VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

May 22, 2002

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

Serial No.:	02-163
LR/MWH	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
REQUEST FOR ADDITIONAL INFORMATION
LICENSE RENEWAL APPLICATIONS

Based on conversations with the NRC in March, 2002 and April, 2002, the staff requests supplemental information related to certain responses provided for Requests for Additional Information (RAIs) concerning the Surry and North Anna license renewal applications (LRAs). The attachment to this letter contains supplemental information for RAIs 2.1-3, 3.5-5, 3.5.8-2, 3.5.9-2, 3.5.9-4, 3.5.9-5, B2.2.7-1, B2.2.7-2, B2.2.7-3, B2.2.11-1, and B2.2.19-3 as requested by the staff.

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

Attachment

Commitments made in this letter: None

A086

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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 22nd day of May, 2002.

My Commission Expires: 3-31-04.

Maggie McClure
Notary Public

(SEAL)

Attachment

License Renewal – Response to RAI
Serial No. 02-163

Response to Request for Supplemental Information
Surry and North Anna Power Stations, Units 1 and 2
License Renewal Applications
RAIs 2.1-3, 3.5-5, 3.5.8-2, 3.5.9-2, 3.5.9-4, 3.5.9-5, B2.2.7-1, B2.2.7-2, B2.2.7-3, B2.2.11-1, and B2.2.19-3

Virginia Electric and Power Company
(Dominion)

RAI 2.1-3:

In addition to the SR/NS and SR/NSQ piping segments discussed above, an applicant needs to consider NSR piping systems which are not connected to SR piping, but have a spatial relationship such that their failure could adversely impact on the performance of an intended safety function. For this piping system configuration, the applicant has two options when performing its scoping evaluation; a mitigative option or a preventive option.

With respect to the mitigative approach, the applicant must demonstrate that plant mitigative features (e.g., pipe whip restraints, jet impingement shields, spray and drip shields, seismic supports, flood barriers, etc.) are provided which protect SR SSCs from a failure of NSR piping segments. When evaluating the failure modes of NSR piping segments and the associated consequences, age-related degradation must be considered. The staff notes that pipe failure evaluations typically do not consider age-related degradation when determining pipe failure locations. Rather, pipe failure locations are normally postulated based on high stress. Industry operating experience has shown that age-related pipe failures can, and do, occur at locations other than the high-stress locations postulated in most pipe failure analyses. Therefore, to utilize the mitigative option, an applicant should demonstrate that the mitigating devices are adequate to protect SR SSCs from failures of NSR piping segments at any location where age-related degradation is plausible. If this level of protection can be demonstrated, then only the mitigative features need to be included within the scope of license renewal, and the piping segments need not be included within the scope.

If an applicant SR SSCs from the consequences of NSR pipe failures, then the applicant should utilize the preventive option, which requires that the entire NSR piping system be brought into the scope of license renewal and an AMR be performed on the components within the piping system.

Finally, an applicant may determine that in order to ensure adequate protection of the SR SSC, a combination of mitigative features and NSR SSCs must be brought within scope. Regardless, it is incumbent upon the applicant to provide adequate justification for the approach taken with respect to scoping of NSR SSCs in accordance with the Rule. Therefore the applicant is requested to identify which option is used for NSR piping systems which are not connected to SR piping, but have a spatial relationship such that their failure could adversely impact on the performance of an intended safety function.

For each non-safety-related piping system which would normally be included within the scope of license renewal, but is excluded because mitigative features have been credited for protecting SR SSCs from the failure of the NSR piping system, please identify the following:

a. the mitigative feature(s) that is credited for protection
b. the hazard (e.g., failure mechanisms and postulated failure locations) for which the mitigative feature(s) is providing protection

c. a summary discussion (including references, such as reports, analyses, calculations, etc.) of the basis for the conclusion that the mitigative feature(s) is adequate to protect SR SSCs.

Dominion Response:

The methodology implemented by Dominion for scoping of systems, structures, and components (SSCs) meeting the 10CFR54.4(a)(2) criterion is described in the license renewal application in Section 2.1.2.2 "Criterion 2 - Non-Safety-Related Affecting Safety-Related" with further details provided in Section 2.1.3.6 "Criterion 2 Report". As identified in the application, the scoping for 10CFR54.4(a)(2) did not include non-safety related mechanical components, such as piping, tanks, valves, etc., that are considered Seismic II/I since the failure of these components during a seismic event is not postulated in the current licensing basis. Based on discussions with the NRC staff, the scope under 10CFR54.4(a)(2) is not limited to seismic II/I supports. Therefore, Dominion has modified the scope of license renewal for Surry and North Anna to include non-safety related SSC that have a spatial relationship with SSC within the scope of license renewal based on 10CFR54.4(a)(1) and whose failure could impact the performance of an intended safety function.

Non-safety related components have been included within the scope of license renewal using the preventive option described in the request for additional information. Components that have been considered for inclusion within the scope of license renewal in response to this RAI include piping, valves, tanks, pumps, and other mechanical system equipment.

To determine the non-safety related SSC to be added to the scope of license renewal, the plant structures and spaces that contain both safety-related and non-safety related SSC were identified. These structures are listed in Table 2.1-3-1, and are described in LRA Section 2.4.

After the structures/spaces were identified, the equipment database was reviewed to determine the mechanical systems containing non-safety related components within these structures and spaces.

From this list of systems, a determination was made whether an assumed failure of the non-safety related components within these systems could impact the performance of an intended function for any SSC in-scope for 10CFR54.4(a)(1) {Criterion 1}. Failure modes considered in the evaluation were pipe whip and jet impingement for high-energy systems and fluid leakage, fluid spray, and component displacement (such that physical contact could occur with SSC in-scope for Criterion 1) for all systems. The component-level intended functions of limited structural integrity and pressure boundary were identified for these non-safety related components. The limited structural integrity function is defined as the capability of a component to maintain sufficient integrity to prevent physical interaction with spatially oriented safety-related components. The pressure boundary function definition is applied to prevent leakage and spray that could affect safety-related components.

Table 2.1-3-1: Structures Containing Non-safety Related Components with Potential Spatial Orientation to Safety-Related Components

North Anna	Surry
Auxiliary Building	Auxiliary Building
Auxiliary Feedwater Pump House	Containment
Casing Cooling Pump House	Containment Spray Pump Building
Containment	Fuel Building
Fuel Building	Fuel Oil Pump House
Fuel Oil Pump House	High Level Intake Structure
Intake Structure	Low Level Intake Structure
Main Steam Valve House	Main Steam Valve House
Quench Spray Pump House	Service Building
Service Building	Safeguards Building
Safeguards Building	Turbine Building
Service Water Pump House	
Service Water Valve House	
Turbine Building	

Industry and site operating experience reviews have been conducted to identify potential concerns with aging of non-fluid containing components. No failures due to aging were identified in these reviews. This operating experience is consistent with the results of aging management reviews performed for in-scope components of the same material exposed to the same environments. Based on this operating experience review, it was concluded that there are no credible aging effects that would result in loss of the limited structural integrity function for non-fluid containing components. Additionally, non-fluid containing components cannot affect safety-related SSC due to leakage or spray. Therefore, since these non-fluid containing components can not affect the function of safety-related SSC, they were not included within the scope of license renewal for this review. Non-safety related components, whose failure could not impact intended functions based on their location relative to safety-related SSC, were also not included within the scope of license renewal for this review.

The mechanical systems that include components that have been determined to be within the scope of license renewal based on this approach are listed in Tables 2.1-3-2 and 2.1-3-3. Table 2.1-3-2 identifies systems that were previously within the scope of license renewal for which the license renewal evaluation boundary has been extended to include additional components as a result of this review. Table 2.1-3-3 identifies the systems added to the scope of license renewal as a result of this review.

Table 2.1-3-2: Systems with Increased License Renewal Boundary Due to Expansion of Criterion 2 Scope

North Anna	Surry
Auxiliary Steam (AS)	Auxiliary Steam (AS)
Boron Recovery (BR)	Bearing Cooling (BC)
Component Cooling (CC)	Boron Recovery (BR)
Chilled Water (CD)	Component Cooling (CC)
Chemical and Volume Control (CH)	Chemical and Volume Control (CH)
Condensate (CN)	Condensate (CN)
Containment Vacuum (CV)	Containment Spray (CS)
Circulating Water (CW)	Containment Vacuum (CV)
Drains Aerated (DA)	Circulating Water (CW)
Drains – Building Services (DB)	Drains Aerated (DA)
Drains Gaseous (DG)	Drains Gaseous (DG)
Fuel Pit Cooling (FC)	Fuel Pit Cooling (FC)
Feedwater (FW)	Feedwater (FW)
High Radiation Sampling (HRS)	Gaseous Waste (GW)
Liquid Waste (LW)	Heating (HS)
Main Steam (MS)	Main Steam (MS)
Primary Grade Water (PG)	Primary Grade Water (PG)
Quench Spray (QS)	Plumbing (PL)
Reactor Coolant (RC)	Reactor Coolant (RC)
Residual Heat Removal (RH)	Residual Heat Removal (RH)
Radwaste (RW)	Recirculation and Transfer (RT)
Steam Drains (SD)	Steam Drains (SD)
Safety Injection (SI)	Safety Injection (SI)
Sampling (SS)	Sampling (SS)
Secondary Vents (SV)	Secondary Vents (SV)
Service Water (SW)	Service Water (SW)
Vents Gaseous (VG)	Vents Aerated (VA)
Vacuum Priming (VP)	Vents Gaseous(VG)
Water Treatment (WT)	Vacuum Priming (VP)
	Ventilation (VS)

Table 2.1-3-3: Systems Added to the Scope of Licensing Renewal Due to Expansion of License Renewal Scope

North Anna	Surry
Bearing Cooling (BC)	Chilled Water (CD)
Decontamination (DC)	Decontamination (DC)
Extraction Steam (ES)	Extraction Steam (ES)
Gaseous Waste (GW)	Liquid Waste (LW)
	Water Treatment (WT)

An aging management evaluation was performed for the non-safety related mechanical components that were determined to be within the scope of license renewal. This review consisted of an evaluation of the effects of aging and identification of activities credited for managing the applicable aging effects based on the results of aging management reviews performed for components of the same material and exposed to the same internal and external environments. This evaluation concluded that the aging effects of loss of material and/or cracking require management and that there are no additional material and environment combinations beyond those currently considered in the application.

The following aging management activities are credited to manage aging effects on external surfaces of in-scope components added as a result of this review:

- Boric Acid Corrosion Surveillance (LRA Section B2.2.3)
- General Condition Monitoring Activities (LRA Section B2.2.9)
- Infrequently Accessed Area Inspection Activities (LRA Section B2.1.2)

The following aging management activities are credited to manage aging effects on internal surfaces of in-scope components added as a result of this review:

- Chemistry Control Program for Primary Systems (LRA Section B2.2.4)
- Chemistry Control Program for Secondary Systems (LRA Section B2.2.5)
- Secondary Piping and Component Inspection (LRA Section B2.2.16)
- Service Water System Inspections (LRA Section B2.2.17)
- Work Control Process (LRA Section B2.2.19)

The aging management activities credited with managing these aging effects are currently described in the license renewal application in the indicated section. These aging management activities are adequate to manage the effects of aging for components within the expanded scope of license renewal for Criterion 2.

A summary of the results of the aging management evaluation for the systems within the scope of license renewal as a result of the expansion of scope for Criterion 2 are provided in Table 2.1-3-4 for North Anna and 2.1-3-5 for Surry.

