5 years. Phase bus enclosure inspections will be performed at the frequency specified in the Structures Monitoring Program. Inaccessible medium voltage cable circuits and the associated manhole, pit and trench tests and inspections for the manholes, pits and trenches located on the OC site will be performed at the frequency specified in the Inaccessible Medium Voltage Cables Not Subject to 10CFR50.49 Environmental Qualification Requirements program.

A.5 License Renewal Commitment List

The items in the table below replace items 31, 36 and 43 in the license renewal application.

ITEM NUMBER	COMMITMENT	UFSAR SUPPLEMENT LOCATION (LRA APP. A)	ENHANCEMENT OR IMPLEMENTATION SCHEDULE	SOURCE
31) Structures Monitoring Program	Existing program is credited. The program includes elements of the Masonry Wall Program and the RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plants aging management program. The Structures Monitoring Program will be enhanced to include: 1. Buildings, structural components and commodities that are not in scope of maintenance rule but have been determined to be in the scope of license renewal. These include miscellaneous platforms, flood and secondary containment doors, penetration seals, sump liners, structural seals, and anchors and embedment. 2. Component supports, other than those in scope of ASME XI, Subsection IWF. 3. Inspection of external surfaces of mechanical components that are not covered by other programs, HVAC duct, damper housings, and HVAC closure bolting. Inspection and acceptance criteria of the external surfaces will be the same as those specified for structural steel components and structural bolting. 4. The visual inspection of insulated surfaces will require the removal of insulation. Removal of insulation will be on a sampling basis that bounds insulation material type, susceptibility of insulated piping or component material to potential degradations that could result from being in contact with insulation, and system operating temperature. 5. Inspection of electrical panels and racks, junction boxes, instrument racks and panels, cable trays, offsite power structural components and their foundations, and anchorage. 6. Periodic sampling, testing, and analysis of ground water to confirm that the environment remains non-aggressive for buried	A.1.31	Prior to the period of extended operation.	Section B.1.31

ITEM NUMBER	COMMITMENT	UFSAR SUPPLEMENT LOCATION (LRA APP. A)	ENHANCEMENT OR IMPLEMENTATION SCHEDULE	SOURCE
	reinforced concrete. 7. Periodic inspection of components submerged in salt water (Intake Structure and Canal, Dilution structure) and in the water of the fire pond dam, including trash racks at the Intake Structure and Canal. 8. Inspection of penetration seals, structural seals, and other elastomers for change in material properties. 9. Inspection of vibration isolators, associated with component supports other than those covered by ASME XI, Subsection IWF, for reduction or loss of isolation function. 10. The current inspection criteria will be revised to add loss of material, due to corrosion for steel components, and change in material properties, due to leaching of calcium hydroxide and aggressive chemical attack for reinforced concrete. Wooden piles and sheeting will be inspected for loss of material and change in material properties. 11. Periodic inspection of the Fire Pond Dam for loss of material and loss of form. 12. **Inspection of Station Blackout System structures, structural components, and phase bus enclosure assemblies.**			
36) Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Program is new. The program manages the aging of inaccessible medium-voltage cables that feed equipment performing license renewal intended functions. These cables may at times be exposed to moisture and are subjected to system voltage for more than 25% of the time. Manholes, conduits and sumps associated with these cables will be inspected for water collection every 2 years and drained as required. In addition, the cable circuits will be tested using a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, or polarization index, as described in EPRI TR-103834-P1-2, or other testing that is state-of-the-art at the time the test is performed. The cables will be tested at least once every 10 years. **Inclusion of the 13.8 kV system circuits in this program reflects the scope expansion of the Station Blackout System electrical commodities.**	A.1.36	Prior to the period of extended operation.	Section B.1.36

ITEM NUMBER	COMMITMENT	UFSAR SUPPLEMENT LOCATION (LRA APP. A)	ENHANCEMENT OR IMPLEMENTATION SCHEDULE	SOURCE
43) **Periodic Monitoring of Combustion Turbine Power Plant - Electrical**	**A new plant specific program is credited. The program will be used in conjunction with the existing Structures Monitoring Program and the new Inaccessible Medium Voltage Cables Not Subject to 10CFR50.59 Environmental Qualification Requirements program to manage aging effects for the electrical commodities that support FRCT operation. The Program consists of visual inspections of accessible electrical cables and connections exposed in enclosures, pits, manholes and pipe trench; visual inspection for water collection in manholes, pits, and trenches, located on the FRCT site, for inaccessible medium voltage cables; and visual inspection of accessible phase bus and connections and phase bus insulators/supports. The new program will be performed on a 2-year interval for manhole, pit and trench inspections, on a 5-year frequency for phase bus inspections, and on a 10-year interval for cable and connection inspections.**	**A.1.37**	**Prior to the period of extended operation**	**Section B.1.37**

