Revised Response to RAI 2.5-1:

Since Dominion's original 9/27/01 response to Request For Additional Information (RAI) 2.5-1, the NRC staff has issued a position paper regarding the subject of in-scope components for the Station Blackout (SBO) rule. As a result of the staff position, Dominion herein provides a revised response to RAI 2.5-1.

Dominion has reviewed the NRC staff position on scoping of equipment relied on to meet the SBO rule, as presented in the staff's letter to NEI and UCS dated April 1, 2002. Based on recent industry discussions and the staff position paper, Dominion has re-reviewed the SBO licensing basis with emphasis on equipment related to the recovery of offsite power. The results of the re-review identified that the Surry and North Anna plant structures and components of the power path for offsite power from the switchyard are within the scope of license renewal in accordance with the SBO scoping criterion, 10 CFR 54.4(a)(3) and the Staff position. This power path includes the 34.5KV circuit breakers in the station's switchyard which supply power to the Reserve Station Service Transformers (RSSTs) and extends to the specific transfer buses at each station which are currently within the scope of license renewal for SBO compliance.

For additional structures and components determined to be within the SBO scope of license renewal and requiring an aging management review (AMR), the review was performed based upon existing Surry and North Anna AMRs of the same materials and exposed to the same environments. If the material/environment combination had not been previously reviewed and documented in the Surry and North Anna License Renewal Applications (LRA), the aging management review was performed and the results provided with this response.

Due to the differences in the power supply configurations at Surry and North Anna, the specific components required for compliance with the SBO Rule and proposed aging management activities for each station are discussed separately in the information that follows.

Surry Plant Specific Response:

The current SBO licensing basis for Surry is for a two unit station blackout. The alternate ac (AAC) diesel generator has the capacity to cope with an SBO event on both units. To do this, the AAC diesel is tied to Transfer Buses D and E. This configuration allows for a single train of safety equipment to be energized on each unit. Transfer Buses D and E are normally aligned to RSSTs A and B, respectively. Recovery from an SBO event involves either the restoration of the onsite emergency power supply (Emergency Diesel Generator system) or offsite power. Offsite power can be supplied to the station by any of three 34.5KV circuits originating in the station switchyard to three Reserve Station Service Transformers (RSSTs). However, restoration of a 34.5KV circuit through either RSST A or RSST B, which would terminate ("recover from") an SBO event, will supply sufficient power to bring both units to cold shutdown. This is consistent with Surry's current licensing basis for compliance with the SBO Rule and, therefore, meets the requirements of 10 CFR 54.4 (a)(3).

For Surry, the additional offsite power path scope required to recover from an SBO event extends from the disconnect switches through the 34.5KV circuit breakers to the RSSTs and continues to the line side of the 4160V circuit breakers which connect the RSSTs to the

Transfer Buses D and E. Transfer Buses D and E and their associated 4160V circuit breakers and controls are already within the SBO equipment scope of license renewal. Figure SPS-1 provides an excerpt from the Surry one-line integrated schematic electrical drawing and shows the boundary of the additional SBO offsite power path scope.

Dominion has determined that the control circuits to the 34.5KV breakers in the switchyard are relied upon to operate the breakers as part of the power restoration procedures. Closure of the 34.5KV circuit breakers is controlled by procedure and operated by station operations at the 230KV control house in the switchyard.

SPS Electrical Components:

Consistent with the April 1, 2002 NRC position, the additional electrical components included in the scope of license renewal as meeting the scoping criteria of 10 CFR 54.4(a)(3) for restoration of offsite power are as follows:

1. 34.5KV Circuit breakers, disconnect switches, and controls to connect the RSST circuits to the grid.
2. Insulated cables (including control cables), bare distribution conductors (All Aluminum Conductor cable), connectors, and aluminum bus bar connecting the 34.5KV circuit breakers to the RSSTs.
3. Ceramic insulators associated with the bare distribution conductors and aluminum tube bus.
4. RSSTs, aluminum tube bus, ceramic insulators, insulated cables and connectors that connect to the line side of the 4160V circuit breakers which power the Transfer Buses D and E.

Based on the guidance in NEI 95-10, the circuit breakers, disconnect switches and RSSTs do not require an aging management review because they are considered active components. The 4160V circuit breakers and their controls, and Transfer Buses D and E are currently within the SBO scope of license renewal. AMRs for the remaining electrical components not originally reviewed in the Surry LRA are presented below.

Insulated Cables and Connectors

Insulated cables and connectors that are subject to aging management review are installed throughout plant buildings and yard areas in various raceway configurations and/or direct buried; therefore, typically they are exposed to atmosphere/weather, sheltered air, raw water, and/or soil environments. Cables and connectors were evaluated as a commodity group in the Surry LRA. Cable materials and operating environments combinations added by the inclusion of the offsite power path to RSSTs A and B are covered in the Surry LRA except for the addition of energized 34.5KV cable. A general discussion of the cable commodity materials and environments is provided below. However, specific discussions of aging effects are limited to the new energized high voltage cable.

The materials of construction for cables and connectors are grouped into organic compounds and metals. The specific types of organic compounds and the metals used for the metal conductors are identified below.