Table 2.1-3-4: Aging Management Evaluation Results for Systems within the Expanded Scope of License Renewal – North Anna

System(s)	Intended Function	Material Group(s)	Environment	Aging Effect	Aging Management Activity
BR, DG, HRS, RH, SS, VG, CH, FC, PG, QS, RC, SI, WT, DA, DB, DC, LW, RW, AS, BD, FW, ES, MS, SD, CC, CN, CW, SW, CD, CV, GW, RC, SV, VP, BC	LSI, PB	Stainless Steel (external surfaces)	Air	Loss of Material	General Condition Monitoring Activities Infrequently Accessed Area Inspection Activities
WT, AS, BD, FW, ES, MS, SD, CC, CN, DB, CW, SW, CD, CV, VA[1] GW, RC, SV, VP, BC	LSI, PB	Carbon Steel, Low-alloy Steel, and Cast Iron (external surfaces)	Air Borated Water Leakage	Loss of Material	Boric Acid Corrosion Surveillance[2] General Condition Monitoring Activities Infrequently Accessed Area Inspection Activities
WT, DB, AS, BD, FW, ES, MS, SD, CN, CC, CW, SW, CD, CV, GW, RC, SV, VP, BC	LSI, PB	Copper Alloys (external surfaces)	Air Borated Water Leakage	Loss of Material	Boric Acid Corrosion Surveillance[2] General Condition Monitoring Activities Infrequently Accessed Area Inspection Activities

[1] Subsystem of the DA system.
[2] For components inside Containment only

Table 2.1-3-4: Aging Management Evaluation Results for Systems within the Expanded Scope of License Renewal – North Anna

System(s)	Intended Function	Material Group(s)	Environment	Aging Effect	Aging Management Activity
BR, DG, HRS, RH, SS, VG	LSI, PB	Stainless Steel (internal surfaces)	Treated Water	Cracking (>140° F)	Chemistry Control Program for Primary Systems Work Control Process
				Loss of Material	Chemistry Control Program for Primary Systems Work Control Process
CH, FC, PG, QS, RC, SI, WT	LSI, PB	Stainless Steel (internal surfaces)	Treated Water	Loss of Material	Chemistry Control Program for Primary Systems Work Control Process
WT	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Raw (Potable) Water Treated Water (Chemical mixing and injection)	Loss of Material	Work Control Process
DA, DB, DC, LW, RW	LSI, PB	Stainless Steel (internal surfaces)	Raw Water	Loss of Material	Work Control Process
DB	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron and Copper Alloys (internal surfaces)	Raw Water	Loss of Material	Work Control Process

Table 2.1-3-4: Aging Management Evaluation Results for Systems within the Expanded Scope of License Renewal – North Anna

System(s)	Intended Function	Material Group(s)	Environment	Aging Effect	Aging Management Activity
AS, BD, FW, ES, MS, SD, CN	LSI, PB	Stainless Steel (internal surfaces)	Treated Water / Steam	Cracking (>140° F)	Chemistry Control Program for Secondary Systems Work Control Process
				Loss of Material	Chemistry Control Program for Secondary Systems Work Control Process
AS, BD, FW, ES, MS, SD, CN	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; and Copper Alloys (internal surfaces)	Treated Water / Steam	Loss of Material	Chemistry Control Program for Secondary Systems Secondary Piping and Component Inspection Work Control Process
CC	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Treated Water	Loss of Material	Chemistry Control Program for Primary Systems Work Control Process
CW, SW	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Raw (Lake) Water	Loss of Material	Service Water System Inspections Work Control Process

Table 2.1-3-4: Aging Management Evaluation Results for Systems within the Expanded Scope of License Renewal – North Anna

System(s)	Intended Function	Material Group(s)	Environment	Aging Effect	Aging Management Activity
CD	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Treated Water	Loss of Material	Chemistry Control Program for Primary Systems[3] Chemistry Control Program for Secondary Systems[4] Work Control Process
CV, VA[5], GW, RC[6], SV, VP	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Air / Gas (with potential for liquid or steam)	Loss of Material	Work Control Process
BC	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Treated Water	Loss of Material	Chemistry Control Program for Secondary Systems Work Control Process

[3] For CD components in support of Containment Air Coolers
[4] For CD components in support of Control Room Cooling
[5] Subsystem of the DA system.
[6] Normally isolated RC system components

Table 2.1-3-5: Aging Management Evaluation Results for Systems within the Expanded Scope of License Renewal – Surry

System(s)	Intended Function	Material Group(s)	Environment	Aging Effect	Aging Management Activity
BR, DG, RH, SS, VG, CH, FC, PG, CS, RC, SI, WT, DA, DC, LW, VA, AS, BD, FW, ES, MS, SD, CC, CN,, CW, SW, RT, CD, CV, GW, RC, SV, VP, BC, HS, PL	LSI, PB	Stainless Steel (external surfaces)	Air	Loss of Material	General Condition Monitoring Activities
					Infrequently Accessed Area Inspection Activities
WT, PL, AS, BD, CN, FW, ES, HS, MS, SD, CC, CD, CV, GW, RC, VS, VA, VP, BC, CW, SW, SV	LSI, PB	Carbon Steel, Low-alloy Steel, and Cast Iron (external surfaces)	Air Borated Water Leakage	Loss of Material	Boric Acid Corrosion Surveillance [1] General Condition Monitoring Activities Infrequently Accessed Area Inspection Activities
WT, PL, AS, BD, CN, FW, ES, HS, MS, SD, CC, CD, CV, GW, RC, VS, VA, VP, BC, CW, SW, SV	LSI, PB	Copper Alloys (external surfaces)	Air Borated Water Leakage	Loss of Material	Boric Acid Corrosion Surveillance [1] General Condition Monitoring Activities Infrequently Accessed Area Inspection Activities
BR, DG, RH, SS, VG	LSI, PB	Stainless Steel (internal surfaces)	Treated Water	Cracking (>140° F)	Chemistry Control Program for Primary Systems Work Control Process

[1] For components inside Containment only

Table 2.1-3-5: Aging Management Evaluation Results for Systems within the Expanded Scope of License Renewal – Surry

System(s)	Intended Function	Material Group(s)	Environment	Aging Effect	Aging Management Activity
BR, DG, RH, SS, VG	LSI, PB	Stainless Steel (internal surfaces)	Treated Water	Loss of Material	Chemistry Control Program for Primary Systems Work Control Process
CH, CS, FC, PG, RC, RT, SI, WT	LSI, PB	Stainless Steel (internal surfaces)	Treated Water	Loss of Material	Chemistry Control Program for Primary Systems Work Control Process
WT	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Raw Water (Potable) Treated Water (Chemical mixing or injection)	Loss of Material	Work Control Process
DA, DC, LW	LSI, PB	Stainless Steel (internal surfaces)	Raw Water	Loss of Material	Work Control Process
PL	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Raw Water	Loss of Material	Work Control Process
AS, BD, CN, FW, ES, HS, MS, SD	LSI, PB	Stainless Steel (internal surfaces)	Treated Water / Steam	Cracking (>140° F)	Chemistry Control Program for Secondary Systems Work Control Process

Table 2.1-3-5: Aging Management Evaluation Results for Systems within the Expanded Scope of License Renewal – Surry

System(s)	Intended Function	Material Group(s)	Environment	Aging Effect	Aging Management Activity
AS, BD, CN, FW, ES, HS, MS, SD	LSI, PB	Stainless Steel (internal surfaces)	Treated Water / Steam	Loss of Material	Chemistry Control Program for Secondary Systems Work Control Process
AS, BD, CN, FW, ES, HS, MS, SD	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; and Copper Alloys (internal surfaces)	Treated Water / Steam	Loss of Material	Chemistry Control Program for Secondary Systems Secondary Piping and Component Inspection Work Control Process
CC, CD	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Treated Water	Loss of Material	Chemistry Control Program for Primary Systems Work Control Process
CV, GW, RC[7], SV, VA, VP	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Air / Gas (with potential for liquid or steam)	Loss of Material	Work Control Process

[7] Normally isolated RC system components

Table 2.1-3-5: Aging Management Evaluation Results for Systems within the Expanded Scope of License Renewal – Surry

System(s)	Intended Function	Material Group(s)	Environment	Aging Effect	Aging Management Activity
BC, VS	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel (internal surfaces)	Treated Water	Loss of Material	Chemistry Control Program for Secondary Systems Work Control Process
CW, SW	LSI, PB	Carbon Steel, Low-alloy Steel, Cast Iron; Copper Alloys; and Stainless Steel	Raw (Brackish) Water	Loss of Material	Service Water System Inspections Work Control Process

Supplemental Information:

RAI 2.1-3, Supplemental Request 1 -

Dominion states that industry and site OE reviews have been conducted to identify aging effects for non-fluid filled SSCs, and no credible effects have been identified that would result in loss of limited structural integrity. Please describe what OE information sources were used. Specific references to industry and NRC documentation would be helpful.

Response -

Non-fluid-containing component groups (e.g. ventilation duct, instrument air valves, valve actuators, etc.) that are spatially orientated near safety-related components are located in sheltered areas and, therefore, are not exposed to adverse environments that promote age-related degradation. As verification, an operating experience (OE) review has been completed relative to age-related degradation. The review has included over 50 industry Licensee Event Reports from the INPO database and over 500 North Anna and Surry Deviation Reports from the Dominion Corrective Action System. Additionally, the NRC web site and the ADAMS database were queried for non-fluid containing age related degradation operating experience. The operating experience review has identified no age-related degradation of non-fluid-containing components that would result in their loss of the limited structural integrity function. Non-fluid-containing components, as such, do not present a potential for flooding or spraying that could affect safety-related components. Additionally, the walkdowns and inspections that were performed to resolve Generic Letter 87-02 using Generic Implementation Procedure for Seismic Verification of Nuclear Plant Equipment, have affirmed that the North Anna and Surry component design is robust and rugged.

RAI 2.1-3, Supplemental Request 2 -

Dominion states that non-safety related components, whose failure could not impact intended functions based on their location relative to safety-related SSC, were also not included within the scope of license renewal for this review. Please have the applicant describe the criteria used to establish when a location was considered outside the "zone of influence."

Response -

Dominion excluded fluid-containing component groups, not individual components, based on their spatial location or other conditions deemed to present no credible concern for safety-related components. Dominion's justification for all component group or total system exclusions is presented in Technical Report: LR-1921/LR-2921, Aging Management of Criterion 2 (NS>SR) Component Groups not Addressed in AMR Reports, Attachments 4 and 5. The following is a summary of the attachments:

System(s)	Component Groups	Exclusion Justification
EH, LO, GM	All	These are oil systems with components in separate areas for spill control and are not spatially oriented in the area of 54.4 Criterion 1 components. Piping outside of these locations are not spatially oriented in the area of 54.4 Criterion 1 components.
LW, DC	Tanks, Pumps	LW and DC tanks and pumps are located in isolated cubicles for ALARA reasons and not spatially oriented in the area of 54.4 Criterion 1 components.
PG	Tanks, Heat Exchangers, Pumps	The PG tanks are located outside in the yard area. The heat exchangers are located in an isolated pit for tank heating. The pumps are isolated in their own cubical. None are spatially oriented in the area of 54.4 Criterion 1 components.
BR, SS, HRS	Filters	The BR and SS filters are located in isolated cubicles for ALARA reasons and not spatially oriented in the area of 54.4 Criterion 1 components.
FC	Pumps and Filters	The FC pumps and filters are located in isolated cubicles for ALARA reasons and not spatially oriented in the area of 54.4 Criterion 1 components.
WT	Tanks, Filters, Pumps	The WT tanks, filters, and pumps are located in an area of the Turbine Building basement remote from any SR components and; therefore, not spatially oriented in the area of 54.4 Criterion 1 components.
RT	Pumps	These pumps are located on the Auxiliary Building basement floor. They are secured and isolated any time the RCS is >200°F. Based on their location on the floor and shut down condition they have been determined not to be spatially oriented near 54.4 Criterion 1 components.
PL, DB	Tanks, Filters, Concrete-encased piping	The tanks are the actual drainage sumps recessed in the floors. The concrete-encased piping are the floor drain lines in the associated buildings. The filters are located in isolated cubicles for ALARA. Therefore, these components are not spatially oriented in the area of 54.4 Criterion 1 components.
GW	Tanks, Filters	The GW tanks and filters are located in isolated cubicles for ALARA reasons and not spatially oriented in the area of 54.4 Criterion 1 components.
FW (Oil)	Tanks, Piping, Valves, Filters	The Feedwater Pump lube oil subsystems are isolated to the feedwater pump skid and not spatially oriented in the area of 54.4 Criterion 1 components.

