VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

February 5, 2002

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

Serial No.: 01-732
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

In a November 26, 2001 letter, the NRC requested additional information regarding the license renewal applications (LRAs) for Surry and North Anna Power Stations. The attachment to this letter contains the responses to the Requests for Additional Information (RAIs) associated with Sections 2.3.3.21, 2.3.3.31, 2.3.4, 3.5, B2.2.6, B2.2.10, B2.2.11, and B2.2.12 of the LRA.

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

Rec'd 7/15/02 - DCD
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 5th day of February, 2001.

My Commission Expires: 3-31-04.

Maggie McClure
Notary Public

(SEAL)

Attachment

License Renewal – Response to RAI
Serial No. 01-732

Response to Request for Additional Information

Dated November 26, 2001

Surry and North Anna Power Stations, Units 1 and 2

License Renewal Applications

Sections 2.3.3.21, 2.3.3.31, 2.3.4, 3.5, B2.2.6, B2.2.10, B2.2.11, and B2.2.12

Virginia Electric and Power Company
(Dominion)

RAI 2.3.3.21-1:

Although the evaluation boundary of the main control room and the different switchgear rooms are identified in both license renewal applications (LRAs), the applicant does not define the areas that constitute the main control room envelope. Describe the main control room envelope in terms of systems, subsystem, and spaces, and its intended functions, for both the North Anna station (NAS) and Surry power station (SPS) in sufficient detail such that the staff can perform its review consistent with the information provided in the LRAs. Ensure that the discussion includes sufficient correlation with the scoping and aging management review (AMR) activities contained in the LRA to allow the staff to utilize the information already provided. Identify any structures and components (SCs) that need to be added to the already identified scope of license renewal, and include all the applicable scoping and AMR information.

Dominion Response:

The control room envelope for both Surry and North Anna is located within the Service Building, which is described in Section 2.4.5 "Miscellaneous Structures" of the license renewal application.

For Surry, the control room envelope consists of the control room (including the control room annex area), emergency switchgear and relay rooms, battery rooms, associated stairwell, and Mechanical Equipment Room (MER) 3. For North Anna, the control room envelope consists of the control room, emergency switchgear and relay rooms, battery rooms, and the associated stairwell.

As indicated in Table 2.4.5-2 "Miscellaneous Structures - Service Building", the floor slabs and walls associated with the control room envelope perform a pressure boundary function for the envelope. In addition, fire barrier penetration seals and fire doors and/or EQ barrier doors associated with the control room envelope also perform a pressure boundary function in support of the envelope.

Systems associated with the Surry control room envelope are described, along with their associated functions, in LRA Section 2.3.3.21 "Ventilation" and consist of the air conditioning system, the bottled air pressurization system, and the emergency ventilation system. Components that are subject to aging management review are identified in Table 2.3.3-21 of the application. This table also identifies the section within the application that contains the aging management review results.

Systems associated with the North Anna control room envelope are described, along with their associated functions, in LRA Sections 2.3.3.21 "Heating and Ventilation" and 2.3.3.13 "Compressed Air" and consist of the air conditioning system, the bottled air pressurization system, and the emergency ventilation system. Components that are subject to aging management review are identified in Tables 2.3.3-21 and 2.3.3-13, respectively, of the application. These tables also identify the section within the application that contains the aging management review results.

The structures and components that comprise the control room envelope and that support the envelope functions are included within the scope of license renewal and subject to an aging management review as described in the license renewal application.

No new structures or components need to be added to the scope of license renewal as a result of the response to this RAI.

RAI 2.3.3.31-1:

In regards to both LRAs, NUREG-1800 includes water based fire protection components within the scoping of AMR. Sprinkler system alarm components, such as retard chambers, pressure switches, orifice plates, and associated piping are typically within the scope of components that require an AMR. These components provide a pressure boundary function during system activation and are made of carbon-steel which is subject to a loss of material as a result of corrosion. Within the SPS license application, the sprinkler system alarm components are not highlighted on the flow diagrams, and are assumed to be excluded from scoping. Identify where in the LRA these components are identified as being within the scope of license renewal and subject to an AMR, or provide a technical justification for its exclusion.

Dominion Response:

Sprinkler system alarm components, including retard chambers, pressure switches, orifice plates, and associated piping, have been added to the scope of license renewal with a pressure boundary function in response to this RAI.

There were no new component groups within the Fire Protection system introduced as a result of these added components, nor were there any new materials, environments, or aging effects requiring management. The components added to scope will be managed for loss of material by the Fire Protection Program and the Work Control Process aging management activities. These activities are currently credited in the license renewal application, as supplemented by the response to RAI B2.2.7-2, for management of fire protection components aging effects.

RAI 2.3.3.31-2:

In regards to both LRAs, the rule, 10 CFR 50.54(a)(3) requires systems, structures, and components (SSCs) relied on for compliance with 10 CFR 50.48, Fire Protection (FP), to be within the scope of license renewal. In addition, operating licenses, in general, contain a license condition for fire protection that defines the 10 CFR 50.48 Fire Protection Program. The license condition states that the licensee "shall implement and maintain in effect the provisions of the approved fire protection program" as described in the Updated Final Safety Analysis Report (UFSAR) and/or as approved in an safety evaluation report (SER). Comparing the applicable information contained in the LRA with the UFSAR and SER, the listed (below) FP systems were identified in the UFSAR and /or SER, but not included within the scope of license renewal. In a discussion with the applicant dated November 19, 2001, the applicant stated that its UFSAR and SER contains FP structures and components that are required not only to meet 10 CFR 50.48 requirements, but other industry requirements, as well. This distinction is not clear in the UFSAR and SER. Upon consideration of the staff's request, and its review of applicable documentation, the applicant decided to submit a letter to clarify its CLB consistent with 10 CFR 50.48 and address each of the items listed below in a letter to the staff in response to this request for additional information. The applicant is expected to submit this clarification before the end of 2001.