Organic Insulation Compounds

– Cross-linked polyethylene (TR XLPE)

– Ethylene propylene rubber (EPR)

Metal Conductors

– Copper/copper alloys

– Aluminum/aluminum alloys

The insulated cables brought into scope through the inclusion of the SBO offsite power restoration path at Surry, includes one new cable type not previously evaluated in the non-EQ cable and connector category previously documented in the Surry LRA. This new cable type is the 34.5KV Tree Resistant (TR) XLPE used in a portion of the RSST A (installed 2002) and RSST B (installed 2001) feeds.

The aging management review for power and I&C cables and connectors has used the most severe plant cable environments considering design values for normal operation in each evaluation group. Surry LRA Table 3.0-2, External Service Environments, provides the environmental conditions for areas containing cables and conductors.

Ambient temperature ranges shown in LRA Table 3.0-2 for sheltered air environments include worst-case upper limits that are not typical of "normal" operation. "Normal" ambient temperature in a sheltered air environment is not in excess of 40°C/104°F. Higher temperatures would be expected only during periods when outside ambient air is at seasonal highs and, then, only when area ventilation is not operating. In fact, cables in sheltered air environments will operate in an ambient temperature below 40°C/104°F for a significant portion of their 60-year operating life.

The outdoor air environment includes precipitation and wind. Therefore, components and structures in this environment are subject to intermittent wetting. The outdoor air environment also includes exposure to ultraviolet radiation and ozone. This environment is bounded by a bulk average air temperature range of -12°F to 105°F. The 60-year maximum design ionizing radiation dose is negligible.

Cables leading from the 34.5KV breakers are exposed to outside ambient air conditions at the 34.5KV breaker end of the cable and at the transition to overhead distribution conductor located at the other end. In between, the cable is underground in a combination of conduit, direct buried, sand bed in a cable trench, and duct bank. The potential aging effect on this cable include UV damage to the exposed portions, thermal or irradiation embrittlement to the cable insulation, and water treeing due to wetted conditions of an energized cable. These cables are continuously energized at 34.5KV.

The cable between the 34.5KV breakers and the overhead distribution conductor is UV stabilized. Therefore, UV damage is not an aging effect that requires management.

There are no potential adverse thermal environments in the cable run. The cable as sized would operate at 65% rated capacity under the worst case loading scenario, a simultaneous 2 unit startup. Under normal operating conditions, the cable will operate at less than 50% capacity. Therefore, ohmic heating is not a concern. Also, radiation in the area of these cables is negligible. Therefore, thermal or radiation embrittlement of the cable insulation is not an aging effect that requires management.

The TR XLPE cable is installed as direct buried or in a sand trench and is subject to wetting from precipitation. The cable has a corrugated copper shield installed over the TR XLPE insulation. This cable construction is specifically designed to resist water treeing. Vendor and utility accelerated tank testing programs for this type of cable support this conclusion. Therefore, water treeing of the direct buried cable from the 34.5KV breakers is not an aging effect that requires management.

All other material/environment combinations for insulated cables and connectors have been previously addressed and summarized in the Surry LRA.

Bare Distribution Conductors

The bare distribution conductor material/environment combination is not new to the Surry LRA. However, the application of the combination as a wire cable is new and, therefore, is addressed by this response. The aging effects for bare distribution conductors requiring evaluation are loss of conductor material resulting from corrosion and aeolian (wind) vibration. Surry overhead bare distribution conductors are 477 kcmil aluminum cables and are designed and installed in accordance with the National Electrical Safety Code. The bare distribution conductors are located outdoors and are exposed to the atmospheric conditions previously stated above and provided in Surry LRA Table 3.0.2. The most prevalent mechanism contributing to loss of conductor material of an aluminum cable is aluminum strand pitting corrosion. Corrosion of an aluminum cable is a very slow acting aging effect. Degradation and corrosion rates dependent largely on air quality. Surry is located in an area that is mostly agricultural. There are no significant industries in the general vicinity that contribute to a adverse/corrosive air quality conditions at Surry. Thus, loss of material due to corrosion is not an aging effect requiring management for the period of extended operation.

Overhead conductor vibration, known as aeolian vibration, can be caused by wind loading over large unprotected spans. Wind loading that can cause the line and insulators to vibrate and is considered in the design and installation. This aging mechanism is of more concern for transmission conductors that are installed in longer and higher spans that are more susceptible to wind loading. Thus, loss of material that could be caused by conductor vibration or sway is not an aging effect requiring management for the period of extended operation.

Based on the above, loss of material regarding the Surry Units 1 and 2 aluminum overhead bare distribution conductors is not an aging effect requiring management for the period of extended operation.

Ceramic Insulators

Ceramic material is not new to the Surry LRA, but was not previously evaluated as an electrical insulator. Therefore, it is included in this response. Aging effects for insulators requiring evaluation are surface contamination and loss of material.

Various airborne materials such as dust, salt, and industrial effluents can contaminate insulator surfaces. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. The buildup of surface contamination is gradual and in most areas such contamination is washed away by rain; the glazed insulator surface aids this contamination removal. Therefore, surface contamination of the Surry Units 1 and 2 insulators is not an aging effect requiring management for the period of extended operation.

Loss of material due to mechanical wear is not a concern for the post insulators, however, it is an aging effect for strain insulators installed at the dead ends and angle structures if they are subject to significant movement. Movement of the insulators can be caused by wind blowing the supported conductor wires, causing it to swing from side to side. If this swinging is frequent enough, it could cause wear in the metal contact points of the insulator string and between an insulator and the supporting hardware. As previously discussed for overhead conductors, wind loading that could cause insulator wear is not a concern for this type of distribution construction. Therefore, loss of material due to wear of the Surry Units 1 and 2 insulators is not an aging effect requiring management for the period of extended operation.