RAI 2.1-3, Supplemental Request 3 -

How has or will the applicant modify LRA information (implementing procedures, scoping/screening reports, P&IDs, etc.) to identify such changes for systems that were previously within the scope of license renewal for which the license renewal evaluation boundary has been extended to include additional components as a result of this review (i.e., table 2.1-3-2 systems).

How has or will the applicant modify LRA information (implementing procedures, scoping/screening reports, P&IDs, etc.) to identify such changes for systems that were not previously within the scope of license renewal, but now are, as a result of this review (i.e. table 2.1-3-3 systems).

Response -

Technical Report LR-1921/LR2921, Aging Management of Criterion 2 (NS>SR) Component Groups Not Addressed in Aging Management Review Reports, documents the Dominion position on the integrated plant assessment of non-safety-related system components that are spatially oriented near safety-related system components. This report is the result of (1) the clarification of the Nuclear Regulatory Commission (NRC) scope definition of Criterion 2 (NS>SR) ascertained in the Dominion discussions with the NRC staff during the Scoping Audit and (2) subsequent Request for Additional Information (RAI) 2.1-3 and 2.1-4. This document supplements Technical Report LR-1007/LR-2007, Criterion 2 Report: Non-Safety-Related Affecting safety-Related and will be carried forward to provide the additional engineering requirements for implementation.

P&ID drawings do not present, in all cases, the spatial orientation of components in a system with respect to structure location; and therefore, are not appropriate to depict this increase in scope. Dominion is presently evaluating the use of a note on drawings to indicate that non-safety-related components in scope due to spatial orientation are not highlighted and direct user to Technical Report LR-1921/LR-2921 for additional guidance.

As discussed with the NRC Scoping and Screening audit team from Region II, spatial relationship is based on structure and system. The following methodology is used to determine in scope spatial orientation:

The systems with increased license renewal boundaries are presented in Attachment 2 of Technical Report LR-1921/LR-2921. The systems added to scope of licensing renewal due to the expansion of Criterion 2 scope are presented in Attachment 3 of Technical Report LR-1921/LR-2921.

The passive mechanical components in the systems described in Attachment 2 and 3 to Technical Report LR-1921/LR-2921 that reside in the structures presented in Attachment 1 are considered to be within the scope of license renewal based on spatial orientation, except as specifically excluded in Attachments 4 and 5 to Technical Report LR-1921/LR-2921 (See response to question 2 above).

RAI 2.1-3, Supplemental Request 4 -

Was any thermal insulation added to the scope of license renewal as a result of the response to RAI 2.1-3? Is there any mirror insulation associated with components added to scope as a result of this RAI?

Response -

The conclusion stated in LRA Section 2.1.5.5 that no thermal insulation needs to be included within the scope of license renewal remains valid. No intended functions have been identified for thermal insulation associated with plant components added to the scope of license renewal by the response to RAI 2.1-3, and no thermal insulation has been identified as being within the scope of license renewal. Additionally, there is no "mirror insulation" associated with the components added to scope as a result of this RAI.

RAI 3.5-5:

In both LRAs, Appendix B, the information provided states that the ISI Program - Containment Inspection includes Category E-P (all pressure retaining components), which refers to 10 CFR 50, Appendix J, Option B. However, there is no description of the 10 CFR 50, Appendix J leak rate testing activity as an aging management program. In a conference call with the applicant, dated August 8, 2001, the applicant stated that Option B is one means of fulfilling the requirements of 10 CFR Part 50, Appendix J. The applicant verified that they use Option B as approved by the staff for both NAS and SPS. However, in previous discussions with the industry, the staff justified the need for an applicant to credit an integrated leak-rate program that is described in more detail in the LRA. Although the staff has determined that an integrated leak rate test performed in accordance with Appendix J, Option B, and consistent with the requirements in TS is one means of managing the applicable aging of the Containment structure, simple reference to the ISI Program - Containment Inspection includes Category E-P, which in turn references Appendix J, Option B, is in itself not sufficient for the staff to make its determination. The applicant needs to more clearly document that the testing will be performed in accordance with Appendix J, Option B, and consistent with the associated requirements in TS.

Dominion Response:

Containment leakrate testing is performed as required by Surry Technical Specification 4.4 (Containment Tests) and North Anna Technical Specification 3.6.1.2 (Containment Leakage). These technical specifications invoke the testing requirements of 10 CFR 50, Appendix J, Option B. Containment leakrate testing, in accordance with the ISI Program - Containment Inspection activity described in Section B2.2.12 of the application, is credited with managing the aging of Containment pressure-retaining components. Compliance with identified testing requirements and acceptance standards confirms that the management of aging effects for sealing surfaces is effective to ensure the integrity of the Containment pressure boundary.

Supplemental Information:

RAI 3.5-5, Supplemental Request -

The staff agrees that a separate leak rate testing AMP is not necessary; however, the applicant is requested to supplement their RAI response to 3.5-5 to include a description of their operating experience implementing Appendix J leak rate testing so that we have reasonable assurance that this aspect of the ISI Program - Containment Inspection activity will be adequately implemented during the period of extended operation.

Response -

Dominion's response to RAI 3.5-5 stated that Appendix J testing is performed in accordance with Surry Technical Specification 4.4 and North Anna Technical Specification 3.6.1.2. For both stations, these Technical Specifications state that leak rate testing is performed as required by 10 CFR 50, Appendix J, Option B, as modified by approved exemptions, and in accordance with the guidelines contained in Regulatory Guide 1.163 (September 1995). Appendix J provides specific limits for the frequencies of Type A, B, and C testing. However, Option B and RG 1.163 allow for performance-based extensions of these limits to as long as 120 months between tests, depending on the performance history. No credit is taken within license renewal for Type C testing due to the active function (i.e., not within the scope of license renewal) of the containment isolation valves.

All of the Surry and North Anna units are permitted, by provisions of 10 CFR 50, Appendix J, Option B, to perform Type A containment integrated leak rate testing every 10 years. This provision to perform testing once per 10 years, instead of three times per 10 years, occurs only because of satisfactory results from previous tests. The satisfactory test results indicate the absence of aging effects.

Operating results for Type B electrical penetration testing are evaluated at intervals coinciding with refueling outages as required by Surry and North Anna station procedures. Each evaluation includes a review of the results of previous tests for the containment electrical penetrations and determines whether the testing frequency can be extended. If the results for the two previous tests of each penetration were within established acceptance criteria, as stated in Station procedures to ensure compliance with Appendix J, then the testing frequency for that penetration can be extended to as much as once per 120 months (although the maximum interval is administratively limited to 60 months for Surry) as allowed by Option B and RG 1.163.

The history for Type B electrical penetration testing is excellent. There is no pattern of aging effects causing repeated failures of the same electrical penetration. A review of the electrical penetration testing results for the past three refueling outages at Surry and North Anna indicates an acceptable value for total leakage from electrical penetrations which has allowed the testing to remain at the relaxed frequency. The absence of repetitive failures for electrical penetration leakage confirms that aging effects are not a concern.

RAI 3.5.8-2:

In the NAS LRA, Section 3.5.8, the applicant does not discuss the loss of material and loss of form of soil used in earthen structures exposed to a raw water environment. Loss of material and loss of form may occur to the soil due to the various aging mechanisms described in the LRA, Appendix C (e.g., erosion, sedimentation, subsurface flow, etc.). Therefore, the staff requests that the applicant provide a technical basis as to why loss of material and loss of form of the soil in a raw water environment are not included as applicable aging effects requiring aging management.

Dominion Response:

The earthen structure exposed to a raw water environment, as described in the North Anna application, Section 3.5.8, is the Service Water Reservoir (SWR). The SWR embankment dike consists of a wide core of compacted random fill, fine and coarse filters, and a wide outside zone of compacted rockfill. The core is protected on the upstream side by a select fill (2-foot clay liner with a permeability of 1×10^{-6} cm/sec) and on the downstream side by the fine and course filters that extend beneath the compacted rockfill. The clay liner on the upstream slopes is protected with a layer of dumped rockfill.

The entire bottom of the SWR is lined with the same 2-foot clay liner that protects the core of the embankment dike. The insitu material (saprolite) in the bottom of the SWR, below the clay liner, is estimated to have the same permeability (1×10^{-6} cm/sec) as the clay liner. Although the insitu material was not installed and compacted to the same standards of the clay liner, its low permeability further reduces the seepage of water from the bottom of the SWR.

Loss of material from the SWR embankment dike in a raw water environment could occur from wave action. However, the clay liner on the waterside slope of the dike embankment is protected from loss of material due to wave action by a 2-foot layer of dumped rockfill.

The clay liner that is installed on the bottom of the SWR could experience loss of material and loss of form in a raw water environment from the following two conditions:

- Flow of water over the surface of the liner in the area of the Service Water Pump House (SWPH) service water intake.
- Flow of water over the surface of the liner as a result of the operation of the winter bypass headers at the Service Water Valve House (SWVH).

Tests performed at Massachusetts Institute of Technology (MIT) on the clay liner material from the North Anna SWR indicate that flow rates greater than 0.55 fps are necessary to initiate erosion of the liner. A concrete liner, which has been designed and installed around the intake to the SWPH, reduces the maximum flow rate expected across the impervious clay liner to 0.20 fps.

The clay liner could experience loss of material and loss of form as a result of the operation of the underwater bypass headers at the SWVH. However, the winter bypass system is designed so that exit velocities are minimized. A coarse aggregate erosion apron, which has been placed on the reservoir bottom in the vicinity of the bypass piping discharge, is sized to ensure that velocities over the clay liner are less than 0.55 fps.

Loss of material and loss of form of the SWR embankment dike in a raw water environment could occur from subsurface flow. Subsurface flow (seepage) is the process by which excess ground water moves from the soil mass and exits to the closest available drainage path. Seepage is generally a problem during the initial filling of a reservoir or water control structure. Seepage may lead to the migration of soil fines out of the soil mass. This phenomenon is known as piping. The following techniques have been incorporated into the SWR embankment dike to prevent piping:

- Construction of the impervious lining of the dike with materials that, by their nature, have a high resistance to piping.
- The introduction, into the downstream portion of the dike, of filters that form a transition in gradation.
- Stringent requirements for uniformly compacted embankments, with emphasis on control of water content and density during construction.

Another source of piping-type failures is along conduits built into or under an embankment. Such a failure is not possible at the SWR because all service water system piping is above the normal saturation level within the core section of the embankment.

The SWR could experience a loss of form from sedimentation buildup, which could limit the storage capacity required for emergency cooling. However, a sedimentation or sludge depth of up to 4 feet can be tolerated without impacting the thermal performance of the 30-day cooling water inventory of the SWR. After twenty years of operation, only 1 foot of sludge buildup has occurred in the SWR. Therefore, sludge buildup will not result in loss of form for the period of extended operation.

Because of the protective measures that have been provided in the design and construction of the SWR, loss of material and loss of form of the soil exposed to the raw water environment are not aging effects that require aging management.

Additionally, a review has determined that there is no North Anna operating experience to support a concern for loss of material or loss of form of soil in Earthen Structures exposed to a raw water environment.

Supplemental Information:

RAI 3.5.8-2, Supplemental Request -

The applicant's response is adequate; however the staff is concerned about the possibility of sludge buildup in the SWR. The applicant states that through 20 years of operation, 1 foot of sludge buildup has occurred in the SWR. Using linear extrapolation, 3 feet of sludge buildup would occur after 60 years. However there is no reason to assume a linear relationship since we only have one data point (1 ft. in 20 yrs). The staff considers that a one-time inspection of the SWR prior to entering the LR term is appropriate.

Response -

A licensee follow-up action has been initiated to require a one-time measurement of sludge buildup in the service water reservoir at North Anna Power Station. The measurement will be performed just prior to the period of extended operation. An engineering evaluation of the result will determine the need for future measurements.