North Anna, Units 1 and 2

1. Component Cooling Water Area Sprinkler System
2. Cooling Tower Deluge System
3. Fuel Oil Storage Tank Foam System
4. Water House No. 2 Sprinkler System
5. Records Room Halon and Sprinkler Systems
6. Service Building Warehouse Sprinkler System
7. Service Bldg Cable Vault and Tunnel Carbon Dioxide and Sprinkler Systems
8. N-16 Instrument Enclosure and N-16 Enclosure Sprinkler Systems
9. ACC (SBO) Building Sprinkler System
10. On-line Chemistry Monitoring System Computer Room Sprinkler System
11. Security Building Sprinkler System
12. Records Storage Building Sprinkler System
13. Training Center Building Sprinkler System
14. Service Water Chemical Addition System Bldg Sprinkler System
15. Warehouse #2 Sprinkler System

Surry, Units 1 and 2

1. Turbine Oil Storage Room Sprinkler System
2. Fuel Oil Storage Tank Foam System
3. ACC (SBO) Building Sprinkler System
4. Station and Chemical Warehouse Sprinkler Systems
5. On-Line Chemical Monitoring Computer Room Sprinkler System
6. Construction Clean Change Building Sprinkler System
7. Training Center Halon & Sprinkler Systems
8. Security Building Sub-Floor Halon System
9. Technical Support Center Charcoal Filter Carbon Dioxide System

The applicant also indicated the Surry Rad-waste building sprinkler system is in the scope of license renewal, but was not specifically identified within the license application, please verify. In addition, please provide justification for exclusion of the other fire protection systems from the aging management review.

Dominion Response:

Dominion has revised the Surry and North Anna UFSARs to clarify the scope of fire suppression systems that are credited for compliance with 10CFR50.48. This clarification of the licensing basis for the plants was communicated to the NRC through separate correspondence (letter Serial Number 01-731 dated January 22, 2002).

For North Anna, the following fire suppression subsystems from the list in RAI 2.3.3.31-2 are not within the scope of license renewal since these systems are not credited for compliance with 10CFR50.48:

- Cooling Tower Deluge System
- Fuel Oil Storage Tank Foam System
- Security Building Sprinkler System
- Records Storage Building Sprinkler System
- Training Center Building Sprinkler System
- Service Water Chemical Addition System Building Sprinkler System
- Warehouse #2 (referred to as the Admin. Annex) Sprinkler System

Item #4 from the North Anna list, "Water House No. 2 Sprinkler System", appears to be an administrative error in the RAI as no such structure or sprinkler system exists at

North Anna. For Item #5, the Records Room has been converted to office space and the Halon system has been removed. The sprinkler system for this area is in scope. The remaining items in the RAI list are within the scope of license renewal.

For Surry, the following fire suppression subsystems from the list in the RAI are not within the scope of license renewal since these systems are not credited for compliance with 10CFR50.48:

- Fuel Oil Storage Tank Foam System
- Station and Chemical Warehouse Sprinkler Systems
- Construction Clean Change Building Sprinkler System
- Training Center Halon and Sprinkler Systems
- Security Building Sub-Floor Halon System

The remaining items in the list, and the Radwaste Building sprinkler system, are within the scope of license renewal.

Although fire suppression subsystems were added to the scope of license renewal by this review, there were no new component groups introduced, nor were there any new materials, environments, or aging effects requiring management. The components added to scope will be managed for loss of material by the Fire Protection Program and the Work Control Process aging management activities. These activities are currently credited in the license renewal application, as supplemented by the response to RAI B2.2.7-2, for management of fire protection components aging effects.

As identified in the letter to the NRC (Serial Number 01-731 dated January 22, 2002), the North Anna and Surry UFSARs have been revised to clarify the licensing basis for compliance with 10CFR50.48. The changes to the scope of license renewal for Fire Protection reflected in this response are consistent with the revised UFSAR.

As a result of the addition of certain fire suppression subsystems to the scope of license renewal, the Maintenance Building and N-16 Enclosure at North Anna and the Radwaste Building at Surry were also added to scope. No new materials, environments, or aging effects requiring management were identified as a result of these additional structures. The structural members added to scope will be managed for loss of material, cracking, and/or change in material properties by the Civil Engineering Structural Inspection activity as described in the license renewal application, and supplemented by the response to RAI 3.5-7, for similar structural members.

RAI 2.3.4.3-1:

In the NAS LRA, Section 2.3.4.3, the Condensate (CN) System, the applicant states that the primary purpose of the CN system is to provide chemically treated water to the suction of the main feedwater pumps at sufficient pressure to support main feedwater pump operation. The CN system also provides the piping, valves, water storage, and make-up supply for auxiliary feedwater. An emergency condensate storage tank is provided for each unit. Each tank supplies water to the three auxiliary feedwater pumps through individual lines. These tanks and the associated components up to the suction of the pumps comprise the portion of the CN system that is subject to aging management review.

a. Why is the 6" line up to and including the vacuum breaker on condensate storage tank 1-CN-TK-1 and the similar 4" line to the vacuum breaker on condensate storage tank 2-CN-TK-1 not identified as being within license renewal scope? Can the failure of these lines jeopardize the safety function of the vacuum breaker? If so, can the failure of the vacuum breaker cause the failure of the associated tank?

b. Confirm that there is an open 6" vent line on condensate storage tank 2-CN-TK-1, along with a parallel nitrogen pressurization system and a vacuum breaker. Describe the intended function for each of the components identified.