Aluminum Tube Bus, Aluminum Bus Bars, and Connectors

The material of construction for the bus components that are subject to aging management review is aluminum only. Both tube bus and bar bus arrangements are included in the power path for offsite power to the transfer buses and both arrangements are in the outdoor environment. Aluminum in an outdoor environment is not a new combination to the Surry LRA. However, it was not previously evaluated as an electrical conductor. Therefore, it is included in this response. Based on Dominions evaluation, no aging effects have been identified for aluminum for the ambient outdoor environmental conditions occurring at Surry. Surry is located in an area that is mostly agricultural. There are no significant industries in the general vicinity that contribute to a adverse/corrosive air quality conditions at Surry. Therefore, there are no aging effects for aluminum bus components requiring management for the period of extended operation.

No unique aging effects were identified as a result of this review beyond those identified above.

The AMR results for electrical components required for restoration of offsite power are provided in Table SPS –1.

Conclusion for SPS Electrical Components:

Based upon the above evaluation of materials and environments between Surry Units 1 and 2, a review of industry information, NRC generic communications, and Surry operating experience, there are no aging effects requiring management for the electrical components discussed above. Therefore, no aging management for electrical components in the offsite power path for restoration of power following an SBO event is necessary.

SPS Structural Components:

Consistent with the April 1, 2002 NRC position, the additional structural components included in the scope of license renewal as meeting the scoping criteria of 10 CFR 54.4(a)(3) for restoration of offsite power are as follows:

1. Foundation and supports for the 34.5KV circuit breakers, disconnect switches, aluminum buses, and controls in the switchyard.
2. Portions of the 230KV switchyard control house.
3. Underground cable and overhead bare distribution conductor supports (wood poles).
4. RSST A and B foundations, bay structures, aluminum tube bus supports up to the turbine building.
5. Conduits, cable trays, and supports to the line side of the 4160V circuit breakers for Transfer Buses D and E.

An AMR evaluation of these components has been performed based on the AMRs of Surry structural components of the same materials exposed to the same environments previously reviewed and documented in the Surry LRA. There are no new aging effects beyond those previously evaluated in the Surry LRA and as modified by associated RAIs. There is one new structural material for which an AMR was performed.

Distribution Conductor Supports

The materials of construction for the power poles used to bring the overhead conductors from the switchyard to RSST A and RSST B is wood (salt-treated [CCA] southern pine). This is a new material that was not previously reviewed for aging effects in the LRA. The specification for the selection of poles is based on the current revision of ANSI Standard 05.1. The specification for handling, preservative treatment, quality control, and storage of CCA treated wood poles is based on the current American Wood Preservers' Association Standards.

The aging effects associated with these wood poles is loss of material and change in material properties. The wood poles are inspected for loss of material due to decay or rot, insect infestation, woodpecker damage, and for change in material properties due to moisture damage.

No study has yielded a widely accepted average service life for poles of any given species and treatment. CCA treated southern pine is longer-lived than others because, unlike creosote or pentachlorophenol, the preservative is chemically bonded or "fixed" to the wood fibers and does not leach out. The estimated life of a southern pine pole properly treated with CCA varies from 45 to 65 years. The wood poles at Surry were produced in

1981 and 1983 time frame.

A visual and sounding inspection is performed on the poles on an annual basis in order to detect the aging degradation of these poles. During the inspection of the poles, the crossarms and associate hardware are also visually inspected. The Civil Engineering Structural Inspection program will be revised to incorporate the on-going annual inspections of these poles. This revision will be completed prior to the year 40 of operation at Surry.

A listing of the structural components and the summary results of the AMRs, including those discussed above, is presented in Table SPS-2.

Conclusion for SPS Structural Components:

Due to the increased scope of the SBO operation, a new structural material (wood) has been added to the LRA. The Civil Engineering Structural Inspection activities will manage the aging effects of this new structural material. The Civil Engineering Structural Inspection activities, General Condition Monitoring, and Battery Rack Inspection activities will manage the aging effects for the remaining structural materials added by the increased SBO scope. As indicated previously, these remaining structural materials and aging effects are not new to the LRA.

A description of these existing aging management activities is provided in Appendix B of the Surry LRA, along with the demonstration that the identified aging effects will be managed for the period of extended operation. Supplemental information on these programs has been provided via RAI response letters dated November 30, 2001 (SN: 01-647) and February 5, 2002 (SN: 01-732). Based on this supplemental information, the incorporation of the wooden pole inspections into the Civil Engineering Structural Inspection Program and the demonstrations provided in Appendix B of the LRA, the effects of aging associated with the yard structures, miscellaneous structural commodities, and general structural supports will be adequately managed. Therefore, there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