This licensee follow-up action will be presented with the Aging Management Activity summary for Service Water in the UFSAR Supplement for North Anna Power Station.

RAI 3.5.9-2:

Section 4.1 of the WOG GTR states that RCS support components are not generally designed to use bolted joint connections requiring pre-load. However, it also states that in the event that pre-load is important for a specific support design, a locking mechanism can be used to ensure that the pre-load is not lost. If a locking mechanism is not used, a plant-specific CLB inspection program may include an inspection of the connection for loss of preload if deemed necessary. LRA, Section 3.5.9, states that preloading has been utilized, but it did not indicate that locking mechanisms were used or that an inspection program is in place. Therefore, the staff requests that the applicant identify the specific supports which rely on bolt pre-load to remain functional, identify the bolt materials, and provide technical justification for not providing a locking mechanism or performing inspections.

Dominion Response:

Based on the NSSS supports materials and environment at Surry and North Anna, loss of bolt pre-load is not an aging effect requiring management. As described in the response to Applicant Action Item 16, Part 4 of 7 (Page 3-365 of the Surry LRA and Page 3-361 of the North Anna LRA), the maximum temperature to which the bolting is exposed is less than the threshold temperature for stress relaxation that could result in loss of pre-load. Therefore, there are no bolting applications where loss of pre-load is an aging effect requiring management for NSSS Supports.

Supplemental Information:

RAI 3.5.9-2, Supplemental Request -

The NRC Staff requests that the applicant address loss of pre-load due to mechanisms other than stress relaxation due to temperature.

Response -

The Dominion evaluation of NSSS supports considered both vibration and stress relaxation as aging mechanisms that could potentially result in loss of pre-load. The results of our evaluation indicate that loss of pre-load is an aging effect that does not require aging management of NSSS support component bolting.

Vibrational effects on the Surry and North Anna NSSS component supports were considered in the design and construction of the bolted connections. The Surry and North Anna design included adequate pre-load of bolted connections. Bolting materials and torque were specified to ensure that design requirements were met, including consideration of vibrational loads. A review of industry and Surry and North Anna operating experience indicates that the bolted connections used in NSSS component supports have not been subject to self-loosening by vibration. Therefore, loss of pre-load due to vibrational loading is not considered in the aging management review of the Surry and North Anna NSSS component supports' bolting. This rationale has been accepted by the Staff during the Oconee LRA review (NUREG-1723, Section

3.8.3.1.13, RAI 3.4.11-2) and ANO-1 LRA review (NUREG- 1743, Section 3.3.6.4.2.1, page 3-238).

In the response to Applicant Action Item 16, Part 4 of 7 (Page 3-365 of the Surry LRA and Page 3-361 of the North Anna LRA), Dominion indicated that the maximum temperature to which the NSSS support components' bolting is exposed is less than the threshold temperature for stress relaxation that could result in loss of pre-load. That description is consistent with the discussion in Section 3.3.1.8 of WCAP 14422, Rev. 2-A, which describes how the WOG determined that the temperature in the PWR RCS supports is generally below 650°F, well below half of the melting point of steels and that creep and stress relaxation are not extended operation issues associated with the RCS supports. Similarly, since the bolted connections experience service temperatures lower than the 650°F stated above, the NSSS primary support bolting is not subject to stress relaxation. A review of Surry and North Anna operating experience indicates that the bolted connections used in NSSS component supports have not been subject to self-loosening by stress relaxation. Therefore, loss of pre-load due to stress relaxation is an aging effect that does not require management for Surry and North Anna NSSS component support bolting.

In the discussion concerning the AISC manual's requirement of a minimum bolt tension equal to 70 percent of ultimate, WCAP – 14422, Rev. 2-A, Section 3.3.1.8 states the following: "WOG recognizes this requirement on Page 5-2 of the WOG report and states that a license renewal applicant must identify 'any specific program necessary to ensure that proper preload is retained for the component supports within the scope of this report.'" This is the requirement for the Renewal Applicant Action Item 16. Dominion does identify any specific program necessary to ensure that proper pre-load is retained since mitigating vibration is considered a feature of design and temperatures are below 650°F (well below half of the melting point of steels).

RAI 3.5.9-4:

LRA Table 3.5.9-1, Footnote 2 indicates that for the neutron shield tank support structure and the reactor coolant pumps, steam generator, and pressurizer support structures, the carbon steel and low-alloy steel material group includes high-strength bolting. However, the table does not identify cracking of high-strength bolting as an aging effect requiring management. Therefore, the staff requests that the applicant provide technical justification for this omission. (This request also applies to LRA Section 3.5.10, General Structural Supports.)

Dominion Response:

Stress corrosion cracking (SCC) is the aging mechanism that results in cracking of high strength bolting. As discussed in the LRA, Section C3.2.1, SCC requires the simultaneous action of a corrosive environment, sustained tensile stress, and a susceptible material. Elimination of any one of these elements will eliminate the susceptibility to SCC. Additionally, the susceptibility of materials to SCC is dependent on the magnitude of these elements. In other words, the greater the tensile stress, the greater the yield strength of the material, or the more severe the environment; the more susceptible a given material is to SCC.

Although the industry has experienced instances of cracking of carbon steel and low-alloy steel bolting due to SCC, these failures have been attributed to high yield strength materials (>150 ksi). For the carbon and low-alloy steel high-strength bolting utilized in the supports (identified by footnote 2 in Table 3.5.9-1 and footnote 3 in Table 3.5.10-1 of the application), the material yield strength ranges from 140 to 160 ksi. Therefore, the yield strengths for these materials only marginally exceed the threshold at which materials are considered susceptible to SCC. These bolts are located in a sheltered air environment that is not corrosive and, therefore, is not conducive to initiation of SCC in these materials. Therefore, there is reasonable assurance that cracking of the carbon and low-alloy steel high-strength bolting of the Surry and North Anna NSSS equipment supports and general structural supports is not an aging effect that requires management. In addition, a review of plant-specific operating experience did not identify cracking of these bolting materials in support applications.

Supplemental Information:

RAI 3.5.9-4, Supplemental Request -

The staff needs more information from the applicant regarding RAI 3.5.9-4, which concerns high-strength bolting used for the neutron shield tank support structure and reactor coolant pumps, steam generator, and pressurizer support structures. The staff requests the specific carbon and low-alloy steel used for the bolts so we can determine the yield strength. If the applicant can provide both the specific steel and its yield strength, that would be helpful.

Response -

The requested information is provided in the table titled "NSSS Support High-strength Bolt Material Mechanical Properties – Surry and North Anna Power Stations."

Consistent with Dominion's response to RAI 3.5.9-4, it should be noted that the environment for the NSSS support bolting is a hot and dry environment. In the LRA Section C3.2.1, Dominion discussed that stress-corrosion cracking (SCC) requires the simultaneous action of a corrosive environment, sustained tensile stress, and a susceptible material. Elimination of any one of these elements will eliminate the susceptibility to SCC. For stress-corrosion cracking (SCC) to occur, presence of an electrolyte is required. Dry bolts cannot fail by SCC independent of pre-load and yield strength. Therefore, since the environment for NSSS support bolting is a hot and dry environment, the Dominion evaluation does not consider SCC as an applicable aging mechanism.

NSSS Support High-strength Bolt Material Mechanical Properties
Surry and North Anna Power Stations

Material	Yield Strength (PSI)		Tensile Strength (PSI)		Hardness	
	Minimum	Maximum [1] (Estimated)	Minimum	Maximum [1] (Estimated)	Rockwell	Brinell
A 574	**153,000**	*186,100*	**170,000**	*206,800*	**37-45**	
UNBRAKO[5]	**153,000**	*186,100*	**180,000[4]**	*218,920*	**37-45**	
Allen	**153,000**	*168,700*	**170,000**	*187,500*	**39-43**	
A490	**130,000**	*147,350*	**150,000[3]**	**170,000[3]**	**33-38**	
A354 Gr BD	**130,000**	*163,600*	**145,350**	*182,900*	**31-39**	
A540 B23 Class 3	**130,000**	*166,400*	**145,000**	*185,600*		**293-375**
A 193 Gr B7	**105,000[6]**	**See note 6**	**125,000**		**Not Specified**	**Not specified**
A331 Gr 4340	**120,000 [2]**	**130,000 [2]**			**Not Specified**	**Not Specified**

Notes:

1) The maximum yield strength **were estimated** using the ratio of hardness and the minimum tensile strength to determine the maximum tensile strength and the maximum yield strength. **Estimated values are shown in italics.**
2) Actual range specified was 120,000 psi to 130,000 psi in the drawing.
3) Actual range specified was 150,000 psi to 170,000 psi in the drawing.
4) Based on vendor catalog.
5) UNBRAKO meets the requirements of ASTM A-574 except the minimum tensile strength is 10,000 psi higher per vendor catalog.
6) A sample review of approximately 160 test results, over a five year period, has indicated that all tested samples have maintained yield strengths below 150 ksi, and in only one case did the yield strength exceed 140 ksi (Reference LR-1914/LR-2914, Rev.3 "Surry and North Anna Power Station Bolting " Technical Report).

Estimation of Maximum Yield Strength:

Minimum TS / Minimum Hardness = Factor 1

Factor 1 X Maximum Hardness = Maximum TS

Minimum YS / Minimum TS = Factor 2

Factor 2 X Maximum TS = Maximum YS

RAI 3.5.9-5:

LRA Table 3.5.9-1 credits the Inservice Inspection (ISI) Program - Component and Component Support Inspections for managing cracking of high strength maraging steel bolting in an air environment. As described in Appendix B2.2.11, the program is based on ASME IWF Category F-A for component supports which requires VT-3 visual inspection method. It is not apparent to the staff that a VT-3 visual inspection is capable of detecting stress corrosion cracking in high strength support bolting before intended function is compromised. Therefore, the staff requests that the applicant provide additional technical justification on the adequacy of this inspection method for managing stress corrosion cracking in a high strength support bolts.

Dominion Response:

The requirements of ASME Section XI, Subsection IWF constitute the current licensing basis requirements for inspection of supports for ASME Class 1, 2, 3, and MC components for Surry and North Anna. These requirements are the current industry standard for inspection of nuclear component supports.

In addition, the NRC staff has accepted the inspection requirements of ASME Section XI, Subsection IWF as an effective aging management program for cracking of structural bolting in its Safety Evaluation Reports for Calvert Cliffs (NUREG-1705) and Arkansas Nuclear One Unit 1 license renewal applications.

Therefore, the aging management approach for NSSS Supports described in the license renewal applications for Surry and North Anna is consistent with the current licensing basis requirements and NRC staff accepted methodologies for license renewal.

Supplemental Information:

RAI 3.5.9-5, Supplemental Request -

As stated by the applicant, the staff has accepted the IWF VT-3 inspection for high-strength bolting used in component supports for previous applications. In the staff FSER for the WOG GTR, paragraph 3.4.2, the staff accepted AMP-1.3 "Stress Corrosion Cracking (bolting)" to manage SCC of structural bolting used in Class 1 component supports. AMP-1.3 references IWF in Table 4-4. However, Section 4.2.2 of the WOG GTR states,

"The aging management program attributes in Section 4 of the report are intended to be implemented after completion of an initial baseline evaluation of the bolts in the RCS supports.

The initial baseline evaluation should follow the guideline in EPRI report NP-5769 including exceptions taken by NUREG-1339 and Generic Letter 91-17. Once the baseline evaluation is performed, structural integrity of the bolts in the RCS supports is thoroughly checked. In other words, the elements that influence the bolts' susceptibility to SCC are reviewed and satisfied with respect to the guidelines of EPRI report NP-5769.

The SCC baseline evaluation provides justification to eliminate (specific) SCC inservice inspection (ISI) for bolts in the RCS supports. The ASME Section XI requirements are still retained as defined in the other attribute tables. The visual examinations of ASME Section XI in the aging management program attributes are designed to detect conditions of any leakage or other contaminants that may cause degradation of bolts by SCC."