Dominion Response:

a. The vacuum breakers and associated piping installed on the emergency condensate storage tanks, 1-CN-TK-1 and 2-CN-TK-1, are not required to function in order for the tanks to perform their intended function since both tanks are vented to atmosphere through an open 6" diameter vent line. Therefore, the vacuum breakers and the associated piping do not perform a license renewal intended function and are not included in scope.

b. There is a 6" diameter vent line (open to atmosphere) in addition to the vacuum breaker and nitrogen line penetrating the top of 2-CN-TK-1 (the identical configuration exists for 1-CN-TK-1). The 6" diameter vent line prevents adverse pressure conditions within the tank during filling and drawdown. This line is within the scope of license renewal, however, no feasible aging effects could prevent the line from performing its function to provide a tank vent.

   As discussed in a. above, the vacuum breaker is not within the scope of license renewal.

   The nitrogen line is no longer used and is isolated from the tank by closed manual isolation valves. Its failure cannot affect tank function. Therefore, the nitrogen line is not within the scope of license renewal.

RAI 2.3.4.4-1:

In both LRAs (NAS Unit 1 drawing 11715-LRM-070A, Sh. 3 and Unit 2 drawing 12050-LRM-070A, Sh. 3) (SPS, Unit 1 drawing 11448-LRM-064A, Sh. 4 and Unit 2 drawing 11548-LRM-064A, Sh. 4), the applicant shows the turbine cases for auxiliary feedwater pumps to be within the scope of license renewal. Provide a technical justification as to why the 6" lines attached to the casing that vents the exhaust to atmosphere and any bolting attaching these lines are not also within the scope and subject to an AMR.

Dominion Response:

These non-safety related exhaust lines do not directly support any safety-related functions. However, 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 safety-related SSC and whose failure could impact the performance of an intended safety function as described in the response to RAI 2.1-3. This modified scope includes the 6-inch turbine exhaust lines attached to the Unit 1 and Unit 2 auxiliary turbine feedwater pump turbine casings. The exhaust lines will be managed for loss of material using the Work Control Process aging management activity.

RAI 2.3.4.4-2:

In the NAS LRA, Unit 1 drawing 11715-LRM-074A, Sh. 1, and Unit 2 drawing 12050-LRM-074A, Sh. 1, the applicant identifies the 16 inch main feedwater lines as being within the scope of license renewal for high energy line break considerations. These lines contain flow elements 1-FW-FE-1476, -1486, and -1496 and 2-FW-FE-2476, -2486, and -2496. Table 2.3.4-4 lists the flow elements as being within the scope for both the pressure boundary and restrict flow intended functions. State if the flow elements are included for its flow detection intended function of providing the source of a safety-related sensing function. In your response, be sure to describe the flow element output and its functions, and discuss why or why not the output signal is safety-related.

Dominion Response:

The non-safety-related feedwater flow elements (1-FW-FE-1476, -1486, -1496 and 2-FW-FE-2476, -2486, and –2496) are used to develop safety-related flow signals as inputs to the reactor protection system. The "restricts flow" function identified for the flow elements in Table 2.3.4-4 includes this flow detection intended function.

RAI 2.3.4.4-3:

In the SPS LRA, Table 3.4-4, the applicant lists stainless steel and carbon steel as the materials for the filters and strainers. The NAS LRA, Table 3.4-4, only identifies carbon steel as the material for filters and strainers. The drawings do not indicate any differences in the components. The tables do not highlight any differences between the tables as is done throughout the application. Please confirm that the differences in the tables are accurate and discuss any differences in convention from the rest of the application and provide any appropriate justification.

Dominion Response:

The information in Surry LRA Table 3.4-4 and North Anna Table 3.4-4 is accurate. As described in Section 1.1 of the application, differences between Surry and North Anna applications were identified within the application to enhance review efficiency in accordance with the conventions explained in Table 1.1-1 "Conventions for Identifying Plant-Specific Information".

As described in Table 1.1-1, the only plant-specific information identified by thick borders in the aging management review results sections (including the tables) are differences in materials, environments, aging effects requiring management, and aging management activities. The materials, environments, aging effects, and aging management activities listed in Table 3.4-4 for the filters and strainers identified in the RAI are included in the Steam and Power Conversion sections of both applications and, therefore, are not identified as differences between the Surry and North Anna applications.

RAI 2.3.4.4-4:

In the NAS LRA, Table 3.3-4, the applicant did not identify accumulators as a commodity group subject to an AMR even though accumulators are included in the evaluation boundary as is indicated on drawings 11715-LRM-074A, Sh. 4 and 12050-LRM-074A, Sh. 4 for auxiliary feedwater (AFW) flow control valves. Clarify that these components are within the scope of license renewal and identify where the AMR for these components can be found in the LRA. If not subject to an AMR, provide a technical justification for not requiring an AMR.

Dominion Response:

The subject air accumulators are within the scope of license renewal and are identified as "Gas Bottles" in Table 2.3.4-4 of the application. The gas bottles were evaluated for the effects of aging as discussed in Section 3.3.5 "Air and Gas Systems", with the results as indicated in Table 3.3.5-2, "Air and Gas Systems – Feedwater".