B.1.31 STRUCTURES MONITORING PROGRAM

Program Description

The Structures Monitoring Program provides for aging management of structures and structural components, including structural bolting, within the scope of license renewal. The program was developed based on guidance in Regulatory Guide 1.160 Revision 2, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and NUMARC 93-01 Revision 2, "Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," to satisfy the requirement of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,"

The scope of the program also includes condition monitoring of masonry walls and water-control structures as described in the Masonry Wall Program and in the RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plants, aging management program. As a result, the program elements incorporate the requirements of NRC IEB 80-11, "Masonry Wall Design", the guidance in NRC IN 87-67, "Lessons learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11", and the requirements of NRC Regulatory Guide 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants."

The program relies on periodic visual inspections by qualified personnel to monitor structures and components for applicable aging effects. Specifically, concrete structures are inspected for loss of material, cracking, and a change in material properties. Steel components are inspected for loss of material due to corrosion. Masonry walls are inspected for cracking, and elastomers will be monitored for a change in material properties. Earthen structures associated with water-control structures and the Fire Pond Dam will be inspected for loss of material and loss of form. Component supports will be inspected for loss of material, reduction or loss of isolation function, and reduction in anchor capacity due to local concrete degradation. Exposed surfaces of bolting are monitored for loss of material, due to corrosion, loose nuts, missing bolts, or other indications of loss of preload. The program relies on procurement controls and installation practices, defined in plant procedures, to ensure that only approved lubricants and proper torque are applied consistent with the NUREG-1801 bolting integrity program.

The scope of the program will be enhanced to include structures that are not monitored under the current term but require monitoring during the period of extended operation. Details of the enhancements are discussed below.

Inspection frequency is every four (4) years; except for submerged portions of water- control structures, which will be inspected when the structures are dewatered, or on a frequency not to exceed 10 years. The program contains provisions for more frequent inspections to ensure that observed conditions that have the potential for impacting an intended function are evaluated or corrected in accordance with the corrective action process

NUREG-1801 Consistency

The Structures Monitoring Program is consistent with the ten elements of aging management program XI.S6,"Structures Monitoring Program," specified in NUREG-1801.

Exceptions to NUREG-1801

None.

Enhancements

- The scope of the program will be increased to add buildings, structural components and commodities that are not in scope of maintenance rule but have been determined to be in the scope of license renewal. These include miscellaneous platforms, flood and secondary containment doors, penetration seals, liner for sumps, structural seals, and anchors and embedment.

- **The scope of the program will be enhanced to include Station Blackout System Structures, structural components, and phase bus enclosure assemblies. Inspection frequency, inspection methods, and acceptance criteria will be the same as those specified for other structures in scope of the program.**

- The scope of the program will be increased to include component supports, other than those in scope of ASME XI, Subsection IWF.

- The scope of the program will be enhanced to include inspection of external surfaces of mechanical components that are not covered by other programs, HVAC duct, damper housings, and HVAC closure bolting. Inspection and acceptance criteria of the exterior surfaces will be the same as those specified for structural steel components and structural bolting.

- The program will be enhanced to require removal of piping and component insulation to permit visual inspection of insulated surfaces. Removal of insulation will be on a sampling basis that bounds insulation material type, susceptibility of insulated piping or component material to potential degradations that could result from being in contact with insulation, and system operating temperature.

- The program will provide for inspections of, electrical panels and racks, junction boxes, instrument racks and panels, cable trays, offsite power structural components and their foundations, and anchorage.

- The program will provide for periodic sampling and testing of ground water and review its chemistry data to confirm that the environment remains non-aggressive for buried reinforced concrete.

- The program will provide for periodic inspection of components submerged in salt water (Intake Structure and Canal, Dilution structure) and in the water of the fire pond dam, including trash racks at the Intake Structure and Canal.

- The program will require inspection of penetration seals, structural seals, and other elastomers for change in material properties by inspecting the elastomers for cracking and hardening.