The staff reviewed Section 11 of Volume 2 of the EPRI report, entitled "Evaluation Procedure for Assuring Integrity of Bolting Material in Component Support Applications", which provides an approach to evaluate the allowable bolt load based on the fracture properties of the materials. Consistent with WOG GTR Section 4.2.2, the staff identified Renewal Applicant Action Item 11, requiring a plant-specific initial baseline inspection.

Response -

As stated in Section 4.2.2 of the WOG GTR and following the guideline in EPRI Report NP-5769, including exceptions noted in NUREG 1339 and Generic Letter 91-17; the initial baseline evaluation of the high-strength bolts has been conducted. The evaluation approach has involved assessment of the SCC susceptibility based on bolt material yield strength and environment. (Conservatively, all bolts have been considered in the evaluation as having sustained tensile stress.) The bolts have been categorized in three groups:

Materials specified as medium strength (120 ksi < Sy < 150 ksi, where Sy is the maximum yield strength determined from the maximum hardness specified in the ASTM standard for the particular material where available).

Materials specified as high strength (150 ksi ≤ Sy < 200 ksi, where Sy is the maximum yield strength determined from the maximum hardness provided in the ASTM standards for the particular material where available).

Materials specified as ultra-high strength (Sy ≥ 200 ksi, where Sy is the specified minimum yield strength).

Bolt materials with 120 ksi < Sy < 150 ksi have been excluded from further evaluation because they are not susceptible to SCC based on their maximum yield strength as identified in LRA Appendix C, Section 3.2.1 – Stress-Corrosion Cracking.

Materials with Sy ≥ 150 ksi and less than 200 ksi, where Sy is the maximum yield strength evaluated based on the maximum hardness of the material, have been evaluated to verify if they are susceptible to SCC. These bolts are in a benign hot and dry environment not conducive to SCC. This is documented in the response to RAI 3.5.9-4.

Due to their greater susceptibility to SCC, ultra-high-strength bolts with Sy ≥ 200 ksi, where Sy is the minimum specified yield strength, have been conservatively assumed to be exposed to an environment conducive to SCC. However, the environment is a benign hot and dry environment not conducive to SCC. The ISI Section XI Subsection IWF Program has been attributed to manage cracking of these bolts due to SCC. This inspection requirement is in accordance with the current licensing basis for inspection. The visual examinations of ASME Section XI Subsection IWF will detect conditions of any leakage or other contaminants that may cause degradation of bolts by SCC.

Regarding plant-specific baseline inspections, Dominion refers the NRC staff to the statement identified in the application in Table 3.5.9-W1 WCAP-14422, Rev.2-A, FSER Response to Applicant Action Items – Action Item No 11. Although not characterized as "Baseline Inspections" at the time they were performed, inspections of the RCS primary supports that serve as baseline inspections have been performed and documented under the Inservice Inspection Program.

RAI B2.2.7-1:

Provide the following information regarding the "Parameters Monitored and Inspected:"

a. The LRAs, Section B2.2.7, contain a statement that penetration seals are checked for an adequate amount of fire-stop material. Provide a complete description of the parameters monitored and inspection. Specifically state whether the parameters monitored and inspected include examinations for any sign of degradation such as cracking, seal separation from walls and components, separation of layers of material, rupture, and puncture of seals which are directly caused by increased hardness and shrinkage of seal material due to weathering. If not, explain the technical basis for the inspections that are performed.

b. Describe the aging management activity used to monitor the performance of the fire protection diesel-driven fire pump fuel line to ensure that it can perform the intended function. Provide sufficient detail of the AMAs used to adequately demonstrate that the applicable aging effects are being managed such that the intended function will be maintained consistent with the CLB throughout the period of extended operation.

Dominion Response:

a. As part of the Dominion Fire Protection Program, penetration seals are confirmed to be intact and free of damage, and to have an adequate amount of fire-stop material. This visual inspection ensures the absence of voids, cracks, punctures, or separation of layers for the sealing material.

b. The integrity and absence of fouling of the fuel supply line for the diesel-driven fire pump is confirmed by an operational test of the pump that is performed as part of the Dominion Fire Protection Program. The pump is run in the recirculation mode each month. The speed of the pump is verified to be within the expected range for the test, and verifies the ability of the fuel oil line to provide the expected amount of flow to the engine. A local inspection of the fire pump components, including the fuel oil line, is performed during the periodic test. Testing of the diesel-driven fire pump is consistent with NFPA-25. The run capability of the pump each month confirms the integrity and absence of fouling of the line that provides the fuel oil supply.

Supplemental Information:

RAI B2.2.7-1, Supplemental Request -

The applicant's response to RAI B2.2.7-1 indicated that diesel fire pump testing is performed in accordance with NFPA-25. However, NFPA-25 requires recirculation flow testing to be performed weekly, but the applicant indicated that recirculation flow testing is performed monthly. Please explain.

Response -

Dominion performs monthly recirculation testing of the diesel-driven fire pump as required by the Dominion Technical Requirements Manual. (The Technical Requirements Manual (TRM) contains requirements that have been removed from the Plant Technical Specifications following NRC approval. The TRM is a controlled document). In addition to being implemented in accordance with the requirements of the TRM, the monthly frequency also is consistent with guidelines provided by NEIL (Nuclear Electric Insurance Limited). The original RAI response incorrectly states that monthly recirculation testing is consistent with NFPA-25.

RAI B2.2.7-2:

Provide an aging management program that as a minimum includes a one-time non-intrusive inspection of a representative sample of fire suppression piping, near the end of the current operating term, and a second inspection within a reasonable length of time (within one refueling cycle) after the 50-year sprinkler head testing/inspection activity required by the NFPA. During these inspections, verify that excessive wall thinning has not occurred such that it may adversely affect the pressure boundary intended function of the system. In addition, verify that the inner-diameter of the pipe will provide sufficient system pressure to meet its intended function. As an alternative, an applicant can consider using its work control process as long as they can demonstrate that sufficient inspections of a representative sample of system piping is performed at an adequate frequency. The only other alternative, is to provide a technical justification, consistent with the material(s) and environment(s), that aging will not occur within the portions of this system that are within the scope of license renewal and subject to an AMR.

Dominion Response:

Pressure and flowrate testing of the fire protection system confirms that a loss of material is not degrading the ability of the system to perform its intended function. Dominion will supplement the NFPA pressure and flowrate testing credited in the Surry and North Anna license renewal applications as part of the Fire Protection Program activity with the Work Control Process activity in order to manage aging effects for the fire protection system piping. The Work Control Process, as described in Section B2.2.19 of the License Renewal Applications, provides numerous opportunities to perform internal inspections of fire protection piping. During the 7-year period between 1993 and 2000, there were in excess of 100 work orders each for Surry and North Anna for activities involving the internal surfaces of the fire protection system. These work orders provided representative samples of the materials and environments for the fire protection system. The identified frequency of work activities for the 7-year period is expected to continue into the period of extended operation. Most activities involve maintenance of valves but include internal examinations of adjacent sections of piping when disassembly is required by the Surry and North Anna maintenance programs. These inspections are performed by maintenance personnel who are VT-qualified and trained as members of a quality maintenance team (QMT). Additional description of the QMT process is provided in the response to RAI B2.2.19-3.

Findings of sedimentation or internal degradation as a result of maintenance inspections are referred to Engineering for evaluation. Any corrective action required by the engineering evaluation is implemented through the Corrective Action System in accordance with 10 CFR 50, Appendix B.

The ongoing maintenance opportunities to inspect fire protection components provide a more continuous indication for the internal condition of piping and valves than would occasional disassembly for the sole purpose of inspection.

Supplemental Information:

RAI B2.2.7-2, Supplemental Request -

Does carbon steel located in a Halon or CO2 environment require aging management?

Response -

In-scope components exposed to a carbon dioxide or Halon environment are included in the Fire Protection system. The results of the Fire Protection and supporting systems AMR are provided in LRA Section 3.3.9. The CO2 and Halon environments are identified as 'gas' environments in the LRA text and tables.

In LRA Table 3.3.9-1, the Flexible Connections, Gas Bottles, one Tanks group, and one Valve Bodies group are identified as carbon steel and low-alloy steel material exposed internally to a gas environment and externally to an air environment. As shown in the table, the AMR concludes that are there no applicable aging effects for carbon steel in the gas (CO2 or Halon) environment, or for carbon steel in the air environment. This approach is consistent with information provided by previous applicants which has been found acceptable by the NRC.

RAI B2.2.7-3:

In the LRAs, Section B2.2.7, the discussion on monitoring and trending contains a statement that various types of fire protection equipment are visually inspected at frequencies that vary from 31 days to 3 years. More specific information is needed regarding the frequency of inspections for the applicable components. Provide the inspection/test frequencies and discuss the technical basis for the following items:

a. penetration seal inspections (including percent of each type inspected each time)

b. fire door inspections for holes in the skin, clearances, wear or missing parts

c. fire door functional tests to verify the operability of automatic hold-open, release, closing mechanisms and latches

d. yard fire hydrant visual inspections

e. fire hydrant hose hydrostatic tests, gasket inspections, and fire hydrant flow tests

f. sprinkler system inspections

Dominion Response:

The inspection and testing activities listed below are performed in accordance with the Dominion Fire Protection Program. Testing and inspection frequencies are consistent with guidance provided by NFPA.

a. Penetration seals are visually inspected to ensure adequate fill material and the absence of cracks or visible damage. At Surry, all seals are inspected every 18 months, except for those that are blocked on both sides with damming material, the removal of which could damage the seal. In these situations, the damming material (such as Marinite) is verified to be intact and free of damage. At North Anna, seals (except those with damming on both sides) are inspected on a rotating basis such that 20% of the seals are inspected every year.

b. Fire doors are visually inspected to ensure that the doors have proper clearance and are free of obstructions, are intact (i.e., no wear or missing parts), have no holes, and are capable of being closed and latched. These inspections are performed monthly.

c. Fire doors that have automatic hold-open mechanisms are functionally tested at least monthly to ensure that each auto-close mechanism is intact and capable of performing its intended function. The door-release function is tested, and the door is confirmed to be capable of closing and latching properly.

d. Visual inspections of yard fire hydrants are performed at least quarterly.

e. Fire hoses (and associated gaskets) are considered to be consumables that are not subject to an aging management review. Fire hydrant flow tests are performed every 3 years.

f. The deluge and sprinkler systems are visually inspected every 18 months.

Supplemental Information:

RAI B2.2.7-3, Supplemental Request 1 -

The applicant's response to RAI B2.2.7-3 indicates compliance with NFPA. However, with respect to flow tests of hydrants, the applicant indicates that the tests are done every three years, but NFPA includes annual testing. Please explain.

Response -

Dominion provided surveillance frequencies for a number of components and stated that the frequencies are consistent with NFPA. Hydrants were among this listing of components for the RAI response. NFPA-25 requires an annual flow test of hydrants, but Dominion performs the flow testing every three years as required by the TRM. This difference in testing frequency should have been identified as an exception to NFPA in our RAI response.

A complete review of the Dominion RAI responses for fire protection has identified no additional differences of testing frequencies between the RAI responses and those provided by NFPA for the scope of components listed in the RAI's.

RAI B2.2.7-3, Supplemental Request 2 -

How are fire hoses addressed in the license renewal application?

Response -

Fire hoses are within the scope of license renewal. Fire hoses have been determined to be short-lived items, as discussed in LRA Section C2.3 "Identification of Short-Lived Components and Consumables", and are not subject to aging management review.

RAI B2.2.11-1:

Aging management activity (AMA) B2.2.11, entitled "ISI Program- Component and Component Support Inspections," includes within its scope ASME Section XI, Subsection IWC, Examination Category C-F-2. The AMA description under "Scope" states "License renewal concerns with respect to Subsection IWC include only the carbon steel piping that is susceptible to high energy line breaks in the feedwater and main steam systems."

a. Subsection IWC identifies a number of examination categories applicable to Class 2 systems. The staff requests the applicant to either (1) describe the AMA credited to manage aging of Class 2 systems, in lieu of IWC, or (2) explain the technical basis for concluding that Class 2 systems do not require aging management.

b. This AMA does not reference Subsection IWD, applicable to Class 3 systems. The staff requests the applicant to either (1) describe the AMA credited to manage aging of Class 3 systems, in lieu of IWD, or (2) explain the technical basis for concluding that Class 3 systems do not require aging management.