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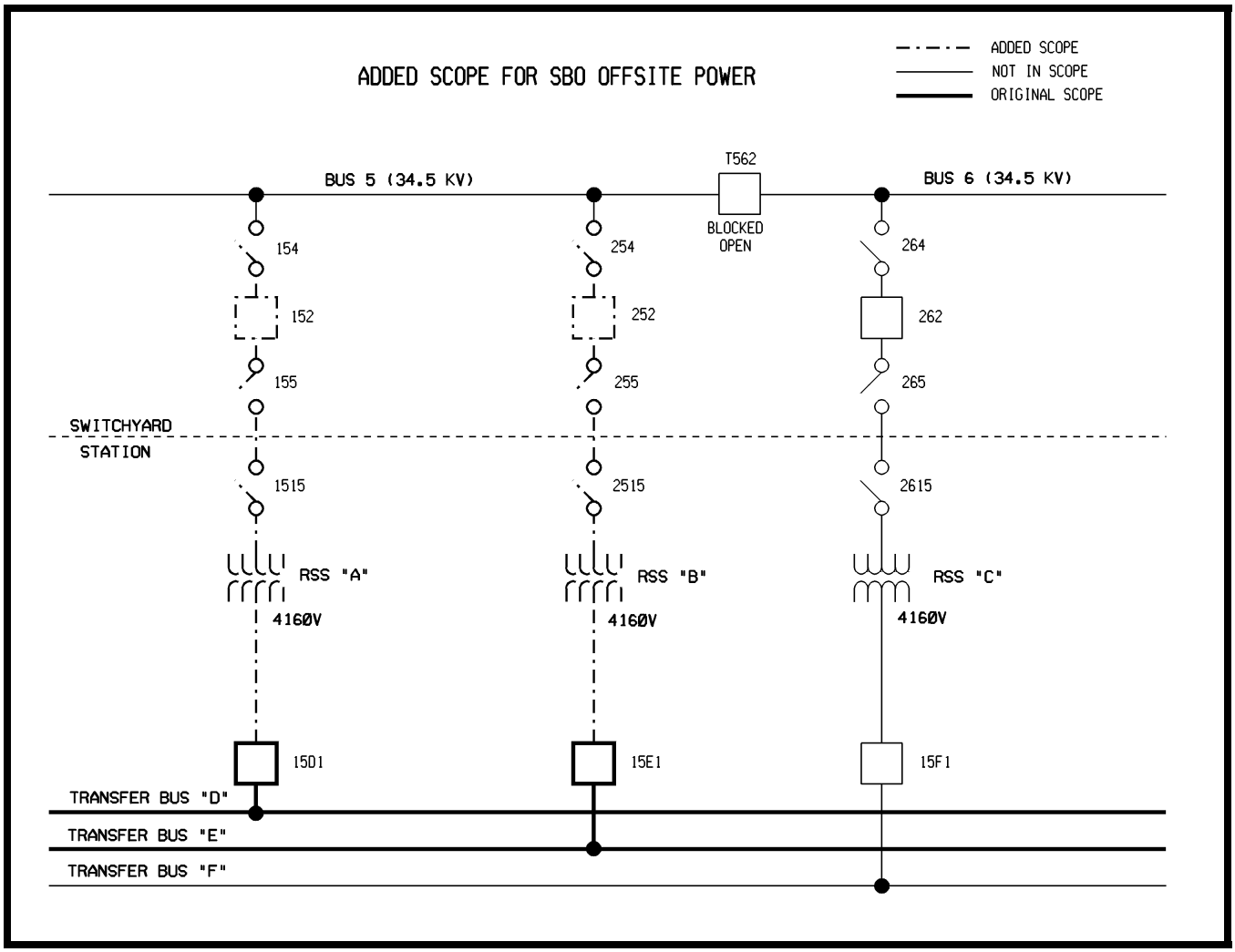

Figure SPS-1: Surry Power Station

TABLE SPS–1

Electrical Components

Surry Power Station

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Insulated Cables and Connectors	Conducts Electricity	Metallic Conductors	Atmosphere/ Weather	None	None Required
		Organic Compounds	Atmosphere/ Weather	None	None Required
			Raw Water	None*	None Required
			Soil	None	None Required
Bare Distribution Conductor	Conducts Electricity	Aluminum	Atmosphere/ Weather	None	None Required
Ceramic Insulators	To electrically isolate and provide struct. support to dist. conductors	Porcelain	Atmosphere/ Weather	None	None Required
Aluminum Tube Bus, Aluminum Bus bar	Conducts Electricity	Aluminum	Atmosphere/ Weather	None	None Required

*Note: TR XLPE cable is qualified for water treeing.

Table SPS-2
Structural Components
(Includes Switchyard, Outside Switchyard to RSST Bays, RSST Area, RSST to 4160V Transfer Bus Breakers)

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Switchyard Bus and Disconnect Switch Support Poles and Crossarms (Note: Crossarms in Atmosphere/Weather Only)	Structural Support	Concrete	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
Switchyard Cable Support Transition Beam and Brackets for Underground Cables	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections
Foundations: Switchyard Breakers Mat Slab, RSST Spread Footings, RSST Tube Bus Support Caissons, B-Line Wall Structure Steel Frame Caissons	Structural Support	Concrete	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
34.5KV Circuit Breaker Supports	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections

Table SPS-2 (Continued)

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Trenches and Duct Banks (Note: Duct Bank is for Soil only)	Structural Support	Concrete	Air	Change in Material Properties	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
			Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
Control House Slab on Grade and Wall Footings (Note: Footing in Soil only)	Structural Support	Concrete	Air	Change in Material Properties	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
Control House Masonry Block Walls	Structural Support	Concrete	Air	Cracking	Civil Eng. Structural Inspections
			Atmosphere/ Weather	Cracking	Civil Eng. Structural Inspections
Control House Structural Steel (bracing, roof framing and decking)	Structural Support	Carbon Steel	Air	Loss of Material	Civil Eng. Structural Inspections
Control Panels and Cabinets	Structural Support	Carbon Steel	Air	Loss of Material	General Condition Monitoring
Battery Racks	Structural Support	Carbon Steel	Air	Loss of Material	Battery Rack Inspections