- The program will require inspection of vibration isolators, associated with component supports other than those covered by ASME XI, Subsection IWF, for reduction or loss of isolation function by inspecting the isolators for cracking and hardening.

- The current inspection criteria will be enhanced to add loss of material, due to corrosion for steel components, and change in material properties, due to leaching of calcium hydroxide and aggressive chemical attack for reinforced concrete. **Accessible** wooden piles and sheeting will be inspected for loss of material and a change in material properties. **Concrete foundations for Station Blackout System structures will be inspected for cracking and distortion due to increased stress level from settlement that may result from degradation of the inaccessible wooden piles.**

- The program will be enhanced to include periodic inspection of the Fire Pond Dam for loss of material and loss of form.

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

Operating Experience

The review of program documentation, and other plant operating experience before the program was implemented, identified cracking of reinforced of exterior walls of the reactor building, drywell shield wall above elevation 95', and the spent fuel pool support beam. Cracking of the reactor building exterior walls was generally minor and attributed to early shrinkage of concrete and temperature changes. Engineering evaluation concluded that the structural integrity of the walls is unaffected by the cracks. Repairs to areas of concern were made to prevent water intrusion and corrosion of concrete rebar. The cracks and repaired areas are monitored under the program to detect any changes that would require further evaluation and corrective action.

Cracking of the drywell shield wall was attributed to high temperature in the upper elevation of the containment drywell. Engineering analysis concluded that stresses are well below allowable limits taking into consideration the existing cracked condition. The shield wall cracking was addressed in NRC SEP review of the plant under Topic III-7B. The cracks have been mapped and inspected periodically under the program. Recent inspections identified no significant change in the cracked area.

Cracking of the spent fuel storage pool concrete support beams was identified in mid-1980. Subsequently crack monitors were installed to monitor crack growth and an engineering evaluation was performed. Based on the evaluation results and additional non-destructive testing to determine the depth of the cracks, it was concluded that the beams would perform their intended function, and that continued monitoring with crack monitors is not required. The cracks are examined periodically under the program and have shown little change.

Inspection of the intake canal, performed in 2001, identified cracks and fissures, voids, holes, and localized washout of coatings that protect embankment slopes from erosion. The degradations were evaluated and determined not to impact the intended function of the intake canal (UHS). However the inspector recommended repair of the degradations to prevent further deterioration. A project to repair the canal banks has been initiated.

Inspections conducted in 2002, concluded that degradations discussed above have not become worse and remains essentially the same as identified in previous inspections. In addition minor cracking, rust stains, water stains, localized exposed rebars and rebar corrosion, and damage to siding were observed. The degradations were evaluated and determined not to have an impact on the structural integrity of affected structures. Operating experience review concluded that the program is effective for managing aging effects of structures, structural components, and water-control structures.

Conclusion

The Structures Monitoring Program was developed to implement the requirements of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The program relies on periodic visual inspections to monitor the condition of structures and structural components. Inspection frequency is every four (4) years (except for water-control structures) with provisions for more frequent inspections to ensure that observed conditions that have the potential for impacting an intended function are evaluated or corrected in accordance with the corrective action process. Submerged portions of water-control structures will be inspected when dewatered or on a frequency not to exceed ten (10) years.

The scope of the program will be enhanced to include all structures, and component supports not covered by other programs, the Fire Pond Dam, and exterior surfaces of mechanical components in the scope of license renewal that are not covered by other programs. Inspection criteria will also be enhanced to provide reasonable assurance that the aging effects are adequately managed so that the intended functions of structures and components within the scope of license renewal are maintained consistent with the current licensing basis during the period of extended operation.

B.1.36 INACCESSIBLE MEDIUM-VOLTAGE CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

Program Description

The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program manages inaccessible medium-voltage cables that are exposed to significant moisture simultaneously with significant voltage.

Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable in standing water). Periodic exposures to moisture that last less than a few days (i.e., normal rain and drain) are not significant. Significant voltage exposure is defined as being subjected to system voltage for more than twenty-five percent of the time.

