VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

July 11, 2002

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Serial No.: 02-297
LR/DWL R0
Docket Nos.: 50-280/281
50-338/339
License Nos.: DPR-32/37
NPF-4/7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)
SURRY AND NORTH ANNA POWER STATIONS UNITS 1 AND 2
LICENSE RENEWAL APPLICATIONS
SUPPLEMENTAL INFORMATION ON STATION BLACKOUT AND NON-EQ CABLE MONITORING PROGRAM

Based on conversations with the NRC, combined industry and staff meetings, and the issuance of an NRC position paper on the subject of Station Blackout (SBO), Dominion provides the enclosed supplemental information related to previously provided responses for Requests for Additional Information (RAIs) concerning the Surry and North Anna license renewal applications (LRAs). Attachment 1 to this letter contains a revised response to RAI 2.5-1 regarding additional scope for SBO related equipment.

The additional scope for SBO equipment specifically includes Non-EQ cables which require aging management. As a result, the Non-EQ Cable Monitoring program identified in the response to RAI 3.6.2-1 (Letter No. 01-647 dated November 30, 2001) will be revised. Therefore, Attachment 2 to this letter provides a supplemental response to RAI 3.6.2-1.

Should you have any questions regarding this submittal, please contact Mr. J. E. Wroniewicz at (804) 273-2186.

Very truly yours,

David A. Christian
Senior Vice President – Nuclear Operations and Chief Nuclear Officer

Attachments (2)

Commitments made in this letter: None.

A001

cc:

U. S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Suite 23T85
Atlanta, GA 30303-8931

Mr. M. J. Morgan
NRC Senior Resident Inspector
North Anna Power Station

Mr. R. A. Musser
NRC Senior Resident Inspector
Surry Power Station

Mr. J. E. Reasor, Jr.
Old Dominion Electric Cooperative
Innsbrook Corporate Center
4201 Dominion Blvd.
Suite 300
Glen Allen, VA 23060

Ms. Ellie Irons, EIR Program Manager
Virginia Dept. of Environmental Quality
629 East Main St., 6th Fl
Richmond, VA 23219

Mr. David Paylor, Program Coordinator
Virginia Dept. of Environmental Quality
P.O. Box 10009
Richmond, VA 23240-0009

Mr. Joe Hassell, Environmental Manager
Virginia Dept. of Environmental Quality
Water Division
P.O. Box 10009
Richmond, VA 23240-0009

Mr. Frank Daniel, Regional Director
Virginia Dept. of Environmental Quality
Tidewater Regional Office
5636 Southern Blvd.
Virginia Beach, VA 23462

Mr. Gregory Clayton, Regional Director
Virginia Dept. of Environmental Quality
Northern Virginia Regional Office
13901 Crown Ct.
Woodbridge, VA 22193

Mr. Frank Fulgham, Program Manager
Virginia Dept. of Agriculture & Consumer Services
Office of Plant & Pest Services
1100 Bank St.
Richmond, VA 23219

Mr. David Brickley, Agency Director
Virginia Dept. of Conservation & Recreation
203 Governor St.
Richmond, VA 23219

Mr. William Woodfin, Director
Virginia Dept. of Game & Inland Fisheries
4010 West Broad St.
Richmond, VA 23230

Mr. Robert Hicks, Director
Virginia Dept. of Health
Office of Environmental Health Services
1500 East Main St., Room 115
Richmond, VA 23219

Ms. Kathleen S. Kilpatrick, Director
Virginia Dept. of Historic Resources
State Historic Preservation Office
2801 Kensington Ave.
Richmond, VA 23221

Dr. Ethel Eaton, Archeologist Senior
Virginia Dept. of Historic Resources
State Historic Preservation Office
2801 Kensington Ave.
Richmond, VA 23221

Mr. Robert W. Grabb, Assistant Commissioner
Virginia Marine Resources Commission
2600 Washington Ave.
Newport News, VA 23607

Dr. John Olney, Associate Professor
Virginia Institute of Marine Science
School of Marine Science
Gloucester Point, VA 23062

Mr. John Simkins
Virginia Dept. of Transportation
Environmental Division
1401 East Broad St.
Richmond, VA 23219

Mr. Robert Burnley
Virginia Economic Development Partnership
901 East Byrd St.
Richmond, VA 23219

Mr. William F. Stephens, Director
Virginia State Corporation Commission
Division of Energy Regulation
1300 East Main St., 4th Fl., Tyler Bldg.
Richmond, VA 23219

Mr. Michael Cline, State Coordinator
Commonwealth of Virginia
Department of Emergency Management
10501 Trade Rd.
Richmond, VA 23236-3713

Mr. Terry Lewis, County Administrator
P.O. Box 65
Surry, VA 23883

Mr. Lee Lintecum
Louisa County Administrator
P.O. Box 160
Louisa, VA 23093

Mr. Douglas C. Walker
Acting Spotsylvania County Administrator
P.O. Box 99
Spotsylvania, VA 22553

Ms. Brenda G. Bailey, County Administrator
P.O. Box 11
Orange, VA 22960

Chairman Reeva Tilley
Virginia Council on Indians
P.O. Box 1475
Richmond, VA 23218

Mr. Don Lillywhite, Director
Economics Information Services
Virginia Employment Commission
State Data Center
703 East Main St., Room 213
Richmond, VA 23219

Mr. Alan Zoellner
Government Information Department
Swem Library
College of William and Mary
Landrum Dr.
P.O. Box 8794
Williamsburg, VA 23187-8794

Mr. Walter Newsome
Government Information Resources
Alderman Library
University of Virginia
160 McCormick Rd.
P.O. Box 400154
Charlottesville, VA 22904-4154

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by David A. Christian who is Senior Vice President and Chief Nuclear Officer of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 11th day of July, 2002.

My Commission Expires: 3-31-04.