Table SPS-2 (Continued)

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Conduit	Structural Support	PVC	Soil	None	None Required
Manhole and Cable Pull Boxes Structural Reinforced Concrete (Walls, Floor, and Ceiling)	Structural Support	Concrete	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
			Air	Change in Material Properties	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
Manhole Access Covers	Structural Support	Cast Iron	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspection
			Air	Loss of Material	Civil Eng. Structural Inspection
Power Poles and Crossarms (Note: Crossarms are Atmosphere/Weather Only)	Structural Support	Wood (CCA Salt Treated)	Atmosphere/ Weather	Change in Material Property	Civil Eng. Structural Inspection
				Loss of Material	Civil Eng. Structural Inspection
			Soil	Change in Material Property	Civil Eng. Structural Inspection
				Loss of Material	Civil Eng. Structural Inspection
Miscellaneous Steel (Guy Wires, Bracing, Bolts)	Structural Support	Galvanized Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspection
RSST Wall Foundations (Spread Footings)	Structural Support	Concrete	Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*

Table SPS-2 (Continued)

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
RSST Walls	Structural Support Fire Barrier	Concrete	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
Grout	Structural Support	Concrete	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
RSST Tube Bus Support Poles and Crossarms	Structural Support	Galvanized Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections
RSST Bay Overhead Structural Steel	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections
B-Line Wall Structural Steel Frame @ Turbine Bldg.	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections
Electrical Conduit and Cable Trays	Structural Support	Aluminum	Air	None	None Required
		Galvanized Steel	Air	None	None Required
			Atmosphere/ Weather	Loss of Material	General Condition Monitoring
Cable Tray Supports	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	General Condition Monitoring

* Aging Management is accomplished by the requirements to monitor groundwater on an annual basis in accordance with the response to RAI 3.5-2 in Letter No. 01-647 dated 11/30/2001.

North Anna Plant Specific Response:

The current SBO licensing basis for North Anna is for a single unit station blackout. The alternate ac (AAC) diesel generator has the capacity to cope with an SBO event on either unit. To do this, the AAC diesel is tied to Transfer Buses D, E, and F. This configuration allows the alignment flexibility for a single train of safety equipment to be energized on either unit. Recovery from an SBO event involves either the restoration of the onsite emergency power supply (Emergency Diesel Generator system) or offsite power. Offsite power can be supplied to the station by any of the three 34.5KV circuits originating in the station switchyard to three Reserve Station Service Transformers (RSSTs). However, restoration of a 34.5KV circuit through any of the RSSTs, which would terminate ("recover from") an SBO event, would supply sufficient power to bring either the single SBO unit or both units to cold shutdown. This is consistent with North Anna's current licensing basis for compliance with the SBO Rule and, therefore, meets the requirements of 10 CFR 54.4 (a)(3) and the Staff position.

For North Anna, the additional offsite power path scope required to recover from an SBO event extends from the disconnect switches through the 34.5KV circuit breakers to the RSSTs and continues to the line side of the 4160V circuit breakers which connect the RSSTs to the Transfer Buses D, E, and F. The aluminum tube buses and cabling which connects the RSSTs to the normal station service buses A, B, C, and G are not required for restoration of offsite power following an SBO event. However, this portion of the North Anna electrical distribution system can not be isolated from the required power path and, therefore, is included in the additional SBO scope for license renewal. Transfer Buses D, E, and F and their associated 4160V circuit breakers and controls are already within the SBO equipment scope of license renewal. Figure NAPS-1 provides an excerpt from the North Anna one-line integrated schematic electrical drawing and shows the boundary of the additional SBO offsite power path scope.

Dominion has determined that the control circuits to the 34.5KV breakers in the switchyard are relied upon to operate the breakers as part of the power restoration procedures. Closure of the 34.5KV circuit breakers is controlled by procedure and operated by station operations at the 500KV control house in the switchyard.

NAPS Electrical Components:

Consistent with the April 1, 2002 NRC position, the additional electrical components included in the scope of license renewal as meeting the scoping criteria of 10 CFR 54.4(a)(3) for restoration of offsite power are as follows:

1. 34.5KV Circuit breakers, disconnect switches, ceramic insulators, and controls to connect the RSST circuits to the grid.
2. Insulated cables, connectors, and aluminum bus bars connecting the 34.5KV circuit breakers to the RSSTs.
3. RSSTs, insulated cables and connectors to connect to the line side of the 4160V circuit breakers which power the Transfer Buses D, E, and F.
4. Aluminum tube bus, insulated cables and connectors to connect to the 4160V circuit breakers which power the normal station service buses A, B, C, and G of each unit.

Based on the guidance in NEI 95-10, the circuit breakers, disconnect switches and RSSTs do not require an aging management review because they are considered active components. The 4160V circuit breakers to Transfer Buses D, E, and F and their controls, are currently within the SBO scope of license renewal. An AMR evaluation of the remaining electrical components is presented below.