Dominion Response:

The results of the aging management reviews for ASME Class 2 and Class 3 components of mechanical systems within the scope of license renewal are provided in Section 3.0 "Aging Management Review Results". Mechanical components, other than ASME Class 1, were not specifically identified in the application by ASME Class designation. However, Class 2 and Class 3 components have been determined to be subject to aging effects, such as loss of material and cracking, and these effects will be managed as indicated in the aging management review results tables provided in the application.

As an example, in Table 3.2-4 of the North Anna application, Class 2 stainless steel piping in the Residual Heat Removal system that is exposed internally to treated water is subject to loss of material and cracking. As indicated in the table, these aging effects are managed by the Chemistry Control Program for Primary Systems, which is described in Section B2.2.4 of the application.

As another example, in Table 3.3.2-3 of the Surry application, Class 3 carbon steel Service Water system piping that is exposed internally to raw water is subject to loss of material. As indicated in the table, this aging effect is managed by the Service Water System Inspections activity, which is described in Section B2.2.17 of the application.

Therefore, as identified in the aging management review results section of the license renewal application, ASME Class 2 and 3 components are managed for the effects of aging.

Supplemental Information:

RAI B2.2.11-1, Supplemental Request -

Is the chemistry program complemented with an inspection activity for Class 2 piping?

Response -

Inherent in the Dominion approach to chemistry control as an aging management activity are the numerous inspection opportunities associated with planned and corrective maintenance activities performed as a part of the Work Control Process. The Work Control Process provides a confirmation that the Chemistry Control Program for Primary Systems and the Chemistry Control Program for Secondary Systems are effective in managing the effects of aging that could affect the intended functions of plant SSCs.

The LRA Sections A2.2.19 and B2.2.19 descriptions of the Work Control Process Aging Management Activity document that visual inspections provide data that can be used to determine the effectiveness of chemistry control aging management activities to mitigate the aging effects of cracking, loss of material, and change of material properties. The Operating Experience discussion of LRA sections B2.2.4 Chemistry Control Program for Primary Systems and B2.2.5 Chemistry Control Program for Secondary Systems document that the preventive and corrective maintenance activities include numerous component inspections and confirm that, with the exception of steam generator tubes, there has been no significant degradation in the ability of components to perform their intended functions due to chemistry concerns. These inspections will continue throughout the lifetime of the plant, as described in LRA section B2.2.19 Work Control Process, and provide confirmation of the effectiveness of the chemistry control program.

Therefore, although inspection activities generally are not specifically credited along with the chemistry control aging management activities for ASME Class 2 piping, the inspections associated with the Work Control Process provide confirmation of the effectiveness of these programs in managing the effects of aging.

RAI B2.2.19-3:

Both LRAs, Section B2.2.19, under, "Operating Experience," need additional information regarding the operating experience for the existing Work Control Process at NAS 1 and 2, and SPS 1 and 2.

Operating experience should include a discussion of past aging and/or failures detected, and any corrective actions resulting in program enhancements or additional programs. A past failure would not necessarily invalidate an AMP because the feedback from operating experience should have resulted in appropriate program enhancements or new programs. This information should demonstrate that there is reasonable assurance that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

Dominion Response:

The Dominion Work Control Process integrates and coordinates the combined efforts of Maintenance, Engineering, Operations, and other support organizations to manage maintenance activities. Maintenance activities (e.g., work orders, corrective and preventative maintenance, periodic testing, predictive analysis) afford the opportunity to inspect numerous components and accessible piping for the purpose of determining the material condition of these system components while open for maintenance. Additionally, fluid samples are obtained for predictive analysis evaluation.

Consistent with the NRC License Renewal Safety Evaluation Report (SER) for Arkansas Nuclear One Unit 1, Dominion has determined that inspection of accessible surfaces of system components that are of the same material and exposed to the same environment can be used to evaluate potential aging of inaccessible surfaces. Thus, inspections of the surfaces in accessible areas can be used as a representative sample of inaccessible surfaces.

Visual inspections, performed by VT-qualified personnel, monitor system aging for cracking, loss of material, and change of material properties. Additionally, the Work Control Process provides visual inspections to supplement the primary, secondary, and fuel oil chemistry control programs. Maintenance uses Quality Maintenance Teams (QMT) to enhance the quality and thoroughness of maintenance activities. The QMTs are comprised of trained and certified craftsmen who have the authority to perform maintenance and to perform a quality check on the work of other maintenance personnel. QMT personnel are provided technical training, which includes inspector certification and visual testing (VT) certification in accordance with station administrative procedures. Additionally, QMT personnel are required to attend annual retraining and to re-certify their VT qualifications every three years.

Periodic testing monitors for heat transfer degradation of coolers and heat exchangers. Additionally, fluid samples (oil and coolant) are collected for analysis of contaminants and chemical properties. These tests and samples are used to monitor the physical condition of system components in support of aging mitigation programs.

The following operating experience examples demonstrate the effectiveness of the Work Control Process in identifying age-related concerns, before loss of intended function, and programmatic improvements.

Loss of Material in Extraction Steam Piping

While performing maintenance at North Anna to correct valve seat leakage on a carbon steel valve, maintenance identified a loss of material on the inside of the adjoining 2" pipe. This condition was evaluated through the Corrective Action System. The Corrective Action System required an engineering evaluation. The engineering evaluation identified erosion/corrosion (flow-accelerated corrosion) as the loss of material mechanism in the adjoining 2" pipe. This system location had not previously been identified as a potential erosion/corrosion location. As a result of the engineering evaluation the Secondary Piping and Inspection Program was revised to address erosion/corrosion in the subject location and similar locations in both units. The Secondary Piping and Inspection Program enhancements are an ongoing part of our inspection program to ensure secondary system reliability.

Loss of Material in Service Water Strainers

During preventive maintenance cleaning of the service water duplex strainers associated with the ventilation system chillers at Surry, maintenance personnel identified a loss of material from the strainer. As a result of the maintenance inspection, corrective action – an engineering evaluation – was requested. The engineering evaluation determined that there was active pitting corrosion. The engineering evaluation recommended that the strainers be coated with a compatible corrosion barrier coating and the Preventive Maintenance (PM) Program be revised. The service water strainers were coated with a corrosion-resistant coating and the PM program was revised to periodically inspect the coating and replace or repair the coating as necessary. The service water strainer coating and inspection PM have resulted in improved reliability of the service water strainers.

Loss of Material from the Main Control Room Chiller Condenser

During preventative maintenance (PM) at Surry to clean the chiller condenser tubes, the visual inspection identified that the epoxy coating on the tube sheet was damaged and that there were indications of corrosion and tube leakage. This condition was evaluated through the Corrective Action System. The Corrective Action System required an engineering evaluation. The engineering evaluation determined that a more corrosion resistant material should be used for the condenser and that additional Preventive Maintenance (PM) Program surveillances should be performed. New condensers are being fabricated with more corrosion resistant materials to replace the existing condensers and the PM program has been enhanced.

Cracking of the Residual Heat Removal Pipe

During a periodic test at Surry, a small boric acid spot was identified on a section of residual heat removal (RH) pipe at the Unit 2 Containment penetration area. This portion of piping is isolated during power operations. As a result of the small boric acid spot, a Deviation Report (Plant Issue) was submitted to initiate the Corrective Action System, which would determine appropriate action and track the issue to resolution. Since the leakage was at the Containment penetration and could affect Containment integrity, the Corrective Action System required the plant be brought to cold shutdown. A flaw evaluation and structural assessment was conducted. Based on leak rate testing results, Containment integrity was maintained within established leakage criteria. The Materials Engineering group performed a failure analysis of the affected piping and determined that intergranular stress corrosion cracking was present on the inside surface of the piping. Engineering Mechanics performed an evaluation on minimum wall thickness requirements and compared it with the ultrasonic examination results. Ultrasonic testing and inspection were also conducted on the similar penetration on Unit 1. Engineering concluded that Unit 1 was not subject to the failure mechanisms contributing to the Unit 2 leak. As a result of the analysis, the line was replaced and an additional isolation valve was installed closer to the penetration. To date no further failures have been identified on the residual heat removal (RH) pipe at the Containment penetration area.

These examples demonstrate the effectiveness of Dominion's Work Control Process and its use of the Corrective Action System. Dominion's history of successful operation at the North Anna and Surry Power Stations demonstrates that the Work Control Process is effective in managing the aging effects of structures, systems, and components.

The attached tables demonstrate that numerous system, component, and material & environment inspection opportunities are available, as verified by the work order database (June 1993 through August 2001). Therefore, these inspection opportunities provide reasonable assurance that the applicable effects of aging will continue to be managed such that the intended functions will be maintained throughout the period of extended operation.

Work Order Inspection Opportunities for North Anna Systems		
System	**Acronym**	**Total**
Alternate AC Diesel Generator	AAC	>100
Auxiliary Steam	AS	>100
Blowdown	BD	>100
Boron Recovery	BR	>100
Chemical Volume Control	CH	>100
Chilled Water	CD	>100
Component Cooling Water	CC	>100
Containment Vacuum	CV	74[1]
Quench Spray	QS	>100
Condensate	CN	>100
Drains – Aerated	DA	>100
Drains – Building Services	DB	>100
Drains – Gaseous	DG	41[1]
Emergency Diesel Generator	EG	>100
Feedwater	FW	>100
Fire Protection	FP	>100
Fuel Oil	FO	>100
Fuel Pit Cooling	FC	13[1]
Heating and Ventilation	HV	>100
High Radiation Sampling	HRS	81[1]
Instrument Air	IA	>100
Liquid & Solid Waste	LW	>100

Note:

1 = System contains a limited number of components and has the same material and environment combination as other systems that afford sufficient leading indicator inspection opportunities, as indicated in the Work Order Inspection Opportunities for North Anna Materials & Environments table.

Work Order Inspection Opportunities for North Anna Systems (cont.)

System	Acronym	Total
Main Steam	MS	>100
Neutron Shield Tank	NS	6[1]
Primary Grade Water	PG	25[2]
Recirculation Spray	RS	>100
S/G Water Treatment	WT	>100
Radwaste	RW	1[1]
Reactor Coolant	RC	>100
Refueling Purification	RP	42[1]
Residual Heat Removal	RH	88[1]
Sampling	SS	>100
Secondary Vents	SV	100
Safety Injection	SI	>100
Security	SEC	26[1]
Service Air	SA	40[2]
Service Water	SW	>100
Steam Drains	SD	>100
Vacuum Priming	VP	>100

Notes:

1 = System contains a limited number of components and has the same material and environment combination as other systems that afford sufficient leading indicator inspection opportunities, as indicated in the Work Order Inspection Opportunities for North Anna Materials & Environments table.

2 = System has the same material and environment combination as other systems that afford sufficient leading indicator inspection opportunities, as indicated in the Work Order Inspection Opportunities for North Anna Materials & Environments table.