Maggie McClure
Notary Public

(SEAL)

Attachment 1

License Renewal – Revised Response to RAI 2.5-1
Serial No. 02-297

Surry and North Anna Power Stations, Units 1 and 2
License Renewal Applications

Virginia Electric and Power Company
(Dominion)

RAI 2.5-1:

"The screening results in both license renewal application (LRA) for Section 2.5 do not include any electrical components listed in NEI 95-10 (Appendix B) and the Standard Review Plan (Table 2.1-5) associated with the offsite power system. These are components such as switchyard bus, transmission conductors, switchyard insulators and transmission line insulators. 10 CFR 54.4(a)(3) requires that all systems, structures, and components (SSCs) relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for station blackout (10 CFR 50.63) be included within the scope of Part 54. In 10 CFR 50.63 it's required that each light-water-cooled nuclear power plant licensed to operate be able to withstand and recover from a station blackout of a specified duration that is based upon factors that include the expected frequency of loss of offsite power and the probable time needed to recover offsite power. At North Anna and Surry the specified duration was determined based upon evaluations that followed the guidance in NRC Regulatory Guide 1.155 and NUMARC 87-00, and included the plants' offsite power characteristics. These characteristics helped determine the probable time needed to recover offsite power (coping duration). The resulting four hour coping duration at North Anna and Surry is, therefore, based on the likelihood of recovering offsite power within four hours following its loss. Therefore, identify where in the LRA these Station Blackout SSCs are included within the scope of license renewal, or provide a technical justification for excluding the Station Blackout SSCs from the screening results."

Revised Response to RAI 2.5-1:

Subsequent to Dominion's original response on September 27, 2001 (Letter No. 01-524) 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 formal staff position, Dominion provides a revised response to RAI 2.5-1.

The NRC staff position on scoping of equipment relied on to meet the SBO rule is documented in a letter to the Nuclear Energy Institute (NEI) dated April 1, 2002. Based on recent industry discussions and the staff position paper, Dominion has reviewed the SBO licensing basis with emphasis on equipment related to the recovery of offsite power. The results of this review identified that the Surry and North Anna plant structures and components in 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 NRC 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 included in the scope of license renewal for SBO compliance.

Specific additional structures and components determined to be within the SBO scope of license renewal and requiring an aging management review (AMR) are identified in the following discussion and tables. If the material/environment combination for these components had not been previously reviewed and documented in the Surry and North Anna License Renewal Applications (LRA), an 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.

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 RSSTs A, B, or C. Restoration of a 34.5KV circuit through any of the RSSTs, which would by definition terminate ("recover from") an SBO event, would supply sufficient power to bring both units to cold shutdown. RSSTs A and B are normally fed from the 34.5KV Bus #5 in the switchyard. RSST C is normally fed from the 34.5KV Bus #6 in the switchyard. Therefore, the circuits from RSST C and either RSST A or B are considered independent power supplies. This is consistent with Surry's current licensing basis for compliance with the SBO Rule and meets the requirements of 10 CFR 54.4 (a)(3) and the NRC staff position.

For Surry, the additional offsite power path scope required to recover from an SBO event extends from the switchyard disconnect switches through the 34.5KV circuit breakers to the RSSTs and continues to Transfer Buses D, E, and F. 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.

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 and 500KV control houses in the switchyard.

SPS Electrical Components:

Consistent with the NRC's April 1, 2002 position, the electrical components which meet the scoping criteria of 10 CFR 54.4(a)(3) for restoration of offsite power and should be included in the scope of license renewal are as follows:

1. 34.5KV circuit breakers with associated control components (including cables) and disconnect switches to connect the RSST circuits to the grid.

2. 34.5KV power conductors (insulated cable, bare overhead cable, tubular bus, and connectors) from the switchyard to the RSSTs.

3. Power cables and connectors for sump pumps located in manholes associated with underground 34.5KV cable.

4. Ceramic insulators used with disconnect switches, overhead bare cable, and tubular bus for 34.5KV and 4160V circuits.

5. RSSTs, 4160V power conductors (tubular bus, insulated cable and connectors) that supply Transfer Buses D, E, and F, the 4160V breakers connecting to the transfer buses, and Transfer buses D, E, and F.

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 RSST A and RSST B 4160V circuit breakers and their controls are currently within the SBO scope of license renewal. Additionally, Transfer Buses D and E are also currently within the 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 are direct buried. Typically, these cables 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 Surry LRA. Cable insulation type and operating environment combinations added by the inclusion of the offsite power path to the RSSTs and transfer buses are covered in the Surry LRA, except for the addition of a new power cable insulation material, bare overhead line conductors, and operation at a high-voltage level of 34.5KV. A general discussion of the cable commodity materials and environments is provided below. However, specific discussions of aging effects are limited to the category of energized high voltage cable.

Materials:

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 (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, include 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 Retardant (TR) XLPE and it is used in a portion of the RSST A (installed 2002) and RSST B (installed 2001) feeds. The 34.5KV EPR cable used in the RSST C feeds (installed 1985) is not a new type of cable, but like the TR XLPE cable, it has not been evaluated as energized high-voltage cable.

Environments:

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. As a result of precipitation drainage, entrapment, or groundwater intrusion, direct buried or underground cable raceways may be subject to substantial wetting if environmental conditions in the

area of cables are not adequately maintained. 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.

Aging Evaluation:

Cables from the 34.5KV breakers are exposed to outside ambient air conditions at the 34.5KV breaker end of the cables and, for lines to RSSTs A and B, at the transition to overhead distribution conductor connections. The cable to RSST C does not connect to an overhead distribution conductor. In between the RSST A and RSST B connections, the cables are run underground in a combination of conduit, manholes, sand bed in a cable trench, and/or duct bank. The potential aging effect on this cable includes 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 cables connected between the 34.5KV breakers and either RSST C or the take-off poles for the overhead circuit to RSSTs A and B are UV stabilized. Therefore, UV damage for exposed portions of cable is not an aging effect that requires management.