RAI 2.3.4.4-5:

The SPS LRA identifies cavitating venturis that have been installed in the 3-inch auxiliary feedwater lines leading to each steam generator. Clarify the intended function of these components (e.g., flow restrictors or flow elements). Identify where in the LRA is the AMR for these components. More specifically, address fatigue as an applicable aging effect for these components. Provide a technical justification as to why fatigue is not an applicable aging effect for these cavitating venturis.

Dominion Response:

The cavitating venturis are designed to limit auxiliary feedwater flow to a depressurized steam generator in the event of a feedwater or main steam line rupture in order to ensure adequate flow to the intact steam generators and prevent auxiliary feedwater pump runout. As indicated in Table 2.4-4 of the Surry application, these components have the license renewal intended functions of restrict flow and pressure boundary.

The Surry auxiliary feedwater system is not normally used as a source of feedwater to the steam generators. Auxiliary feedwater flow through the cavitating venturis only occurs during auxiliary feedwater system surveillance testing prior to plant start-up and during certain plant transients. Based on this limited usage, fatigue due to cavitation-induced dynamic loading was considered to be insignificant and does not result in aging effects requiring management. Additionally, a review of operating experience has not identified age-related degradation of these venturis due to fatigue effects.

The auxiliary feedwater lines are analyzed to the code requirements of ANSI B31.1-1967. The cavitating venturis are evaluated as piping segments in these analyses. Thermal fatigue of the B31.1-scope piping systems is addressed as a time-limited aging analysis (TLAA) in Section 4.3.3 of the application.

RAI 2.3.4.4-6:

In the SPS LRA, Unit 1 drawing 11448-LRM-068A, Sh. 1 and Unit 2 drawing 11548-LRM-068A, Sh. 1, the applicant does not include the 14 inch main feedwater lines in the scope of license renewal. These 14 inch lines contain flow elements 1-FW-FE-1476, -1486, and -1496 and 2-FW-FE-2476, -2486, and -2496. Provide a technical justification for not including these flow elements and the associated lines within the scope of license renewal. Please include in your discussion the safety related sensing function (flow restriction for measurement purpose - reactor power measurement; feedwater flow for various actuations), as well as any other intended function that should be considered when determining the scope of license renewal and the need to subject them to an AMR.

Dominion Response:

The non-safety-related feedwater flow elements (1-FW-FE-1476, -1486, -1496 and 2-FW-FE-2476, -2486, and -2496) are used to develop safety-related flow signals as inputs to the reactor protection system. These components have the intended function to restrict flow, which includes the flow detection function. Dominion has added these flow elements to the scope of license renewal and performed an aging management review. The aging management review results are consistent with those provided in Table 3.4-4 of the Surry application for the component group Flow Elements.

The piping adjacent to these flow elements is not required to remain intact to support the function of the flow elements since the safety signal is generated on a low flow condition. However, 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 safety-related SSC and whose failure could impact the performance of an intended safety function as described in the response to RAI 2.1-3. Therefore, the piping and components adjacent to these flow elements are included in this expanded scope of license renewal.

RAI 2.3.4.5-1:

In regards to the NAS LRA, provide a technical justification as to why the piping from the exhausts of the main steam safety valves and main steam power operated relief valve to atmosphere are not included within scope of license renewal (Unit 1 drawings 11715-LRM-070B, Sh. 1, 11715-LRM-070B, Sh. 2, 11715-LRM-070B, Sh. 3; Unit 2 drawings 12050-LRM-070B, Sh. 1, 12050-LRM-070B, Sh. 2, 12050-LRM-070B, Sh. 3). In your justification, specifically discuss the function of the valve and any potential safety-related, station blackout (SBO), and Appendix R applications associated with this piping.

Dominion Response:

This non-safety related piping does not directly support a safety-related function or support the plant response to SBO or App. R fire events. However, 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 safety-related SSC and whose failure could impact the performance of an intended safety function as described in the response to RAI 2.1-3. This modified scope includes the piping from the exhausts of the main steam safety valves and main steam power operated relief valves. The piping from the exhausts of the main steam safety valves and main steam power operated relief valves will be managed for loss of material using the Work Control Process aging management activity.

RAI 2.3.4.5-2:

In the NAS LRA, the main steam system (MS) evaluation boundary ends at a manual valve immediately upstream of the pneumatically controlled decay heat release valves (1-MS-HCV-104 and 2-MS-HCV-204 on drawings 11715-LRM-070B, Sh. 2 and 12050-LRM-070B, Sh. 2, respectively). The UFSAR notes that the decay heat release valve is a Seismic Class I, Quality Assurance Category I valve located in the main steam valve house. Provide a technical justification as to why this valve is not within the scope of license renewal. In your justification, specifically discuss the function of the valve and any potential safety-related, SBO, and Appendix R applications for this valve.

Dominion Response:

These valves are safety-related, consistent with the UFSAR statements, and perform a system pressure boundary function for the Main Steam. The valves and upstream piping have been added to the scope of license renewal. The valves do not support the plant response to SBO or App. R fire events. Additionally, Dominion has modified the scope of license renewal for North Anna to include non-safety related SSC that have a spatial relationship with safety-related SSC and whose failure could impact the performance of an intended safety function as described in the response to RAI 2.1-3. This modified scope includes the decay heat release valves outlet piping. The decay heat release valves and associated outlet piping will be managed for loss of material using the Work Control Process aging management activity.