Ceramic Insulators

Ceramic material is not new to the North Anna LRA, but was not previously evaluated as an electrical insulator. Therefore, it is included in this response. Aging effects for insulators requiring evaluation are surface contamination and loss of material.

Various airborne materials such as dust and industrial effluents can contaminate insulator surfaces. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. The buildup of surface contamination is gradual and in most areas such contamination is washed away by rain; the glazed insulator surface aids this contamination removal. Therefore, surface contamination of the North Anna Units 1 and 2 insulators is not an aging effect requiring management for the period of extended operation.

Loss of material due to mechanical wear is an aging effect for strain and suspension insulators if they are subject to significant movement. The North Anna uses only post type insulators in the power path from the switchyard to the RSSTs. Therefore, loss of material due to wear of the North Anna Units 1 and 2 insulators is not an aging effect requiring management for the period of extended operation.

Insulated Cables and Connectors

Insulated cables and connectors that are subject to aging management review are installed throughout plant buildings and yard areas in various raceway configurations and/or direct buried; therefore, typically they are exposed to atmosphere/weather, sheltered air, raw water, and/or soil environments. Insulated cables and connectors were evaluated as a commodity group in the North Anna LRA. Cable materials and operating environments combinations added by the inclusion of the offsite power path to the RSSTs, transfer buses, and normal station service buses are covered by the North Anna LRA AMR except for the addition of energized 34.5KV cable. A general discussion of the cable commodity materials and environments is provided below. However, specific discussions of aging effects are limited to the new energized high voltage cable.

The materials of construction for cables and connectors are grouped into organic compounds and metals. The specific types of organic compounds and the metals used for the metal conductors are identified below.

Organic Insulation Compounds

- Cross-linked polyethylene (HS XLP)
- Ethylene propylene rubber (EPR)

Metal Conductors

– Copper/copper alloys

– Aluminum/aluminum alloys

The insulated cables brought into scope through the inclusion of the SBO offsite power restoration path at North Anna, involve no new cable insulation types from those previously evaluated in the non-EQ cable and connector category previously documented in the North Anna LRA.

The aging management review for power and I&C cables and connectors has used the most severe plant cable environments considering design values for normal operation in each evaluation group. North Anna LRA Table 3.0-2, External Service Environments, provides the environmental conditions for areas containing cables and conductors.

Ambient temperature ranges shown in LRA Table 3.0-2 for sheltered air environments include worst-case upper limits that are not typical of "normal" operation. "Normal" ambient temperature in a sheltered air environment is not in excess of 40°C/104°F. Higher temperatures would be expected only during periods when outside ambient air is at seasonal highs and, then, only when area ventilation is not operating. In fact, cables in sheltered air environments will operate in an ambient temperature below 40°C/104°F for a significant portion of their 60-year operating life.

The outdoor air environment includes precipitation and wind. Therefore, components and structures in this environment are subject to intermittent wetting. The outdoor air environment also includes exposure to ultraviolet radiation and ozone. This environment is bounded by a bulk average air temperature range of -12°F to 105°F. The 60-year maximum design ionizing radiation dose is negligible.

Cables feeding from the 34.5KV breakers are exposed to outside ambient air conditions at the 34.5KV breaker end of the cable and at the connections to the line-side of the RSSTs located at the other end. In between, the cable is underground in a combination of conduit, direct buried, and duct bank. The potential aging effect on this cable include UV damage to the exposed portions, thermal or irradiation embrittlement to the cable insulation, and water treeing due to wetted conditions of an energized cable. These cables are continuously energized to 34.5KV.

The cable between the 34.5KV breakers and the overhead distribution conductor is UV stabilized. Therefore, UV damage is not an aging effect that requires management.

There are no potential adverse thermal environments in the cable run. The cable as sized would operate at 61% rated capacity at maximum RSST loading. Under normal operating conditions, the cable will operate at less than 50% capacity. Therefore, ohmic heating is not a concern. Also, radiation in the area of these cables is negligible. Therefore, thermal or radiation embrittlement of the cable insulation is not an aging effect that requires management.

The HS XLP cable is installed as direct buried and in a duct bank and is subject to wetting from precipitation. This is the only adverse localized condition identified for cable included in the additional SBO scope for offsite power restoration. The insulation of this cable is HS XLP and industry experience has demonstrated that this type of insulation is not

effective in precluding the aging effect of water treeing. Therefore, water treeing is an aging effect that requires management.

All other material/environment combinations for insulated cables and connectors have been addressed and summarized in the North Anna LRA.

Aluminum Tube Bus, Aluminum Bus Bars, and Connections

The material of construction for the bus components that are subject to aging management review is aluminum only. Both tube bus and bar bus arrangements are included in the power path for offsite power to the transfer buses and both arrangements are in the outdoor environment. Aluminum in an outdoor environment is not a new combination to the North Anna LRA. However, it was not previously evaluated as an electrical conductor. Therefore, it is included in this response. Based on Dominions evaluation, no aging effects have been identified for aluminum for the ambient outdoor environmental conditions occurring at North Anna. North Anna is located in an area that is mostly agricultural. There are no significant industries in the general vicinity that contribute to a adverse/corrosive air quality conditions at North Anna. Therefore, there are no aging effects for aluminum bus components requiring management for the period of extended operation.

The AMR results for electrical components required for restoration of offsite power are provided in Table NAPS-1.