There are no potential adverse thermal environments in the cable runs for the power cables added to the SBO scope. The TR XLPE (A and B RSSTs) cables as sized would operate at 69% rated capacity to fully load the transfer bus ducts. The EPR ("C" RSST) cables would operate at 39% rated capacity to fully load the transfer bus ducts. Under normal operating conditions, the TR XLPE will operate at less than 12% capacity and the EPR will operate at less than 7% 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 cables used in the circuits for RSSTs A and B are installed in conduit, duct bank, and in a cable trench with a sand bed. Intermittent wetting of cables due to precipitation and drainage is not considered significant wetting. Manholes are subject to wetting from entry of precipitation and groundwater. If water collects in manholes and places cable in a standing water condition, then the potential for significant wetting exists. The TR XLPE cable has a corrugated copper shield installed over the 345 mil TR XLPE insulation. This cable construction is specifically designed to resist water treeing and is qualified for direct buried application. An accelerated tank testing program was run by Georgia Power for this type of cable with vendor and utility participation. The results of this program support the water tree resistant capability of this cable. Intermittent wetting associated with cable trenches or direct buried cable alone would not warrant aging management of the TR XLPE cable. However, the potential for significant wetting due to collection and entrapment of precipitation and/or groundwater in manholes present in the

duct bank configuration for these cables at Surry requires that water treeing is an aging effect that requires management for the energized TR XLPE cables from the switchyard 34.5KV breakers.

The EPR cables used in the circuit for RSST C are installed in conduit, direct buried, in cable trench with sand bed, and in a duct bank. Because of manholes in these cable runs, these cables are subject to significant wetting from entrapment and collection of precipitation and groundwater. There is no overhead conductor section in the RSST C circuit. The cable has 345 mil EPR insulation which has been shown by operating experience to be resistant to water treeing but was not designed for significant wetted conditions. Therefore, intermittent wetting of this cable does not pose a water treeing concern, however, significant wetted conditions could lead to the potential aging effect of water treeing. Therefore, water treeing of the EPR cable from the 34.5KV breaker to RSST C is 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 of aluminum in the outdoor environment has been previously considered in the Surry LRA. However, the application of this material/environment 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 all 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 all aluminum cable is a very slow acting aging mechanism. Degradation and corrosion rates depend largely on air quality. Surry is located in an area that is mostly agricultural. There are no significant industries located nearby that could contribute to adverse/corrosive air quality conditions at Surry. Thus, loss of material due to corrosion is not considered to be 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 the strain/suspension insulators to vibrate 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 considered to be 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 all aluminum overhead bare distribution conductors is not considered to be 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.

Airborne particulate 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 adhesion is minimized by the glazed insulator surface. Contamination of this type is washed away by rain. Surry receives sufficient annual rainfall to remove contamination buildup. The National Weather Service 30-Year Average rainfall amount for the Surry area is greater than 44" annually. 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 because post insulators are fixed and have no moving pivot points. However, loss of material may be a potential aging effect for the strain/suspension insulators installed at the dead ends and angle structures if they are subject to significant movement. The strain/suspension insulators are designed with joints to account for potential movement. Movement of the strain/suspension insulators can be caused by wind blowing the supported conductor wires, causing them 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 strain/suspension insulator wear is not a concern for this type of distribution configuration which involves low elevation and short span construction. Therefore, loss of material due to wear of the Surry Units 1 and 2 insulators is not considered to be an aging effect requiring management for the period of extended operation.

Aluminum Tube Bus and Connectors

The material of construction for the bus components that are subject to aging management review is aluminum only. The tube buses are included in the power path for offsite power at the RSSTs and 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 Dominion's evaluation, no new aging effects have been identified for aluminum in an the outdoor environmental conditions occurring at Surry. Surry is located in an area that is mostly agricultural. There are no significant industries nearby that could contribute to 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.

The inclusion of Transfer Bus F in the SBO scope adds an additional bus duct as part of the transfer bus configuration, however, no new materials or environments are added for the evaluation of bus ducts addressed previously in the Surry LRA. Therefore, no new or additional aging management activities are required for this additional scope equipment.

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 for 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 tube bus, bus duct, control or instrument cables, bare distribution conductors, connections, and insulators for the period of extended operation. Therefore, there is reasonable assurance that the intended function(s) of these electrical components will be maintained consistent with the current licensing basis during the period of extended operation.

The Non-EQ Cable Monitoring program periodically evaluates the existence of local adverse conditions affecting in-scope cables resulting from changing conditions or modifications at the station. A description of this aging management activity was provided in response to RAI 3.6.2-1 by Letter No. 01-647 dated November 30, 2001 and is supplemented by Attachment 2 to this letter. Insulated cable added to the license renewal scope by the inclusion of the SBO offsite power path will be monitored in accordance with the requirements of the Non-EQ Cable Monitoring program.

Aging management is required for the underground 34.5KV energized cables. Excessive water in the underground raceways for the energized power cables feeding the RSSTs is considered an adverse condition. The Dominion approach to managing the aging mechanism of water treeing is consistent with the staff proposed approach outlined in Section XI.E.3 of NUREG-1801. Actions, such as inspecting for water collection in cable manholes, and design features, such as drains or sump pumps, will be utilized to prevent cables from being exposed to wetted conditions for any significant period of time. High-voltage cables for which such actions are taken are not required to be tested since operating experience indicates that prolonged exposure to water and voltage are required to induce this aging mechanism. The Non-EQ Cable Monitoring program will be revised to specifically credit programs to control water in the manholes associated with the RSST power circuit cable raceways at Surry. Additionally, the Corrective Action attribute of the Non-EQ Cable Monitoring program will be revised in accordance with Attachment 2 to this letter to provide for appropriate testing of cables determined to have been wetted for a significant period of time. The specific type of test performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of the insulation system due to wetting. Test results will be evaluated and will consider the cable age, condition, materials, and cable construction as well as the duration of the exposure to a wetted condition to determine appropriate actions. Appropriate actions may include replacement or additional testing/inspections to provide reasonable assurance that the in-scope high-voltage power cables would continue to perform their intended functions throughout the period of extended operation.

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 such 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.

SPS Structural Components:

Consistent with the NRC's April 1, 2002 position, the structural components which meet the scoping criteria of 10 CFR 54.4(a)(3) for restoration of offsite power and should be included in the scope of license renewal, 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 and 500KV switchyard control houses (slab, block walls and footings, and overhead structural steel).

3. Underground cable supports.

4. Overhead bare distribution conductor supports (wood poles).

5. RSST foundations, bay structures, aluminum tube bus supports up to the turbine building.

6. Conduits, cable trays, and supports to the line side of the 4160V circuit breakers between RSSTs A and B and Transfer Buses D and E, respectively.