RAI 2.3.4.5-3:

In the SPS LRA, the piping from the exhausts of the main steam safety valves and main steam power operated relief valve to atmosphere is not included within scope of license renewal (Unit 1 drawings 11448-LRM-064A, Sh. 1, 11448-LRM-064A, Sh. 2 11448-LRM-064A, Sh. 3; Unit 2 drawings 11548-LRM-064A Sh. 1, 11548-LRM-064A, Sh. 2, 11548-LRM-064A, Sh. 3). Provide a technical justification for excluding this piping for the scope of license renewal. Include in your justification safety-related, SBO, and Appendix R applications.

Dominion Response:

This non-safety related piping does not directly support a safety-related function or support the plant response to SBO or App. R fire events. However, 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 safety-related SSC and whose failure could impact the performance of an intended safety function as described in the response to RAI 2.1-3. This modified scope includes the piping from the exhausts of the main steam safety valves and main steam power operated relief valves. The piping from the exhausts of the main steam safety valves and main steam power operated relief valves will be managed for loss of material using the Work Control Process aging management activity.

RAI 3.5.5-1:

In the Surry LRA, Section 3.5.5 and Table 3.5.5-2 (Service Building), the applicant identify cracking and change in material properties of elastomers in an air environment as requiring aging management. The Work Control Process aging management activity (AMA) is credited for managing these aging effects. However, the description of the Work Control Process AMA in Surry LRA Appendix B, does not identify elastomers as a component within its scope. Therefore, the staff is requesting that the applicant verify that elastomers in the service building, and miscellaneous structural commodities that are within the scope of this AMA are specifically inspected (not managed by extrapolation of inspection results from other structures and components). The staff also requests the same information for elastomer materials requiring aging management in the Intake Structure and the Miscellaneous Structural commodities.

Dominion Response:

Although elastomer materials are not specifically listed in the Work Control Process activity description in Section B2.2.19 of the application, they are included in this activity as non-metallic materials in air and in atmosphere/weather environments as clarified in the response to RAI B2.2.19-3.

As described in Section B2.2.19 of the application, and as supplemented by the responses to RAIs B2.2.19-1 and B2.2.19-3, the Work Control Process activity provides ample inspection opportunities for detection of aging effects for material and environment combinations that are within the scope of the activity. As stated above, elastomer materials in air and in atmosphere/weather environments are included in the scope of the Work Control Process such that representative component inspections are performed, aging effects will be identified, and appropriate corrective actions will be taken, as applicable, to resolve the effects of aging before intended functions are affected.

Specifically, for elastomer materials in the Service Building, a review has found that 6 inspections have been performed over the last seven years as part of the preventive maintenance program included within the Work Control Process.

Therefore, the Work Control Process provides reasonable assurance that the intended functions of the in-scope elastomer components in the Service Building, Intake Structure, and the Miscellaneous Structural Commodities will be maintained.

RAI 3.5.6-1:

In the NAS LRA, Section 3.5.6, the applicant identifies concrete as a material used in the construction of the intake structures but does not identify the need to manage the aging of this concrete for loss of material, change in material properties, and cracking. A generic concern regarding the managing of aging on all concrete structures and concrete members was raised in RAI 3.5-7 provided to the applicant in a letter dated October 11, 2001, and previously discussed with the applicant in a telecommunication on August 8, 2001. This question is being raised again to ensure that the applicant understands that the staff is of the position that all concrete structures and structural members that are within the scope of license renewal are required to be managed for loss of material, change in material property, and cracking, and any exception needs to be documented and technically justified in its response to RAI 3.5-7.

Dominion Response:

The aging effects of loss of material, change in material properties, and cracking of concrete in the intake structures will be managed as described in the response to RAI 3.5-7.

RAI 3.5.6-2:

In the NAS LRA, Section 3.5.6, the applicant specifies the water velocities for the various intake structures. These velocities are lower than the threshold velocity for loss of concrete material due to abrasive erosion and cavitation, identified by the applicant in LRA Appendix C3.1.13. The staff notes, however, that erosion varies with the type and amount of abrasive material, size of the abrasive material, velocity, angle of contact, obstructions, and changes in the direction of flow or the presence of eddies. Cavitation varies with the mean velocity, boundary roughness, growth and formation of boundary layers, and stream turbulence. Therefore, the applicant will need to specifically address these concerns relating to loss of concrete material (due to abrasive erosion and cavitation) in its response to RAI 3.5-7 (previously submitted to the applicant in a letter dated October 11, 2001), if the applicant intends to provide a technical justification that loss of material is not an applicable aging effect for NAS concrete intake structures or concrete elements of earthen structures (Section 3.5.8 of the LRA) that are exposed to flowing water.

Dominion Response:

Dominion's technical evaluation and review of site operating experience for the North Anna concrete intake structures or concrete elements of earthen structures exposed to flowing water have concluded that loss of material, due to abrasive erosion and cavitation, is not an applicable aging effect that requires aging management. Further, we have evaluated the concrete elements for abrasive erosion and cavitation considering the variations discussed above in the RAI and concluded that the variations are not present in our configuration.

However, the aging effects of loss of material, change in material properties, and cracking of concrete in the North Anna concrete intake structures and concrete elements of earthen structures exposed to flowing water will be managed as described in the response to RAI 3.5-7.

RAI 3.5.6-3:

For the intake structures discussed in LRA Section 3.5.6, it is not clear why the change in material properties and cracking of elastomers is limited to an air environment. Rubber material is used in the circulating water pipe at Surry as a concrete pipe joint gasket. The circulating water in the pipe is a raw water (brackish) environment. Therefore, the staff is requesting that the applicant provide a technical justification for not requiring aging management of elastomers in a raw water environment for cracking and change in material properties. This request also applies to the rubber gasket material used in the concrete culvert at Surry (even though the water may not be brackish), identified in LRA Section 3.5.8 (Earthen Structures).