Oyster Creek has **2.3 kV, 4.1 kV and 13.8 kV** medium voltage cable installations. Because of Oyster Creek's history of medium voltage cable failures, **2.3 kV, 4.1 kV and 13.8 kV system** circuits are conservatively assumed to have the potential to be exposed to significant moisture conditions. Further, **the 2.3 kV, 4.1 kV and 13.8 kV system circuits** are conservatively assumed to be energized more than 25% of the time. Consequently, **2.3 kV, 4.1 kV and 13.8 kV system** circuits are included in the scope of the Inaccessible Medium Voltage Cables Not Subject To 10CFR 50.49 Environmental Qualification Requirements Program. **Inclusion of the 13.8 kV system circuits in this program reflects the scope expansion of the Station Blackout System electrical commodities.**

This program will inspect manholes, conduits and sumps associated with the **2.3 kV, 4.1 kV and 13.8 kV system** circuits for water collection so that draining or other corrective actions can be taken. Inspections for water collection will be performed at least once every 2 years and the frequency of testing will be adjusted based on the results obtained. The first inspections will be completed prior to the period of extended operation.

In addition, these medium-voltage cable circuits will be tested using a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, or polarization index, as described in EPRI TR-103834-P1-2, or other testing that is state-of-the-art at the time the test is performed. Cable testing will be performed at least once every 10 years and the frequency of testing will be adjusted depending on the results obtained. The first tests will be completed prior to the period of the extend operation.

NUREG-1801 Consistency

The aging management program for Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements is a new program. The program is scheduled for implementation prior to the period of extended operation. Program activities are consistent with the ten elements of aging management program XI.E3, Inaccessible Medium-Voltage Cables Not

Subject to 10 CFR 50.49 Environmental Qualification Requirements, specified in NUREG-1801.

Exceptions

None.

Enhancements

None.

Operating Experience

Oyster Creek has experienced eleven in-service medium voltage circuit failures to date. Five resulted from water intrusion, four from manufacturing defects and two from a single lightning strike. The majority of those failures occurred in EPR-insulated "UniShield" cables manufactured by Anaconda before 1985. In 1991, Oyster Creek implemented a medium voltage cable testing program covering **its 2.3 kV and 4.1 kV** medium voltage circuits to attempt to identify cable degradation so that appropriate corrective action could be taken prior to failure. The results of that inspection program have successfully identified degradation in XLPE-insulated cables prior to failure, but has not been able to do so for EPR-insulated cable.

Testing performed under the current cable testing program has successfully identified degradation in XLPE-insulated cables (e.g., GE Vulkene) such that replacements could be made prior to in-service failures. Eleven XLPE-insulated cable circuit replacements have been made based on test results since the testing program was implemented in 1991. No in service failures of XLPE-insulated cable have occurred since the testing program was implemented in 1991

Testing performed under the current cable testing program has not been successful at identifying degradation in EPR-insulated UniShield type cables, for example Anaconda UniShield, such that replacements could be made prior to in-service failures. Five in-service failures of UniShield cable circuits exposed to moisture have occurred since the testing program was implemented in 1991. Four of the five failed cables were manufactured before UniShield manufacturing process improvements to address manufacturing defects were implemented in mid-1984. Oyster Creek has experienced no failures in UniShield cables manufactured after that date.

Following the most recent in-service cable failure in 2003, corrective actions were completed to (1) test failed cables, to confirm the failure mechanisms, (2) confirm the accuracy of configuration information for 4160V circuits, (3) evaluate all remaining UniShield cables and replace or schedule for replacement any manufactured before 1985 which might be exposed to significant moisture and (4) eliminate the future use of UniShield cables at Oyster Creek.

Oyster Creek tested 18 of its medium voltage cable circuits in 2004 in a trial use of a new, state-of-the-art testing method based on partial discharge. As a result, one XLPE insulated cable was replaced. Additional medium voltage cables will

be tested in 2005. Following evaluation, a decision will be made as to the effectiveness of this testing method and whether a commitment will be made for its long term use. The current inspection program will remain in effect until replaced the Inaccessible Medium Voltage Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program.

The Inaccessible Medium Voltage Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program is a new program. Therefore, no programmatic operating experience is available.

Conclusion

The aging management program for inaccessible medium-voltage cables not subject to 10 CFR 50.49 environmental qualification requirements provides reasonable assurance that aging effects are adequately managed so that the intended functions of these cables are maintained consistent with the current licensing basis during the period of extended operation.

B.1.37 PERIODIC MONITORING OF COMBUSTION TURBINE POWER PLANT ELECTRICAL

Program Description

The new AmerGen Periodic Monitoring of Combustion Turbine Power Plant – Electrical Program, the existing Structures Monitoring Program, and the new Inaccessible Medium Voltage Cables Not Subject to 10CFR50.49 Environmental Qualification Requirements program will be used to manage aging effects for the electrical commodities that support FRCT operation.