7. Conduits, cable trays, and supports from RSST C up to and including the Transfer Bus F.

8. Bus duct supports on Transfer Bus F.

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. Aging management for concrete is performed in accordance with the Dominion response provided to RAI 3.5-7 in Letter No. 01-647 dated November 30, 2001. 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, wood, for which an AMR was performed.

Distribution Conductor Supports

The material of construction for the power poles used to bring the overhead conductors from the switchyard to the RSSTs 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 are loss of material and change in material properties. The wood poles are inspected for loss of material due to rot or fungal decay, insect infestation, woodpecker damage, and for change in material properties due to rot or fungal decay.

There is no 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 the 1981 and 1983 time frame.

A visual and sounding inspection is performed on the poles on a periodic basis in order to detect any 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 inspections of these poles. This revision will be completed prior to the year 40 of operation at Surry and will require inspections on a 5-year basis. This inspection interval is based on the US Department of Agriculture Rural Utilities Service Bulletin 1730B-121 which indicated that wooden utility pole initial inspections should occur between the time the poles are 8 and 10 years old. Subsequent inspections should occur every 8 years. Therefore, the 5-year inspection interval is conservative.

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 components supporting 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, General Condition Monitoring, Infrequently Accessed Area Inspection, and Battery Rack Inspection activities will manage the aging effects for the remaining structural components added by the increased SBO scope. 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 in RAI responses via Letter No. 01-647 dated November 30, 2001 and Letter No. 01-732 dated February 5, 2002. 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.

SPS Mechanical Components:

Consistent with the NRC's April 1, 2002 position, the mechanical components which meet the scoping criteria of 10 CFR 54.4(a)(3) for restoration of offsite power and should be included in the scope of license renewal are the sump pumps and discharge piping in Manholes #2 and #3. These are large manholes on the south side of the intake canal and are the low points for the power cables for the manhole sump pumps and the cable run for the 34.5kV power cables to RSST C (Manhole #3). Operation of these sumps is necessary to ensure that the in-scope cables remains dry.

Based on the guidance in NEI 95-10, the sump pump motors do not require an aging management review because they are considered active components. Supports for the pumps and discharge piping are included within the structural components previously discussed. That leaves the pump casings (cast iron) and the discharge piping and check valve bodies (carbon steel) as the in-scope passive components which require an AMR. An evaluation of these components has been performed based on the AMRs of Surry 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 as modified by associated RAIs.

The AMR results for mechanical components associated with the restoration of offsite power are provided in Table SPS-3.

Conclusion for SPS Mechanical Components:

The Work Control Process will manage the aging effects for the mechanical components added by the increased SBO scope. As indicated previously, none of these mechanical materials and aging effects is new to the LRA. 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.