Dominion Response:

Dominion performed an aging management review of the circulating water pipe rubber gaskets and the concrete culvert rubber gaskets in a raw water environment. The results of this aging management review are provided in LRA Tables 3.5.6-3 and 3.5.8-1, respectively. Exposure to ultraviolet radiation, ozone, and temperatures exceeding 95°F (thermal exposure) are considered to be the only aging mechanisms that can result in the aging effects for rubber in a raw water environment. The conclusion of the aging management review indicates that there are no aging effects on these rubber gaskets in a raw water environment because these gaskets are not exposed to ultraviolet radiation, ozone, or temperatures exceeding 95°F.

Additionally, a review of technical literature, and site and industry operating experience, has not identified any concerns related to aging of rubber in these applications.

Therefore, there are no aging effects requiring management for these rubber gaskets in the raw water environment.

RAI 3.5.6-4:

For Surry, the applicant credits the Civil Engineering Structural Inspection activities to manage change in material properties and cracking of rubber gaskets used in the intake structures (LRA Section 3.5.6) and polysulfide sealant material used in earthen structures (LRA Section 3.5.8). From the AMA description presented in the LRA Appendix B2.2.6, it is not clear that the Civil Engineering Structural Inspection activities cover these elastomer materials within its scope. Therefore, the staff is requesting that the applicant verify that elastomers are covered in the scope of the Civil Engineering Structural Inspection activity and to describe how aging of elastomers is managed.

Dominion Response:

Although not specifically stated in the program description, the rubber gaskets used in the intake structures (LRA Section 3.5.6) and the polysulfide sealant material used in the earthen structures (LRA Section 3.5.8) are within the scope of the Civil Engineering Structural Inspection activity.

The Civil Engineering Structural Inspection activity relies on preventive maintenance activities initiated through the Work Control Process for the inspection and management of the rubber gaskets used in the intake structures.

The Civil Engineering Structural Inspection activity relies on surveillance test activities initiated through the Work Control Process for the inspection and management of the polysulfide sealant material used in the earthen structures.

The scope of the Civil Engineering Structural Inspection activity will be clarified to include elastomers and associated aging effects in the revised program summary description for the UFSAR Supplement that will be presented to the NRC staff in a future submittal.

RAI 3.5.8-1:

In the NAS LRA, Section 3.5.8, the applicant discusses the aging management of the concrete for the service water system (SW)R liner and spread footings. The applicant needs to recognize that they have to address these structures, including the concrete portion of the floodwall (culvert), in its response to RAI 3.5-7.

Dominion Response:

The concrete elements of the North Anna earthen structures included in LRA Section 3.5.8 are the Service Water Reservoir (SWR) liner at the intake of the Service Water Pump House (SWPH), the SWR spray-piping spread footings, and the cement-mortar liner for the floodwall steel drain culvert. The aging effects of loss of material, change in material properties, and cracking of concrete in these concrete elements will be managed as described in the response to RAI 3.5-7.

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.

RAI 3.5.9-1:

In both LRAs, Section 3.5.9, indicates that the Westinghouse Owners Group (WOG) Generic Technical Report (GTR), WCAP-14422, is directly applicable to the Surry and North Anna NSSS Supports, and that the scope of the NSSS supports described in the GTR bounds the installed supports with some minor exceptions. Section 8.0 of the WOG GTR provides a detailed implementation procedure that an applicant should follow in order to verify that its plant is bounded by the GTR. This procedure instructs the applicant to identify and justify deviations regarding plant characteristics, applicable aging effects, and aging management program features. In its review, the staff found a number of deviations from the WOG GTR which were neither identified nor justified in the LRA. They include the following:

a. The WOG GTR recommends an aging management program (AMP-1.2) for concrete local to reactor coolant system (RCS) support concrete embedments. Dominion responses to Applicant Action items 1, 10, 13, 14, 15, and 16 indicate that the concrete portion of RCS supports are evaluated under Containment, and that there are no aging effects that require management for concrete structural members within Containment. Dominion should identify this as a deviation to the WOG GTR and provide technical justification for concluding that the aging effects due to aggressive chemical attack and corrosion as described in the WOG GTR do not require management.

b. The WOG GTR recommends an aging management program to manage aging effects due to aggressive chemical attack and corrosion in RCS support steel components (AMP-1.1). The program includes IWF inspections, leakage identification walkdowns, and leakage monitoring. In response to Applicant Action Items 10 and 14, Dominion did not provide any detailed information on a leakage monitoring program. If a leakage monitoring program is not credited for managing these aging effects, this should be identified as a deviation from the WOG GTR and a technical justification for its omission should be provided.

c. Materials of construction of NSSS supports identified in LRA Section 3.5.9 include "maraging" steel. This material is not included in the WOG GTR. Dominion should identify this as a deviation to the WOG GTR, and provide a description and results of a plant-specific aging management review for components fabricated from this material.

d. LRA Table 3.5.9-1 identifies bronze as a bearing plate material. This material is not included in the WOG GTR. Section 2.3 of the WOG GTR indicates that the type of base material used for the Lubrite plates is ASTM A-48. Dominion should identify this as a deviation to the WOG GTR, and provide a description and results of a plant-specific aging management review for components fabricated from bronze.