Conclusion for NAPS Electrical Components:

Based upon the above evaluation of materials and environments between North Anna Units 1 and 2, a review of industry information, NRC generic communications, and North Anna operating experience, there are no aging effects requiring management for bus bar, connections, and insulators for the extended period of operation. There is aging management required for the direct buried 34.5KV energized cables.

The following program and activities manage the aging effects associated with insulated cables and connectors:

- Non-EQ Cable Monitoring Program

A description of this aging management activity was provided in response to RAI 3.5.2-1 by letter dated 11/30/2001. The current program credits the North Anna manhole monitoring activities in the prevention of water treeing. However, the program as currently presented does not address direct buried cable nor does it address insulated cable determined to be in the wetted and energized condition except to provide engineering evaluation if these conditions are discovered by inspection. Therefore, as a follow-up action, the Non-EQ Cable Monitoring Program will be revised to provide monitoring via inspection or testing methods to monitor direct buried or wetted power cables for the aging effect associated with the aging mechanism of water treeing. This revision will be completed prior to year 40 of operation and will be consistent with the industry position on cable monitoring at the time of the revision.

Therefore, based on implementation of the revised Non-EQ Cable Monitoring Program, the effects of aging associated with insulated cables and connectors will be adequately managed so that there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

NAPS Structural Components:

Consistent with the April 1, 2002 NRC position, the additional structural components included in the scope of license renewal as meeting the scoping criteria of 10 CFR 54.4(a)(3) for restoration of offsite power are as follows:

1. Foundations and supports for the 34.5KV circuit breakers, disconnect switches, and controls in the switchyard.
2. Portions of the 500KV switchyard control house
3. Underground cable supports.
4. RSST foundations, bay structures, bus supports.
5. Conduits, cable trays, and supports to the 4160V circuit breakers for Transfer Buses D, E, and F.
6. Tube bus and cabling supports to the 4160V circuit breakers for the normal Station Service Buses A, B, C, and G.

An AMR evaluation of these components has been performed based on the AMRs of North Anna structural components of the same materials exposed to the same environments previously reviewed and documented in the North Anna LRA. There are no new aging effects or material/environment combinations associated with the structural components added to the SBO scope for license renewal due to the addition of the offsite power path. On this basis, a listing of the additional structural components and the results of the AMRs are presented in Table NAPS-2.

Conclusion for North Anna Structural Components:

The Civil Engineering Structural Inspection, General Condition Monitoring, and Battery Rack Inspection activities manage the aging effects for the structural members added by the additional SBO scope. A description of these existing aging management activities is provided in Appendix B of the North Anna LRA, along with the demonstration that the identified aging effects will be managed for the period of extended operation. Supplemental information on these programs has been provided via RAI response letters dated 11/30/01 (SN: 01-647) and 2/5/02 (SN: 01-732). Therefore, based on the demonstrations provided in Appendix B of the LRA, the effects of aging associated with the yard, miscellaneous structural commodities, and general structural supports will be adequately managed so that there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

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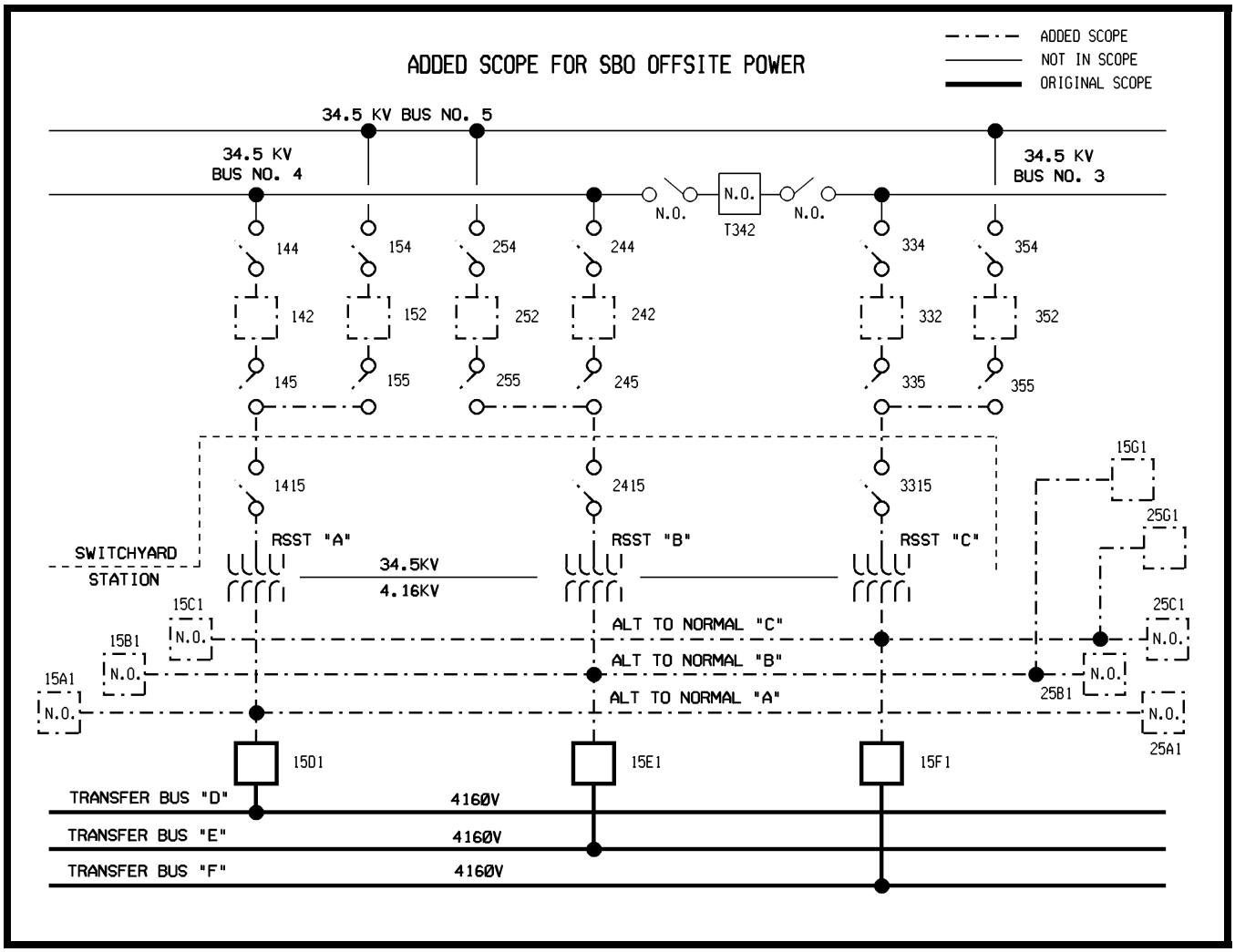