Figure SPS-1
Surry Power Station

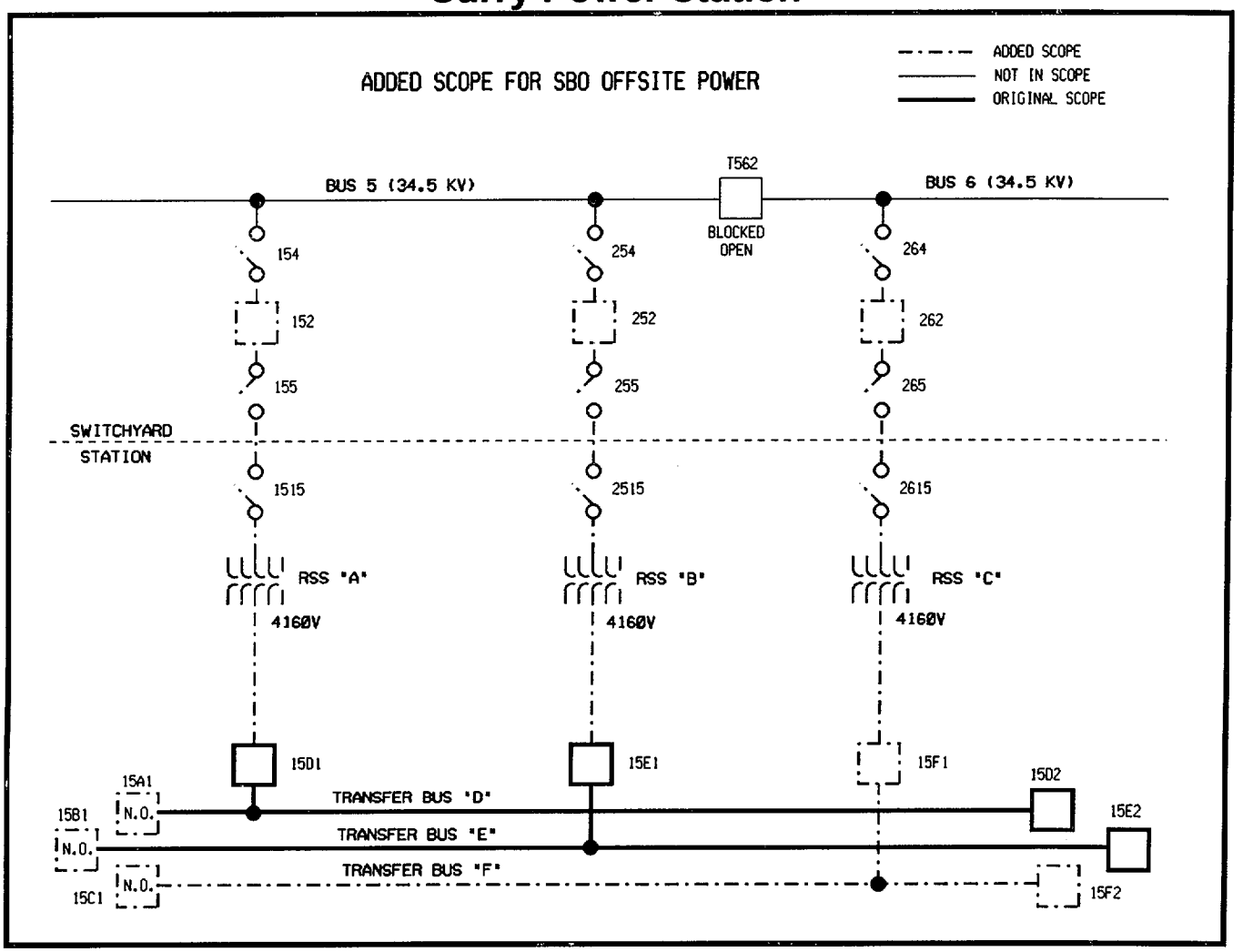

TABLE SPS-1
Electrical Components

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	Water Treeing	Non-EQ Cable Monitoring program
			Soil	Water Treeing	Non-EQ Cable Monitoring program
Bare Distribution Conductor	Conducts Electricity	Aluminum	Atmosphere/ Weather	None	None Required
Bus Duct	Conducts Electricity	Metallic Conductors	Air	None	None Required
		Organic Compounds	Air	None	None Required
Bus Duct Supports	To electrically isolate and provide struct. support to conductors	Organic Compounds	Air	None	None Required
Ceramic Insulators	To electrically isolate and provide struct. support to dist. conductors	Porcelain	Atmosphere/ Weather	None	None Required
Aluminum Tube Bus	Conducts Electricity	Aluminum	Atmosphere/ Weather	None	None Required

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[1]
				Loss of Material	Civil Eng. Structural Inspections[1]
				Cracking	Civil Eng. Structural Inspections[1]
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, A and B Tube Bus Support Frame Caissons, RSST C 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[1]
				Cracking	Civil Eng. Structural Inspections[1]
				Loss of Material	Civil Eng. Structural Inspections[1]
34.5KV Circuit Breaker Supports	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

Table SPS-2 (Continued)
Structural Components

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Cable 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[1]
				Loss of Material	Civil Eng. Structural Inspections[1]
				Cracking	Civil Eng. Structural Inspections[1]
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[1]
				Loss of Material	Civil Eng. Structural Inspections[1]
				Cracking	Civil Eng. Structural Inspections[1]
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 (Beams, bracing, roof framing and decking)	Structural Support	Carbon Steel	Air	Loss of Material[2]	Civil Eng. Structural Inspections
Control Panels and Cabinets	Structural Support	Carbon Steel	Air	None[3]	None Required
Battery Racks (Including spacers)	Structural Support	Carbon Steel	Air	Loss of Material[4]	Battery Rack Inspections

Table SPS-2 (Continued)
Structural Components

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 Inspection
				Cracking	Civil Eng. Structural Inspection
				Loss of Material	Civil Eng. Structural Inspection
			Air	Change in Material Properties	Infrequently Accessed Areas Inspections
				Cracking	Infrequently Accessed Areas Inspections
				Loss of Material	Infrequently Accessed Areas Inspections
			Soil	Change in Material Properties	Civil Eng. Structural Inspection
				Cracking	Civil Eng. Structural Inspection
				Loss of Material	Civil Eng. Structural Inspection
Manhole Access Covers	Structural Support	Cast Iron	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspection
			Air	Loss of Material	Civil Eng. Structural Inspection
Electrical Conduit, Cable Tray, and Supports in Manholes	Structural Support	Galvanized Steel	Air	Loss of Material	Infrequently Accessed Areas Inspections
Power Poles and Crossarms (Note: Crossarms are Atmosphere/Weather Only)	Structural Support	Wood (CCA Salt Treated)	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspection
			Soil	Change in Material Properties	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[1]
				Cracking	Civil Eng. Structural Inspections[1]
				Loss of Material	Civil Eng. Structural Inspections[1]

Table SPS-2 (Continued)
Structural Components

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
Underground Cable Transition Supports and Misc. Steel at RSST C Bay	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	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
A and B Tube Bus Support Frame and C Tube Bus Cantilever Support Frame @Turbine Bldg. Wall	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
			Air	Loss of Material	General Condition Monitoring

Notes:

1. 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.
2. The structural steel has been conservatively assumed to be subject to intermittent wetting.
3. The control panels and cabinets are in a controlled environment. The control panels and cabinets are painted and not subject to intermittent wetting.
4. Battery racks could potentially come in contact with acidic fluids if the batteries were to leak.

TABLE SPS-3
Mechanical Components

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
Pump Casing	Pressure Boundary	Cast Iron	Air*	Loss of Material	Work Control Process
			Raw Water	Loss of Material	Work Control Process
Piping	Pressure Boundary	Carbon Steel	Air*	Loss of Material	Work Control Process
			Raw Water	Loss of Material	Work Control Process
Valve Bodies	Pressure Boundary	Carbon Steel	Air*	Loss of Material	Work Control Process
			Raw Water	Loss of Material	Work Control Process

* Subject to intermittent wetting.

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). Restoration of a 34.5KV circuit through any of the RSSTs, which would by definition terminate ("recover from") an SBO event, would supply sufficient power to bring either the single SBO unit or both units to cold shutdown. RSSTs A and B are normally fed from the 34.5KV Bus #4 in the switchyard. RSST C is normally fed from the 34.5KV Bus #3 in the switchyard. Therefore, the circuits from RSST C and either RSST A or B are considered independent power supplies. As an alternate, the 34.5KV Bus #5 in the switchyard can be aligned to any of the RSSTs. This is consistent with North Anna's current licensing basis for compliance with the SBO Rule and meets the requirements of 10 CFR 54.4 (a)(3) and the NRC 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 connect 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.

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 NRC's April 1, 2002 position, the electrical components which meet the scoping criteria of 10 CFR 54.4(a)(3) for restoration of offsite power and should be included in the scope of license renewal as are as follows:

1. 34.5KV disconnect switches, ceramic insulators, and circuit breakers with associated controls (including cables) 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.

Airborne particulate 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 adhesion is minimized by the glazed insulator surface. Contamination of this type is washed away by rain. North Anna receives sufficient annual rainfall to remove contamination buildup. The National Weather Service 30-Year Average rainfall amount for the North Anna area is greater than 43" annually. 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/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. Post insulators are fixed insulators

and have no moving pivot points. Therefore, loss of material due to wear of the North Anna Units 1 and 2 post insulators is not considered to be 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 are direct buried. Typically these cables 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. The previous LRA cable scope did not include energized high voltage (34.5KV) power cable. A general discussion of the cable commodity materials and environments is provided below, however, specific discussions of aging effects are limited to the category of energized high voltage cable.