Dominion Response:

As discussed in Section 3.5.9 of the application, Dominion has performed a plant-specific aging management review for the NSSS Supports at Surry and North Anna. As

such, Dominion has provided sufficient information in the license renewal application to document the plant-specific aging management review results, as required by 10CFR54.21, without sole reliance on the conclusions of the WOG GTR. Although the WOG GTR was used as a technical reference for the aging management review, deviations from the WOG GTR were not specifically identified in the application, and are not addressed in the response to RAI 3.5.9-1. Dominion has, however, addressed the Applicant Action Items resulting from the NRC FSER for this GTR and included this information in the application in Table 3.5.9-W1 to aid the NRC staff review.

a. The aging effects of loss of material, change in material properties, and cracking of concrete local to RCS support concrete embedments will be managed as described in the response to RAI 3.5-7.

b. Loss of material due to boric acid wastage for the RCS supports is managed with the Boric Acid Corrosion Surveillance activities described in Section B2.2.3 of the application. These activities include inspections for evidence of borated water leakage, reviews of inspection results, and evaluations of the effects of leakage. Inspections for borated water leakage are performed at a frequency of each refueling outage. These inspections are performed to comply with the requirements of NRC Generic Letter 88-05. If leakage is found, evaluation of the affected components, including NSSS Supports as applicable, are initiated in accordance with the Corrective Action System. Therefore, the leakage monitoring is performed in accordance with the Boric Acid Corrosion Surveillance activity.

c. Section 2.4.1 and Table 2-4 of the WOG GTR identify the materials most commonly specified for the RCS supports. Although not identified in Section 2.4.1 and Table 2-4, the potential for stress-corrosion cracking of maraging steel is discussed in WOG GTR, Section 3.2.1. A plant-specific aging management review has been performed for maraging steel in accordance with the methodology outlined in Appendix C of the application. The results of this plant-specific aging management review are provided in LRA Table 3.5.9-1.

d. Section 2.4.1 and Table 2-4 of the WOG GTR identify the materials most commonly specified for the RCS supports. Bronze is not identified in this section or table and is not discussed elsewhere in the WOG GTR. A plant-specific aging management review has been performed for bronze in accordance with the methodology outlined in Appendix C of the application. The results of this plant-specific aging management review are provided in LRA Table 3.5.9-1.

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.

RAI 3.5.9-3:

The applicant's response to Applicant Action Item 6 did not address the staff's concern discussed in Section 3.3.1.7 of the FSER on the WOG GTR. The staff noted that many WOG plants used the 1963 AISC Code, which allowed the use of materials that did not have as great a yield strength or fatigue resistance as the more modern steels listed in Table 2-4 of the WOG GTR. For this reason, the staff was concerned that the results of the Westinghouse aging effects evaluation for fatigue (Table 3-2 of the WOG GTR) which concluded that fatigue is not an aging concern for RCS supports may not be bounding for those plants. Surry used the 1963 AISC Code. Therefore, the staff requests that the applicant provide additional information to confirm that the conclusion of the Westinghouse generic aging effects evaluation for fatigue is applicable to the Surry RCS supports.

Dominion Response:

There were no design codes with specific jurisdiction or applicability to the Surry NSSS equipment supports. In the absence of mandated codes and standards, state of the art design and fabrication procedures were adopted. The basic design criteria for these supports are outlined in the Surry UFSAR; however, fatigue is not part of the design analyses since these supports are not subject to a significant number of fatigue cycles. As noted in Table 3-2 of the WOG GTR, the number of loading cycles conservatively estimated for the RCS supports for 40 years of operation is 600 cycles. Codes that are typically used in the design of supports (e.g., AISC and ASME Section III, Subsection NF) require a reduction of member allowable stresses if fatigue cycles are in the range of 10,000 to 20,000 cycles, or greater. The number of fatigue cycles that the Surry NSSS equipment supports could experience are much less (estimated to be 900 cycles over 60 years based on the WOG GTR) than generally accepted thresholds at which fatigue is to be considered in the design evaluation. Therefore, there is reasonable assurance that there are no aging effects due to fatigue that require management.

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.

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.

RAI 3.5.10-1:

In the staff's review of Section 3.5.10, "General Structural Supports," in both LRAs, the staff identified the need for the following clarifications:

a. In both LRAs, Section 3.5.9 and 3.5.10, the applicant recognizes the need to manage supports for the purpose of maintaining the intended functions of the associated SCs under design load conditions. However, the applicant did not identify the need to manage those supports that are within the scope of license renewal and perform the functions of allowing for thermal expansion and seismic restraint. Buildup of debris or material on the non-moving surface can cause an obstruction that can impede the ability to expand and, therefore, prohibit the ability to allow for thermal expansion. As such, the staff requests that the applicant include fouling of the component surface as an applicable aging effect for these supports that needs to be managed and to identify the AMA that will be used to manage this fouling, or provide a technical justification as to why fouling is not an applicable aging effect.

b. In both LRAs, Section 2.4.10, the applicant indicates that supports for mechanical equipment (e.g., fans) are within the scope of the general structural support AMR. Fans and other mechanical equipment are often mounted on vibration isolating supports, which employ various non-metallic materials to absorb equipment vibration. The staff considers change in material property and cracking as aging effects requiring management for vibration isolation supports. However, the applicant's AMR does not identify any non-metallic materials, and does not specifically indicate that vibration isolating supports are within the scope of the AMR for general structural supports. Therefore, the staff requests that the applicant: (1) clarify whether there are any vibration isolating supports within the scope of license renewal, and where in the LRA is the AMR for these structural supports; and (2) describe the AMR for vibration isolating supports, including the materials and environments, the applicable aging effects, and the AMAs credited to manage aging. If the applicant has concluded that no AMA is required for these supports, then a detailed technical justification for its exclusion is required.