This AmerGen program will include elements of GALL programs XI.E1 for accessible electrical cables and connections; XI.E3 for manholes, pits and cable trenches; and XI.E4 for phase bus and connections and phase bus insulators.

This AmerGen program will inspect accessible electrical cables and connections, prior to the period of extended operation, with an inspection frequency of at least once every 10 years.

This AmerGen program will inspect manholes, pits and cable trenches, containing inaccessible medium voltage cables, located on the FRCT site, for inaccessible medium voltage cables, for water collection so that draining or other corrective actions can be taken. Inspections for water collection will be performed at least once every 2 years and the frequency of inspection will be adjusted based on the results obtained. The first inspections will be completed prior to the period of extended operation.

This AmerGen program will also inspect accessible phase bus and connections and phase bus insulators, prior to the period of extended operation, with an inspection frequency of at least once every 5 years.

Inspection of phase bus enclosures will be performed under the existing Structures Monitoring Program, B.1.31. The first inspection will be performed prior to the period of extended operations, with an inspection frequency of at least 4 years.

The following represents AMP B.1.36 scope for the 13.8 kV cables that distribute the output of the FRCT to both the Oyster Creek SBO transformer and the 230 kV switchyard. Inaccessible medium voltage cable circuits supporting the FRCT and the associated manholes, pits and trenches located on the Oyster Creek site will be tested or inspected by the new Inaccessible Medium Voltage Cables Not Subject to 10CFR50.49 Environmental Qualification Requirements program, B.1.36. The first tests and inspections will be performed prior to the period of extended operations, with a cable test frequency of at least 10 years and a manhole, pit and trench inspection frequency of at least 2 years.

These aging management activities ensure the continued availability of the FRCTs as the alternate AC source in the event of a SBO at OCGS.

Aging Management Program Elements

(1) Scope of Activity: The scope of this aging management program (AMP) includes electrical commodities that are subject to aging management. The electrical commodities necessary for the FRCTs to provide alternate AC power to OCGS during a SBO and subject to aging management are:

- Insulated Cables and Connections (XI.E1)
- Inaccessible Medium Voltage Cables (XI.E3)
- Phase Bus and Connections (XI.E4)
- Phase Bus Enclosure Assemblies (Structures Monitoring, XI.S6)
- Phase Bus Insulators (XI.E4)

This AMP provides reasonable assurance that aging effects for these commodities will be adequately managed, such that the FRCTs are available to perform their intended function for the extended period of Oyster Creek operation.

(2) Preventive Actions:

- There are no preventative actions associated with accessible electrical cables and connections.

- The inspection and drainage of manholes, pits and cable trenches under this AMP assist in preventing the premature aging of electrical cables.

- There are no preventative actions associated with phase bus and connections and phase bus insulators.

(3) Parameters Monitored/Inspected: This AMP includes the following activities:

- Accessible Electrical Cables and Connections:
  Visual inspection of accessible electrical cables and connections exposed in enclosures, pits, manholes, and pipe trench will be performed by AmerGen. These inspections will be performed for signs of accelerated age-related degradation such as embrittlement, discoloration, cracking or surface contamination. The scope of this inspection includes accessible power, control and instrumentation cables. The first inspection will be performed prior to the period of extended operation, with an inspection frequency of at least 10 years.

- Inaccessible Medium Voltage Cables
  Visual inspections of manholes, pits and pipe trench, located on the FRCT site, for inaccessible medium voltage cables, will be performed by AmerGen. These inspections will be performed for evidence of excessive water collection. Inspections for water collection will be performed at least once every 2 years and the frequency of testing will be adjusted

based on the results obtained. The first inspections will be completed prior to the period of extended operation.

- Phase Bus and Connections and Phase Bus Insulators/Supports
  Visual inspections of accessible phase bus and connections and phase bus insulators/supports will be performed by AmerGen. These inspections will be performed for signs of melting or other heat effects on the tape covering bus connections, cracking of thermoplastic or degradation of insulators/supports. The first inspection will be performed prior to the period of extended operations, with an inspection frequency of at least 5 years.

- Phase Bus Enclosure Assemblies
  Visual inspection of the phase bus enclosure assemblies will be performed by AmerGen, under the Structures Monitoring Program, B.1.31. These inspections will be performed for signs of general corrosion or loss of weather tightness. The first inspection will be performed prior to the period of extended operations, with an inspection frequency of at least 4 years.