Materials:

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 (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 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.

Environments:

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.

Aging Evaluation:

Cables 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 run underground in a combination of conduit, direct buried, through various manholes, and duct banks. The potential aging effect on this cable includes 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 exposed cable between the 34.5KV breakers and the underground cable run 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 62% 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.

A portion of the XLPE insulated cable run that connects the switchyard to each RSST is installed as direct burial within the switchyard with the remaining major portion of the cable

length installed in a duct bank. The direct burial portion is subject to intermittent wetting from precipitation. Intermittent wetting due to precipitation and drainage is not considered significant wetting. Manholes are subject to wetting from entry of rain water. If water collects in manholes and places cable in a standing water condition, then the potential for significant wetting exists. This is the only potential adverse localized condition identified for cable included in the additional SBO scope for offsite power restoration. The insulation of this cable is 345 mils XLPE and industry experience has demonstrated that this type of insulation is not effective in precluding the aging effect of water treeing under conditions of significant wetting. 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 Dominion's 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 nearby that could contribute to 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 for 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 tube or bus bar, connections, and insulators for the period of extended operation. 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.

The Non-EQ Cable Monitoring program periodically evaluates the existence of local adverse conditions affecting in-scope cables resulting from changing conditions or modifications at the station. A description of this aging management activity was provided in response to RAI

3.5.2-1 by Letter No. 01-647 dated November 30, 2001 and is supplemented by Attachment 2 to this letter. Insulated cable added to the license renewal scope by the inclusion of the SBO offsite power path will be monitored in accordance with the requirements of the Non-EQ Cable Monitoring program.

Aging management is required for the underground 34.5KV energized cables. Excessive water in the underground cable raceways for the power cables feeding the RSSTs is considered an adverse condition. The Dominion approach to managing the aging mechanism of water treeing is consistent with the staff proposed approach outlined in Section XI.E.3 of NUREG-1801. Actions, such as inspecting for water collection in cable manholes, and design features, such as drains and sump pumps, will be utilized to prevent cables from being exposed to wetted conditions for any significant period of time. High-voltage cables for which such actions are taken are not required to be tested since operating experience indicates that prolonged exposure to water and voltage are required to induce this aging mechanism. The Non-EQ Cable Monitoring program credits the North Anna manhole monitoring activities in the management of adverse conditions for the prevention of water treeing. Additionally, the Corrective Action attribute of the Non-EQ Cable Monitoring program will be revised in accordance with Attachment 2 to this letter to provide for appropriate tests of cables determined to have been wetted for a significant period of time. The specific type of test performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of the insulation system due to wetting. Test results will be evaluated and will consider the cable age, condition, materials, and cable construction as well as the duration of the exposure to a wetted condition to determine appropriate actions. Appropriate actions may include replacement or additional testing/inspections to provide reasonable assurance that the in-scope high-voltage power cables would continue to perform their intended functions throughout the period of extended operation.

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 NRC's April 1, 2002 position, the structural components which meet the scoping criteria of 10 CFR 54.4(a)(3) for restoration of offsite power and should be included in the scope of license renewal are as follows:

1. Foundations and supports for the 34.5KV circuit breakers, disconnect switches, aluminum bus bars, and controls in the switchyard.

2. Portions of the 500KV switchyard control house (Slab and structural steel).

3. Underground cable supports.

4. RSST foundations, bay structures, bus supports up to the turbine building.

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 for each unit.

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 is presented in Table NAPS-2.

Conclusion for North Anna Structural Components:

The Civil Engineering Structural Inspection, General Condition Monitoring, Infrequently Accessed Area Inspection, 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 as RAI response via Letter No. 01-647 dated November 30, 2001 and Letter No. 01-732 dated February 5, 2002. 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, such 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.