Work Order Inspection Opportunities for North Anna Stagnant Water Condition in Support of Chemistry Aging Management Activities	
Systems/Groups	**WCP Inspection Opportunities**
Reactor Coolant	>100
ESF Systems (SI, QS, RS)	>100
SPCS Systems (MS, MFW, SD)	>100
Fuel Oil System	>50

Work Order Inspection Opportunities for North Anna Civil Components		
Structures	**Acronym**	**Total**
Doors	BLD	>100
Fire Barrier Penetrations	Various	>100
Personnel Hatch O-Rings	CE	>100
Electrical Penetration O-rings	PE	>100

Work Order Inspection Opportunities for North Anna Materials & Environments

Internal Environments	Stainless Steel	Carbon Steel	Nickel-based Alloys	Copper-based Alloys	Titanium	Non Metallic
Treated Water (Borated)	> 100	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Treated Water (Low Oxygen)	59	> 100	>100[9]	N/A[1]	N/A[1]	N/A[1]
Treated Water (Saturated Oxygen)	> 100	84[5]	N/A[1]	4[2]	N/A[1]	N/A[1]
Treated Water (Corrosion Inhibitors)	> 100	N/A[1]	N/A[1]	N/A[1]	0[3]	N/A[1]
Oil (Fuel & Lube)	96	> 100	N/A[1]	> 100	N/A[1]	N/A[1]
Raw Water (Brackish)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Raw Water (Drainage)	97	> 100	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Raw Water (Lake, Well, etc)	> 100	> 100	N/A[1]	14[4]	6[3]	N/A[1]
Air or Gas	66	> 100	N/A[1]	> 100	N/A[1]	10[7]
Atmosphere / Weather	N/A[1]	39[6]	N/A[1]	N/A[1]	N/A[1]	8[8]

Notes:

1 = Material and environment combination does not credit Work Control Process for license renewal.

2 = Population of 3 valves.

3 = Population of 2 heat exchangers installed in 1997.

4 = Population of 14 components.

5 = Population of 170 components.

6 = Population of 5 components.

7 = Population of 12 components.

8 = Population of 14 components.

9 = This grouping is for MS flow venturi erosion. The flow measurement periodic tests monitor erosion.

Work Order Inspection Opportunities for Surry Systems		
System	**Acronym**	**Total**
Alternate AC Diesel Generator	AAC	46[1]
Auxiliary Steam	AS	>100
Bearing Cooling	BC	>100
Blowdown	BD	63[1]
Boron Recovery	BR	>100
Chemical Volume Control	CH	>100
Circulating Water	CW	>100
Component Cooling Water	CC	>100
Containment Spray	CS	48[1]
Condensate	CN	>100
Drains – Aerated	DA	60[1]
Drains – Building Services	PL	>100
Drains – Gaseous	DG	50[1]
Emergency Diesel Generator	EG	>100
Feedwater	FW	>100
Fire Protection	FP	>100
Fuel Oil	EE	>100
Fuel Pit Cooling	FC	69[1]
Heating and Ventilation	VS	>100
Instrument Air	IA	>100
Main Steam	MS	>100
Neutron Shield Tank	NS	6[1]

Note:

1 = System contains a limited number of components and has the same material and environment combination as other systems that afford sufficient leading indicator inspection opportunities, as indicated in the Work Order Inspection Opportunities for Surry Materials & Environments table.

Work Order Inspection Opportunities for Surry Systems (cont.)

System	Acronym	Total
Primary and Secondary Plant Gas System	GN	23[1]
Primary Grade Water	PG	35[2]
Recirculation Spray	RS	>100
S/G Recirculation & Transfer	RT	18[1]
Reactor Coolant	RC	>100
Reactor Cavity Purification	RP	8[1]
Residual Heat Removal	RH	81[1]
Sampling	SS	98
Secondary Vents	SV	2[1]
Safety Injection	SI	>100
Security	SE	19[1]
Service Air	SA	24[2]
Service Water	SW	>100
Vacuum Priming	VP	>100

Notes:

1 = System contains a limited number of components and has the same material and environment combination as other systems that afford sufficient leading indicator inspection opportunities, as indicated in the Work Order Inspection Opportunities for Surry Materials & Environments table.

2 = System has the same material and environment combination as other systems that afford sufficient leading indicator inspection opportunities, as indicated in the Work Order Inspection Opportunities for Surry Materials & Environments table.

Work Order Inspection Opportunities for Surry Stagnant Water Condition in Support of Chemistry Aging Management Activities	
Systems/Groups	**WCP Inspection Opportunities**
Reactor Coolant	>100
ESF Systems (SI, CS, RS)	>100
SPCS Systems (MS, MFW, SD)	>100
Fuel Oil System	>100

Work Order Inspection Opportunities for Surry Civil Components		
Structures	**Acronyms**	**Total**
Doors	BS-DR	89
Doors - water-tight, gasket	BS-DR	7[1]
Fire Barrier Penetrations	Various	60
Personnel Hatch O-Rings	BS-PAH	>100
Electrical Penetration O-rings	PEN	>100

Notes:

1 = This applies to the Mechanical Equipment Room 3 door installed in 1993.

Work Order Inspection Opportunities for Surry Materials & Environments

Internal Environments	Stainless Steel	Carbon Steel	Nickel-based Alloys	Copper-based Alloys	Titanium	Non Metallic
Treated Water (Borated)	> 100	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Treated Water (Low Oxygen)	25	> 100	N/A[1]	> 100	> 100	N/A[1]
Treated Water (Saturated Oxygen)	> 100	57[3]	N/A[1]	92[5]	N/A[1]	N/A[1]
Treated Water (Corrosion Inhibitors)	N/A[1]	N/A[1]	N/A[1]	N/A[1]	> 100	N/A[1]
Oil (Fuel & Lube)	85	> 100	N/A[1]	87	N/A[1]	N/A[1]
Raw Water (Brackish)	> 100	> 100	1[9]	> 100	> 100	N/A[1]
Raw Water (Drainage)	76	> 100	N/A[1]	3[7]	N/A[1]	N/A[1]
Raw Water (Lake, Well, etc)	> 100	> 100	N/A[1]	22[2]	N/A[1]	N/A[1]
Air or Gas	>100	> 100	N/A[1]	>100	N/A[1]	>100[8]
Atmosphere / Weather	N/A[1]	99[6]	N/A[1]	0[4]	N/A[1]	0[8]

Notes:

1 = Material and environment combination does not credit Work Control Process for license renewal.

2 = Population of 6 heat exchangers.

3 = Population of 138 components.

4 = Population of 1 component (installed 10/95).

5 = Population of 8 components.

6 = Population of 5 components.

7 = Population of 12 valves.

8 = These groupings encompass commodity items. An FAI has been issued to identify the VS system items and issue a PM to inspect them on a periodic basis.

9 = Population of 4 radiation monitors.

Supplemental Information:

RAI B2.2.19-3, Supplemental Request -

Please provide additional information regarding the extent of planned maintenance activities with respect to the overall scope of the Work Control Process.

Response -

The Work Control Process is an important program with multiple functions at both North Anna and Surry. This is a large program that, in general, manages all planned and corrective work activities in the individual plants. Because of the importance and broad application of this program and our previous attempts to summarize its application for license renewal some confusion may now exist. Therefore, this response will supplement and clarify our previous responses to inquiries and RAIs regarding this matter.

The Work Control Process, for the purpose of license renewal, is used to manage general aging effects, such as the loss of material from general corrosion. The process requires that, each time the system is opened, visual inspections be conducted on the component being worked and the accessible adjacent component(s) both down stream and upstream. The visual inspections look for general corrosion, gross cracking, discoloration or other visual indications of material degradation. Other aging management activities such as the Flow Accelerated Corrosion (FAC) program manages configuration-specific aging, such as erosion-corrosion.

The Work Control Process, as it applies to general aging, uses a number of different types of maintenance activities. The primary intent of this program is to use planned maintenance activities that are performed on a frequency of 3 months to 120 months. The planned work control activities provide opportunity to inspect and monitor the material condition of a cross section of plant systems, component groups, and material-environment combinations located throughout the systems that use this AMA to manage general aging. Planned maintenance activities can be categorized into three programmatic categories:

1. Preventive maintenance activities
2. Predictive analysis maintenance activities
3. Periodic surveillance testing

A review of these individual planned maintenance programs indicate that over 750 inspection opportunities for each station will be provided over a cross section of plant systems, component groups, and material-environment combinations located throughout the systems in the next ten years.

The following table represents the preventive maintenance inspection opportunity history for selected systems at Surry since 1993.

Table 1
Preventive Maintenance Inspection Opportunity History for Selected Systems at Surry since 1993

System	Predominate Material(s)	Predominate Environment	Preventive Maintenance Review Individual Components	Preventive Maintenance Inspection Opportunities
Chemical Volume Control (CH)	Stainless Steel	Treated Water (Borated)	51	77
Containment Spray (CS)	Stainless Steel	Treated Water (Borated)	14	32
Recirculation Spray (RS)	Stainless Steel	Treated Water (Borated)	8	15
Residual Heat Removal (RH)	Stainless Steel	Treated Water (Borated)	2	5
Safety Injection (SI)	Stainless Steel	Treated Water (Borated)	23	52
Totals for ESF Grouping	Stainless Steel	Treated Water (Borated)	**98**	**181**
Feedwater (FW)	Carbon Steel and Low-alloy Steel	Treated water (Steam Cycle)	61	114
Main Steam (MS)	Carbon Steel and Low-alloy Steel	Treated water (Steam Cycle)	152	419
Totals for SPCS Grouping	Carbon Steel and Low-alloy Steel	Treated water (Steam Cycle)	**213**	**533**
Instrument Air (IA)	Copper Alloy	Air	46	107
Service Air (SA)	Copper Alloy	Air	7	11
Totals for Air & Gas Grouping	Copper Alloy	Air	**53**	**118**

Table 1 (continued)
Preventive Maintenance Inspection Opportunity History for Selected Systems at Surry since 1993

System	Predominate Material(s)	Predominate Environment	Preventive Maintenance Review Individual Components	Preventive Maintenance Inspection Opportunities
Component Cooling Water (CC)	Carbon steel	Treated Water (chromates)	112	221
Drains Aerated (DA)	Stainless Steel	Raw Water	3	4
Fuel Oil (EE)	Carbon Steel	Oil (Fuel Oil)	6	10
Service Water (SW)	Carbon Steel / Copper Alloys	Raw Water (Brackish)	95	171

The Work Control Process supplements the planned maintenance activities with corrective maintenance activities. Although license renewal is limited to passive / long-lived components, numerous opportunities arise to inspect structures and components that are subject to an AMR, and for those components that are active and/or short-lived. Although these corrective maintenance activities are not performed at specific locations or at specific frequencies, the Work Control Process AMA requires Dominion to take advantage of every opportunity to ensure aging is being managed. A maintenance history review from 1993 to the present has verified that corrective maintenance has provided ample opportunities to periodically inspect numerous systems, component groups, and material-environment combinations throughout the systems monitored by the Work Control Process.

Although these corrective management activities are performed at random locations with no specific frequencies, statistically the number of opportunities and diverse sampling of systems are reliable for the purpose of aging management. The material condition of both facilities have been maintained at a very high quality for much longer than the time period covered by the work history database as is demonstrated by our overall performance evaluations and generating capacity, the continued need to maintain our systems, and correct component failure should not decrease as the plant gets older. It is reasonable to assume that the maintenance history is representative with respect to numbers and diverse locations of anticipated maintenance for future years. This contributes to an overall conclusion that there is reasonable assurance that aging management of systems covered by the Work Control Process will be effective for general aging concerns.

Table 2
Corrective Maintenance Inspection Opportunity History for Selected Systems at Surry since 1993

System	Predominate Material(s)	Predominate Environment	Corrective Maintenance Review Individual Components	Corrective Maintenance Inspection Opportunities
Chemical Volume Control (CH)	Stainless Steel	Treated Water (Borated)	40	44
Containment Spray (CS)	Stainless Steel	Treated Water (Borated)	15	16
Recirculation Spray (RS)	Stainless Steel	Treated Water (Borated)	3	3
Residual Heat Removal (RH)	Stainless Steel	Treated Water (Borated)	10	11
Safety Injection (SI)	Stainless Steel	Treated Water (Borated)	45	54
Totals for ESF Grouping	Stainless Steel	Treated Water (Borated)	**113**	**128**
Feedwater (FW)	Carbon Steel and Low-alloy Steel	Treated water (Steam Cycle)	65	76
Main Steam (MS)	Carbon Steel and Low-alloy Steel	Treated water (Steam Cycle)	109	146
Totals for SPCS Grouping	Carbon Steel and Low-alloy Steel	Treated water (Steam Cycle)	**174**	**222**

Table 2 (continued)
Corrective Maintenance Inspection Opportunity History for Selected Systems at Surry since 1993

System	Predominate Material(s)	Predominate Environment	Corrective Maintenance Review Individual Components	Corrective Maintenance Inspection Opportunities
Instrument Air (IA)	Copper Alloy	Air	86	110
Service Air (SA)	Copper Alloy	Air	6	7
Totals for Air & Gas Grouping	Copper Alloy	Air	**92**	**117**
Component Cooling Water (CC)	Carbon steel	Treated Water (chromates)	48	50
Drains Aerated (DA)	Stainless Steel	Raw Water	12	17
Fuel Oil (EE)	Carbon Steel	Oil (Fuel Oil)	8	9
Service Water (SW)	Carbon Steel / Copper Alloys	Raw Water (Brackish)	104	128

Additionally, the Work Control Process supplements the planned maintenance and corrective activities through its corrective action elements. If ongoing general aging is identified in a system with a material and environment combination, the Corrective Action Program will require a broader evaluation of the system with the same material and environment conditions and other applicable systems with similar material and environment conditions.