- Inaccessible Medium Voltage Cable Circuits
  Testing of inaccessible medium voltage cable circuits supporting the FRCT and inspection of the associated manholes located on the Oyster Creek site will be performed by AmerGen, under the Inaccessible Medium Voltage Cables Not Subject to 10CFR50.49 Environmental Qualification Requirements program, B.1.36. These inspections will be performed for signs of cable insulation degradation and prevention of wetted environments. The first cable tests will be performed prior to the period of extended operations, with a test frequency of at least 10 years. The first manhole, pit and trench inspections will be performed prior to the period of extended operations, with an inspection frequency of at least 2 years.

(4) **Detection of Aging Effects:** The AmerGen inspection of electrical commodities described above will ensure that aging effects on cables and phase bus are detected prior to loss of intended function.

- Accessible Electrical Cables and Connections:
  Conductor insulation aging degradation from heat or moisture in the presence of oxygen causes cable and connection jacket surface anomalies. Accessible electrical cables and connections in at the FRCT are visually inspected for cable and connection jacket anomalies, such as embrittlement, discoloration, cracking or surface contamination. Accessible electrical cables and connections will be performed prior to the period of extended operation and inspected at least once every 10 years.

- Inaccessible Medium Voltage Cables
  The actions under this program addressing inaccessible medium voltage cables are preventative only.

- Accessible Phase Bus and Connections and Phase Bus Insulators/Supports
  Bolted connections will be checked for loose connection by performing visual inspections for aging degradation of insulating materials and for foreign debris and excessive dust build-up, and evidence of moisture intrusion. Bus insulations will be visually inspected for signs of embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation. Bus supports will be inspected for structural integrity and signs of cracks. The program will be completed prior to the period of extended operation and every 5 years thereafter.

(5) Monitoring and Trending:

- Monitoring of electrical commodities involves visual inspection activities by qualified individuals, at specified intervals, to determine the condition of the cables and connections.

- Monitoring of electrical commodities involves visual inspection activities by qualified individuals, at specified intervals, to determine if there is standing water in manholes, pits and trenches.

- Monitoring of electrical commodities involves visual inspection activities by qualified individuals at specified intervals to determine the condition of phase bus.

Results of inspections performed by both FirstEnergy, under their routine activities, and AmerGen, under this new program are reviewed by OCGS engineering as part of confirmation and monitoring the reliability of the FRCTs.

(6) Acceptance Criteria: Acceptance criteria for the electrical commodity inspections are as follows:

- Accessible Electrical Cables and Connections:
  The accessible cables and connections are to be free from unacceptable, visual indications of surface anomalies, which suggest that conductor insulation or connection degradation exists.

- Inaccessible Medium Voltage Cables
  Manholes, pits, and cable trenches are to be free from standing water.

- Accessible Phase Bus and Connections and Phase Bus Insulators/Supports
  Phase bus is to be free from unacceptable visual indications of surface anomalies, suggesting conductor insulation degradation exists.

(7) Corrective Action: If an inspection identifies a degraded condition, a Corrective Action Program Issue Report will be initiated in accordance with 10 CFR Part 50, Appendix B plant administrative procedures. The degraded condition will be evaluated and corrective actions are taken as necessary.

The 10 CFR Part 50 Appendix B corrective action program ensures that conditions adverse to quality are properly corrected. If the deficiency is found to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence.

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

(9) **Administrative Controls:** See Item 8 above.

(10) **Operating Experience:** While this is a new program, FRCT has not experienced a cable or bus related failure during its period of operation.

The 2004 inspection involved major rework and repair of the exhaust plenum after and forward walls, including complete rebuild and re-wiring of the load compartment and junction boxes, and extensive alignment activities. These major efforts ensured that the FRCT cables and connections were in optimal condition when returned to service. Lessons learned from routine inspections are incorporated into future outage scope.

Enhancements:

None.

Conclusion:

The Periodic Monitoring of Combustion Turbine Power Plant – Electrical Program will effectively manage the aging of insulated cables and connections; inaccessible medium voltage cables; and phase bus and connections and phase bus insulators; and phase bus enclosures such that there is reasonable assurance that the intended functions of the FRCTs will be maintained consistent with the current licensing basis during the period of extended operation.