Figure NAPS-1
North Anna Power Station

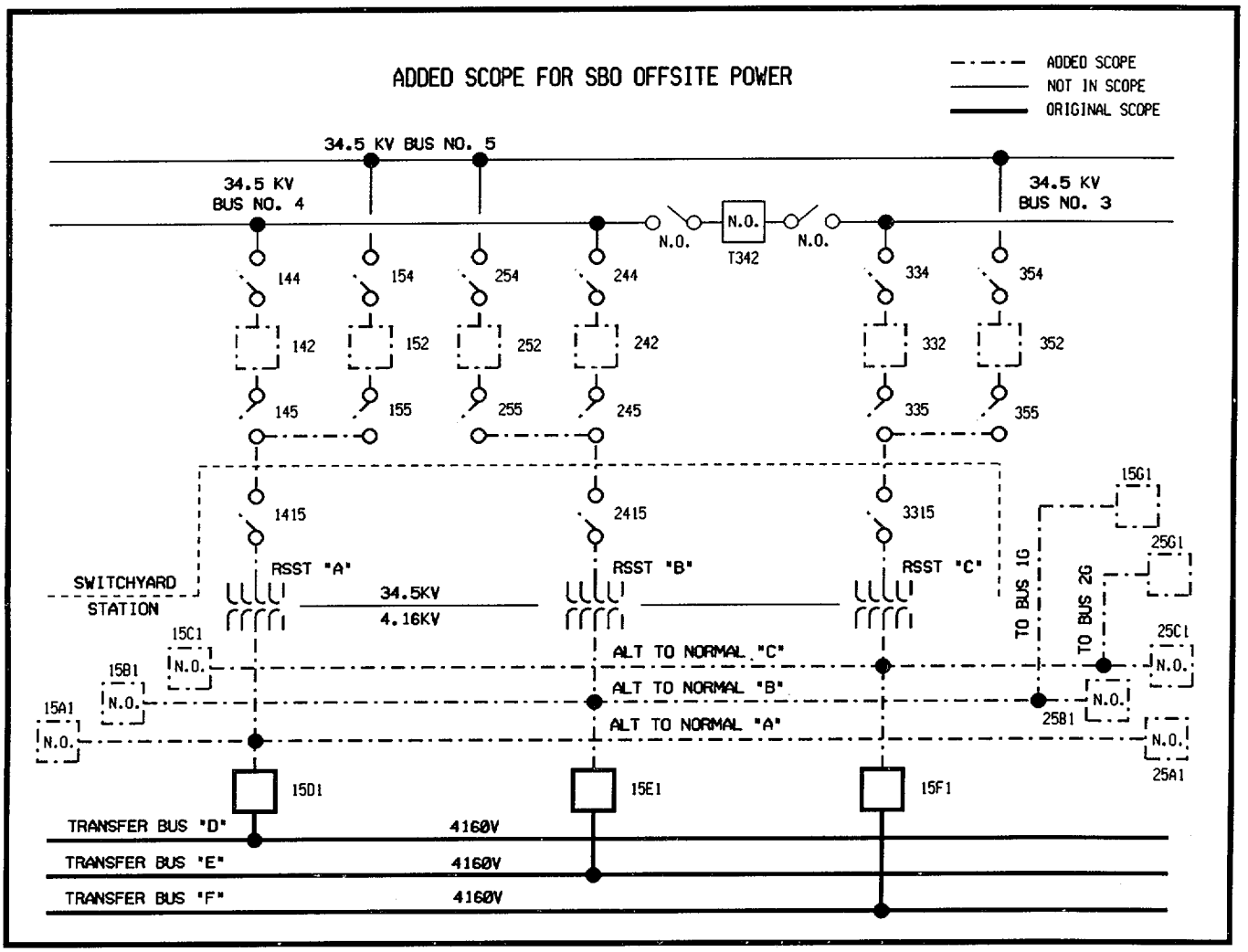

TABLE NAPS-1
Electrical Components

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	Water Treeing	Non-EQ Cable Monitoring program
			Soil	Water Treeing	Non-EQ Cable Monitoring program
Aluminum Tube 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[1]
				Loss of Material	Civil Eng. Structural Inspections[1]
				Cracking	Civil Eng. Structural Inspections[1]
		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[1]
				Cracking	Civil Eng. Structural Inspections[1]
				Loss of Material	Civil Eng. Structural Inspections[1]
34.5KV Circuit Breaker Supports	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections

Table NAPS-2 (Continued)
Structural Components

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[1]
				Cracking	Civil Eng. Structural Inspections[1]
				Loss of Material	Civil Eng. Structural Inspections[1]
Control House Structural Steel (beams, columns, bracing, roof framing and decking)	Structural Support	Carbon Steel	Air	Loss of Material[2]	Civil Eng. Structural Inspections
Control Panels and Cabinets	Structural Support	Carbon Steel	Air	None[3]	None Required
Battery Racks (including spacers)	Structural Support	Carbon Steel	Air	Loss of Material[4]	Battery Rack Inspections
Cable 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[1]
				Cracking	Civil Eng. Structural Inspections[1]
				Loss of Material	Civil Eng. Structural Inspections[1]
			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)
Structural Components

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	Infrequently Accessed Areas Inspections
				Cracking	Infrequently Accessed Areas Inspections
				Loss of Material	Infrequently Accessed Areas 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 Inspections
			Air	Loss of Material	Civil Eng. Structural Inspections
Cable Supports in Manholes	Structural Support	Carbon Steel	Air	Loss of Material	Infrequently Accessed Areas Inspections
RSST Wall Foundations (Spread Footings)	Structural Support	Concrete	Soil	Change in Material Properties	Civil Eng. Structural Inspections[1]
				Cracking	Civil Eng. Structural Inspections[1]
				Loss of Material	Civil Eng. Structural Inspections[1]
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
Underground Cable Transition Supports and Misc. Steel at RSST Bays	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections

Table NAPS-2 (Continued)
Structural Components

Component Group	Passive Function	Material Group	Environment	Aging Effects Requiring Management	Aging Management Activity
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[1]
				Loss of Material	Civil Eng. Structural Inspections[1]
				Cracking	Civil Eng. Structural Inspections[1]
RSST Bus Support Crossarms	Structural Support	Carbon Steel	Atmosphere/ Weather	Loss of Material	Civil Eng. Structural Inspections
A, B, Ands C Tube Bus Cantilever Support Frame @ Turbine Bldg. Wall	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	Atmosphere/ Weather	Loss of Material	General Condition Monitoring
			Air	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

Notes:

1. 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.
2. The structural steel has been conservatively assumed to be subject to intermittent wetting.
3. The control panels and cabinets are in a controlled environment. The control panels and cabinets are painted and not subject to intermittent wetting.
4. Battery racks could potentially come in contact with acidic fluids if the batteries were to leak.

Attachment 2

License Renewal – Supplemental Response to RAI 3.6.2-1
Serial No. 02-297

Surry and North Anna Power Stations, Units 1 and 2
License Renewal Applications

Virginia Electric and Power Company
(Dominion)

RAI 3.6.2-1:

"In both LRAs, Section 3.6.2, the applicant does not identify any applicable aging effects for non-environmentally qualified cables. Industry operating experience indicates that aging of cables requires aging management. Therefore, the applicant is requested to perform an aging management review of non-EQ cables consistent with industry operating experience and submit aging management activities that demonstrate that the applicable aging effects will be managed throughout the period of extended operation."

Supplemental Response to RAI 3.6.2-1:

Modifications to the attributes of the Non-EQ Cable Monitoring program have been implemented to incorporate: 1) the consideration of environmental conditions, including moisture, in the engineering evaluations of degraded cables, 2) credit for the calibration of certain in-scope sensitive low-voltage signal instrument cables, and 3) testing of energized medium- or high-voltage power cables determined to be subject to significant wetting conditions.

The following revised program attributes for Non-EQ Cable Monitoring supercedes in its entirety the program attributes previously submitted in Letter No. 01-647 dated November 30, 2001:

Non-EQ Cable Monitoring Aging Management Activity

Scope

Cables that are within the scope of license renewal and subject to aging effects requiring management, but not designated as Environmentally Qualified (EQ), are categorized as three different cable types.