The above discussed facets of the Work Control Process ensure that adequate inspection opportunities are afforded to inspect and monitor the material condition of a cross section of plant systems, component groups, and material-environment combinations across numerous inspection locations to provide reasonable assurance that age-related degradation would be managed for the period of extended operation.

Additional RAI B2.2.19-3 supplemental requests:
In order for the staff to make a final determination on the adequacy of the Work Control Process (WCP) Aging Management Activity (AMA), we request the following information from the applicant.

1) Confirm that all component groups, listed in Section 3 of the LRA, that credit the WCP AMA are covered by the planned maintenance portion (i.e., preventive maintenance, predictive analysis, periodic surveillance) of the WCP such that these components will be periodically inspected during the period of extended operation.

Response -

The basis for the Work Control Process (WCP) as an aging management activity (AMA), as described in LRA Section B2.2.19, is that all material and environment combinations for components groups that credit the WCP are included within the scope of the WCP AMA. The WCP AMA focus is on material / environment combinations because the materials of construction in conjunction with the environmental stressors associated with the structure or component are the basis for determining applicable aging effects and the management of those aging effects. However, at the staff's request, we have reviewed the systems and material-environmental combinations to help the staff determine the completeness of the WCP.

The Work Control Process, as it applies to general aging, uses a number of different types of maintenance activities. The primary intent of this program is to use planned maintenance activities that are performed on a frequency of 3 months to 120 months. The planned work control activities provide opportunity to inspect and monitor the material condition of plant systems, component groups, and the predominant material-environment combinations located throughout the systems that use this AMA to manage general aging. Planned maintenance activities can be categorized into three programmatic categories:

- Preventive maintenance activities
- Predictive analysis maintenance activities
- Periodic surveillance testing

The Work Control Process supplements the planned maintenance activities with corrective maintenance activities. Numerous opportunities arise to inspect structures and component groups that are managed by the WCP. In addition to the structures and components that are subject to an AMR, the corrective maintenance activities also provides opportunities for inspecting active and/or short-lived components with the same materials and environments, that is effective in identifying ongoing aging in the components groups subject to aging. Although these corrective maintenance activities are not performed at preplanned locations or at specific frequencies, the Work Control Process AMA requires Dominion to take advantage of every opportunity to ensure aging is being managed. A maintenance history review from 1993 to the present has verified that corrective maintenance has provided ample opportunities to periodically inspect systems, component groups, and material-environment combinations throughout the systems monitored by the Work Control Process.

Although these corrective maintenance activities are performed at random locations with no specific frequencies, statistically the number of opportunities and diverse sampling of systems are reliable for the purpose of aging management. As the plant ages, maintenance activities are not expected to decline and it is reasonable to assume that the maintenance history is reflective with respect to numbers and diverse locations of anticipated maintenance for future years. Therefore, corrective maintenance activities will contribute to the management of aging effects such that there is reasonable assurance that intended functions will be maintained.

Along with the planned and corrective maintenance activities, the Dominion Corrective Action System will require an evaluation of aging to ensure that aging is not occurring in other locations with the same material and environment. This evaluation will not be limited by system boundaries. Aging identified in a location within a system that cannot be explained by environmental/operational conditions at that specific location will require additional inspections within that same system and other systems with the same material and environmental conditions.

Additionally, based on maintenance history reviews and an assessment of the breadth of the planned maintenance performed at the Surry and North Anna stations, when supplemented by the numerous inspection opportunities afforded by corrective maintenance activities and the stringent requirements of the corrective action system, the WCP AMA provides adequate management of aging effects such that there is reasonable assurance that intended functions will be maintained throughout the period of extended operation.

As confirmation that the Work Control Process has inspected representative components from each component group for which WCP is credited to manage the effects of aging, Dominion will perform an audit of inspections actually performed and, if WCP activities are found not to be representative, supplemental inspections will be performed. Two audits of the WCP are anticipated, and each will consist of a review of 10 years of historical data. One audit will be performed prior to 40 years of plant operation, and another will be performed at approximately 50 years of plant operation. Any required supplemental inspections would be completed within 5 years after the audit is performed.

2) In the applicant's response to RAI B2.2.19-3 (November 30, 2002) a number of additional systems, beyond those listed in Section B2.2.19 of the LRA, were listed as being part of the Work Control Process AMA. These additional systems are:

- bearing cooling (SPS only)

- chilled water (NAS only)
- containment vacuum (NAS only)
- quench spray (NAS only)
- fire protection
- fuel oil
- heating (SPS only)
- high radiation sampling (NAS only)
- liquid and solid waste (NAS only)
- neutron shield tank
- primary and secondary plant gas systems (SPS only)
- primary grade water
- radwaste (NAS only)
- reactor coolant (NAS only)
- reactor cavity purification (NAS only)
- refueling purification (NAS only)
- sampling

Please clarify whether these additional systems credit the WCP AMA for license renewal. If so, identify for each system the in-scope component groups listed in LRA Section 3 that credit the WCP AMA. If not, clarify why these systems were included in the response to RAI B2.2.19-3.

Response -

The response to RAI B2.2.19-3 included Work Control Process activities for systems and components that are not listed in LRA Section B2.2.19 as crediting the WCP for managing the effects of aging. A number of additional systems and components were added to the scope of license renewal by the response to RAI 2.1-3, and the WCP was credited for managing aging effects for fire protection system components by the response to RAI B2.2.7-2. Additionally, WCP provides confirmation of the effectiveness of the Chemistry Control Programs for primary systems, secondary systems, and fuel oil as described in LRA Sections A2.2.19 and B2.2.19. The systems and components for which the chemistry control programs are credited for management of aging effects are also included in the response to RAI B2.2.19-3.

The basis of the WCP as an AMA, as described in LRA Section B2.2.19, includes the results of work control activities performed on components for which the WCP is not credited to manage aging. These activities are considered in the representative inspections when a material and environment combination is representative of in-scope components. Therefore, the inspection opportunities provided in the response to RAI B2.2.19-3 are relevant to the basis of WCP as an effective AMA even for systems and components for which the WCP is indirectly credited to manage aging effects.

3) The interaction between the WCP AMA and other AMAs is not clear. For example, the applicant's response to RAI 3.5.6-4 describes the interaction between the Civil Engineering Structural Inspection (CESI) AMA and the WCP AMA. Does the CESI AMA initiate an activity conducted under the WCP, in accordance with the inspection schedule defined in the CESI AMA, or does the CESI AMA simply utilize the results of activities conducted under the WCP that initiated independent of the CESI AMA? For the latter case, how is the CESI AMA inspection schedule ensured? Similarly the applicant's response to RAI B2.2.10-1 describes the interaction between Inspection Activities - Load Handling Cranes and Devices (IA-LHCD) AMA and WCP. Does the IA-LHCD AMA initiate an activity conducted under the WCP, in accordance with the inspection schedule defined in the IA-LHCD AMA, or does the IA-LHCD simply utilize the results of activities conducted under the WCP that are initiated independent of the IA-LHCD AMA? For the latter case, how is the IA-LHCD AMA inspection schedule ensured?

Response -

As stated in the response to RAI 3.5.6-4, the CESI AMA relies on activities initiated through the WCP specifically for the inspection and management of rubber gaskets at the intake structure and for polysulfide sealant material used in earthen structures at Surry. The CESI AMA utilizes the results of these WCP activities to manage the effects of aging for these items. The structural inspections conducted in accordance with the CESI AMA are scheduled as CESI activities as discussed in LRA Section B2.2.6.

The aging management activities for Load Handling Cranes and Devices (IA-LCHD) take advantage of inspections that are scheduled through the Work Control Process. The IA-LCHD AMA does not schedule inspections independently of the WCP. Station work planning process requires inspections of most load handling cranes and devices to be performed on annual basis except for cranes inside Containment which are inspected at the refueling interval.

4) Some specific questions regarding the applicant's response to RAI B2.2.19-3. It is not clear how the table provided in response to RAI B2.2.19-3 covers all the items identified in LRA Tables 3.5.1-1 and 3.5.11-1 that credit the WCP

   a. In the applicant's response to RAI B2.2.19-3, "Personnel hatch O-rings" are explicitly identified. More than 100 opportunities are listed for both North Anna and Surry. However, there is no mention of the O-rings/gaskets for the <u>Equipment</u> Hatch.

      Response -

      The only Containment hatch O-rings/gaskets that are subject to aging management review are those associated with the Containment personnel hatch.

The equipment hatch O-rings are short-lived items and are not subject to aging management review.

b. In the applicant's response to RAI B2.2.19-3, "Electrical Penetration O-rings" are explicitly identified. More than 100 opportunities are listed for both North Anna and Surry. However, there is no mention of the gaskets in junction, terminal and pull boxes.

Response -

As confirmation that the Work Control Process has inspected representative components from each component group for which WCP is credited to manage the effects of aging, Dominion will perform an audit of inspections actually performed and, if WCP activities are found not to be representative, supplemental inspections will be performed. Refer to the response to Supplemental Request 1 above.

c. There is no reference to the Surry Intake Structure portable gate gaskets in the applicant's response to RAI B2.2.19-3. Specific identification of these gaskets and the number of inspection opportunities over the last seven years is needed.

Response -

As confirmation that the Work Control Process has inspected representative components from each component group for which WCP is credited to manage the effects of aging, Dominion will perform an audit of inspections actually performed and, if WCP activities are found not to be representative, supplemental inspections will be performed. Refer to the response to Supplemental Request 1 above.

d. In LRA Table 3.5.1-1, the applicant credits the WCP to manage loss of material for the North Anna and Surry Reactor Cavity Seal components made of carbon and low-alloy steel. The applicant, however, did not provide any information on the reactor cavity seals in response to RAI B2.2.19-3.

Response -

As confirmation that the Work Control Process has inspected representative components from each component group for which WCP is credited to manage the effects of aging, Dominion will perform an audit of inspections actually performed and, if WCP activities are found not to be representative, supplemental inspections will be performed. Refer to the response to Supplemental Request 1 above.

e. The applicant's response to RAI 3.5-1 states that pump casings, valve bodies and piping associated with the subsurface drainage system components for both

North Anna and Surry are subject to loss of material and will be managed by the WCP AMA. The applicant, however, did not provide any information on the pump casings, valve bodies and piping associated with the subsurface drainage system components in response to RAI B2.2.19-3.

Response -

The subsurface drainage system pump casings, valve bodies, and piping components included within the scope of license renewal in response to RAI 3.5-1 consist of the following material / environment combinations that result in aging effects requiring management:

- Carbon steel material in a raw water (drainage) environment
- Carbon steel material in an atmosphere/weather environment
- Copper-based alloy material in a raw water (drainage) environment
- Copper-based alloy material in an atmosphere/weather environment
- Copper-based alloy material in an air environment

As confirmation that the Work Control Process has inspected representative components from each component group for which WCP is credited to manage the effects of aging, Dominion will perform an audit of inspections actually performed and, if WCP activities are found not to be representative, supplemental inspections will be performed. Refer to the response to Supplemental Request 1 above.