Figure NAPS-1: North Anna Power Station

TABLE NAPS-1

Electrical Components

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Ceramic Insulators	To electrically isolate and provide struct. support to dist. conductors	Porcelain	Atmosphere/ Weather	None	None Required
Insulated Cables and Connectors	Conducts Electricity	Metallic Conductors	Atmosphere/ Weather	None	None Required
		Organic Compounds	Atmosphere/ Weather	None	None Required
			Raw Water	None	None Required
			Soil	Water Treeing	Non-EQ Cable Monitoring Program
AluminumTube Bus, Aluminum Bus bar	Conducts Electricity	Aluminum	Atmosphere/ Weather	None	None Required

Table NAPS-2

Structural Components

(Includes Switchyard, Outside Switchyard to RSST Bays, RSST Area, RSST to 4160V Transfer and Normal Station Service Bus Breakers)

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Switchyard Bus and Disconnect Switch Support Poles and Crossarms (Note: Crossarms in Atmosphere/Weather Only)	Structural Support	Concrete	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
		Galvanized Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections
Switchyard Cable Support Transition Brackets for Underground Cables	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections
Caulking and Sealants	Structural Support	Elastomers	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
Foundations: Switchyard Bus and Disconnect Switch Galv. Steel Pole Caissons, Switchyard Breaker Mat Slab, RSST Mat Slab, RSST Underground Feeder Pier	Structural Support	Concrete	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
34.5KV Circuit Breaker Supports	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections

Table NAPS-2 (Continued)

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Control House Slab on Grade	Structural Support	Concrete	Air	Change in Material Properties	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
Control House Structural Steel (beams, columns, bracing, roof framing and decking)	Structural Support	Carbon Steel	Air	Loss of Material	Civil Eng. Structural Inspections
Panels and Cabinets	Structural Support	Carbon Steel	Air	Loss of Material	General Condition Monitoring
Battery Racks	Structural Support	Carbon Steel	Air	Loss of Material	Battery Rack Inspections
Trenches and Duct Banks (Note: Air only environment does not apply to Duct Banks.)	Structural Support	Concrete	Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
			Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
			Air	Change in Material Properties	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections

Table NAPS-2 (Continued)

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Conduit	Structural Support	PVC	Soil	None	None Required
Manholes and Cable Pull Boxes Structural Reinforced Concrete (Walls, Floor, and Ceiling),	Structural Support	Concrete	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
			Air	Change in Material Properties	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
Manhole Access Covers	Structural Support	Cast Iron	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspection
			Air	Loss of Material	Civil Eng. Structural Inspection
Cable Supports in Manholes	Structural Support	Carbon Steel	Air	Loss of Material	General Condition Monitoring
RSST Wall Foundations (Spread Footings)	Structural Support	Concrete	Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
RSST Walls	Structural Support Fire Barrier	Concrete	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections

Table NAPS-2 (Continued)

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Underground Cable Transition Supports and Misc. Steel at RSST Bays	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections
RSST Bus Support Poles	Structural Support	Concrete	Atmosphere/ Weather	Change in Material Properties	Civil Eng. Structural Inspections
				Loss of Material	Civil Eng. Structural Inspections
				Cracking	Civil Eng. Structural Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspections*
				Loss of Material	Civil Eng. Structural Inspections*
				Cracking	Civil Eng. Structural Inspections*
RSST Bus Support Crossarms	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections
RSST Bay Overhead Structural Steel	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections
Cable Tray Supports	Structural Support	Carbon Steel	Air, Atmosphere/ Weather	Loss of Material	General Condition Monitoring
Electrical Conduits and Cable Trays	Structural Support	Aluminum	Air	None	None Required
		Galvanized Steel	Air	None	None Required
			Atmosphere/ Weather	Loss of Material	General Condition Monitoring

* Aging Management is accomplished by the requirements to monitor groundwater on an annual basis in accordance with the response to RAI 3.5-2 in Letter No. 01-647.