Type E1 includes accessible electrical cables that may experience adverse conditions caused by high values of heat or radiation. Reviews have shown that previously evaluated environments do not cause aging effects requiring management for cable jackets and connector coverings that are within the scope of license renewal. However, since plant conditions can change and create a new possibility for an adverse environment, Dominion plans an additional activity to provide confirmation of these evaluations for the period of extended operation. A detailed review of Surry and North Anna facilities will be performed to determine areas of high temperature or radiation for possible age-related degradation of cable jackets and connector coverings in a potentially adverse environment.

Type E2 cables are used in low-voltage instrumentation loops for high-voltage components such as nuclear instrumentation and radiation monitors. For Surry and North Anna, this situation may lead to aging effects requiring management for the nuclear source, intermediate, and power range instruments. The instrument loops for the source, intermediate and power range components are susceptible to induced currents from the high voltage power supply if insulation resistance diminishes.

Type E3 cables are inaccessible, medium-voltage cables that are energized more than 25% of the time and are potentially exposed to significant moisture (i.e. long-term wetting). For Surry and North Anna, this category includes underground cables that supply power to the Reserve Station Service Transformers (RSST). For North Anna only, this category also includes cables supplying power to the service water pump motors. Periodic exposures to moisture lasting less than a few days (e.g., normal rain and drain) do not result in any additional cables being subjected to aging effects requiring management.

Implementation of the Non-EQ Cable Monitoring activities will be completed prior to year 40 of operation.

Preventive Actions

The Non-EQ Cable Monitoring activities for Type E1 and E2 cables are designated *condition monitoring*. No preventive actions are performed.

For Type E3 cables, design features that prevent cables from being wetted for significant lengths of time include drains and sump pumps. These features are considered to be preventive actions.

Parameters Monitored or Inspected

For Type E1 cables, an inspection plan will be developed to visually examine representative samples of accessible, non-EQ cable jackets and connector coverings for surface indications such as cracking, discoloration, or bulging. EPRI document TR-109619 will be used for guidance in performing the inspections.

For Type E2 cables, routine calibration tests are performed, based on technical specifications requirements, for indication of possible age-related degradation of insulation that could affect instrumentation loops.

For Type E3 cables, concerns related to water treeing of potentially wetted cables are eliminated by maintaining the cables in a dry condition. Cable manholes will be inspected for water collection.

Detection of Aging Effects

For Type E1 cables, visual inspections for representative samples of accessible, non-EQ cable jackets and connector coverings determine the presence of cracking, discoloration, or bulging that would indicate aging effects requiring management. These effects can result from high values of temperature or radiation.

For Type E2 cables, routine calibration tests performed as part of the plant surveillance program will be used to identify the potential existence of age-related degradation.

For Type E3 cables, the environment which could lead to water-treeing in medium-voltage cables will be visually monitored for the presence of water around cables.

Monitoring and Trending

For Type E1 cables, visual inspections for surface anomalies on non-EQ cable jackets and connector coverings can identify indications of age-related degradation due to excessive heat or radiation. Initial visual inspections for representative samples of non-EQ insulated cables and connectors will be performed as a Licensee Follow-up Action between year 30 and the end of the current operating license. Subsequent inspections will be performed at least once per 10 years during the period of extended operation.

For Type E2 cables, routine calibration testing can detect variations of signals in instrumentation loops that are susceptible to induced currents (from high-voltage power supplies) caused by reduced insulation resistance due to aging.

For Type E3 cables, periodic visual inspections for water collection in manholes containing in-scope cables (i.e., the power cables for the service water pump

motors at North Anna, and the cables supplying power to the RSST's at Surry and North Anna) will be performed at frequencies ranging from bi-weekly to annually depending upon the design features that exist to mitigate water intrusion into specific manholes.

Acceptance Criteria

For Type E1 cables, the acceptance criterion for the condition of accessible, non-EQ cable jackets and connector coverings is the absence of anomalous indications that are signs of degradation. Such indications include cracking, discoloration, or bulging.

For Type E2 cables, acceptance criteria are specified in calibration procedures for source, intermediate, and power range instrumentation. These acceptance criteria are specified in terms of voltage and current limits.

For Type E3 cables, the acceptance criterion with respect to wetted conditions is the absence of exposure to significant wetting. In-scope cable found to be submerged in standing water for an extended period of time will be subject to an engineering evaluation and corrective action. The evaluation will be based on appropriate testing (using available technology consistent with NRC positions) of cables that are determined to be wetted for a significant period of time. The test will use a proven methodology for detecting deterioration of the insulation system due to wetting.

Any anomalies resulting from visual inspections will be dispositioned by Engineering. Occurrence of an anomaly that is adverse to quality will be entered into the Corrective Action System.

Corrective Actions

Corrective actions for conditions that are adverse to quality are performed in accordance with the Corrective Action System as part of the Quality Assurance Program. The engineering evaluation of visual inspection results for the representative samples of accessible cables and connectors will consider whether the observed condition is applicable for other accessible or inaccessible cables and connectors. This engineering evaluation also will consider the potential for moisture in the area of any anomalies. Corrective action for anomalous calibration results for instrumentation loops will lead to adjustments of electronics and may involve component evaluation/replacement. The

engineering evaluation of cables found to be wetted for a significant period of time will be based on an appropriate test of the cable and will consider the age, condition, material, and construction of the cables. Testing frequency will be consistent with the guidelines of NUREG-1801 for significantly wetted cables. Any resultant maintenance, repair, or replacement activities will be performed in accordance with the Work Control Process. The corrective action process provides reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to be acceptable. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the component intended function is maintained consistent with the current licensing basis. If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined, and an action plan is developed to preclude repetition. The Corrective Action System identifies repetitive discrepancies and initiates additional corrective action to preclude recurrence.

Confirmation Process

The confirmation process for Non-EQ Cable Monitoring involves the Work Control Process to monitor cable conditions on an ongoing basis.

Administrative Controls

Administrative and implementation procedures are reviewed, approved, and maintained as controlled documents in accordance with the procedure control process and the Quality Assurance Program.

Operating Experience

The Non-EQ Cable Monitoring activity is new and has no operating experience. However, Dominion operating experience has shown that cable jacket anomalies have occurred, and have been evaluated and corrected to maintain intended functions at both Surry and North Anna. Wetted conditions for underground cables also have occurred and corrective actions have been implemented to mitigate the water intrusion.