Dominion Response:

a. There are supports within the scope of license renewal that are designed to restrain components in certain directions while allowing thermal expansion in the other directions. Although fouling of the component surface is not identified in the LRA as an aging effect requiring management, such degradation would be identified by aging management activities relied on for managing the effects of aging for these supports. Therefore, fouling of component support surfaces that could affect the function to allow thermal expansion will be managed by the ISI Program – Component and Component Support Inspections, General Condition Monitoring Activities, and Infrequently Accessed Area Inspection Activities.

b. There are supports within the scope of license renewal that are designed for

vibration isolation which utilize non-metallic materials. These support elements are considered to be an integral part of the overall structural support component and are not uniquely identified in the application. Degradation associated with these non-metallic support elements would be identified by aging management activities relied on for managing the entire structural support assembly. Therefore, aging effects of non-metallic materials used in vibration isolating supports are managed by the ISI Program – Component and Component Support Inspections, General Condition Monitoring Activities, and Infrequently Accessed Area Inspection Activities.

RAI 3.5.10-2:

The issue of reduction in concrete anchor capacity due to degradation, described in Item 3.5.9-1 for NSSS Supports, also applies to LRA Section 3.5.10 - General Structural Supports and LRA Section 3.5.12 - Load-handling Cranes and Devices. In the LRA, Section 3.5.10, the applicant does not address the aging effect of reduction in concrete anchor capacity due to degradation of the embedded portion of the anchor or the concrete and grout surrounding the anchor. In the LRA ,Section 3.5.12 (Table 3.5.12-1), the applicant identifies baseplates and anchors for load-handling cranes and devices as being within the AMR; however, the concrete surrounding the anchor and the grout beneath the baseplates are not listed. Anchor capacity may be reduced due to local concrete and grout degradation (i.e., cracking, loss of material) and degradation of the steel anchor. The applicant states in the LRA that these items are addressed under the building structures that support these components. However, the AMR for the building structures concludes that, with few exceptions, there are no aging effects requiring management for concrete members. Therefore, the staff requests the applicant to describe the AMR for the potential reduction in concrete anchor capacity which may occur due to degradation of the (1) surrounding concrete (2) grout, and (3) embedded steel anchor. In addition the applicant needs to describe the aging management program credited to manage this aging effect.

Dominion Response:

Potential aging effects on the embedded portion of the anchor, or the concrete and grout surrounding the anchor, are evaluated along with the associated structure concrete. The embedded steel is surrounded by the concrete and is considered to be an integral part of the concrete. Therefore, embedded steel is evaluated along with the concrete in which it exists.

The review of operating experience has identified no issues related to embedded steel other than event-driven degradation (such as water hammer events) which is repaired as it is identified in accordance with the corrective action system.

However, the aging effects of loss of material, change in material properties, and cracking of concrete in the concrete structures will be managed as described in the response to RAI 3.5-7. As clarified in the NRC letter dated October 11, 2001 "Summary of August 8, 9, 13, 27, and 28, 2001, Telecommunication with Virginia Electric and Power Company" for Item B2.2.9-2 (b) and (c), Dominion also credits the General Condition Monitoring activity, as described in Section B2.2.9 of the application, to manage potential cracking of concrete associated with piping and equipment anchors that can affect the intended function of these anchors.

RAI 3.5.11-1:

In both LRAs, Table3.5.11-1, the applicant states (in Footnote 1) that carbon and low-alloy steel bus duct enclosures, electrical component supports, panels and cabinets, and switchgear enclosures in an air environment do not require aging management because they are not subject to intermittent wetting. This statement implies that intermittent wetting is a prerequisite for loss of material from carbon and low-alloy steel in an air environment. This does not appear to be consistent with the applicant's previous determinations that carbon steel and low-alloy steel plant components in an air environment require aging management for loss of material. Therefore, the staff requests that the applicant provide additional information concerning intermittent wetting as a prerequisite for causing loss of material, and also to describe how humidity was addressed in the North Anna and Surry AMRs.

The staff also notes that the applicant identified a borated water leakage environment for junction, terminal, and pull boxes, and for panels and cabinets, but not for bus duct enclosures, electrical component supports (inside panels and cabinets), and switchgear enclosures. Therefore, the staff requests that the applicant provide an explanation for excluding a borated water leakage environment for bus duct enclosures, electrical component supports (inside panels and cabinets), and switchgear enclosures.

The applicant's AMR for North Anna identifies 3M E53A mats and mineral wool bats as materials used for fire wraps and also identifies gypsum boards, which serve a fire protection function. In NAS LRA, Table 3.5.11-1, the applicant has indicated that these materials in an air environment do not require aging management. No basis for this conclusion is provided in the LRA. Therefore, the staff requests that the applicant provide a technical justification for this conclusion and to specifically address the potential effect of humidity on degradation of the fire protection function of these materials.

Dominion Response:

Intermittent wetting in an air environment has been considered during the assessment of the aging of structural steel members. As identified in Table 3.0-2 of the license renewal application, structural steel members associated with mechanical system components may have the potential for condensation or intermittent wetting. Therefore, structural members have been generally assumed to be subject to an intermittently wetted environment. When there is no potential for condensation or other source of intermittent wetting, such as for bus duct enclosures, electrical component supports, panels and cabinets, and switchgear enclosures in the control room, the switchgear rooms, and the vicinity of the electrical equipment, an exception to this general application of an intermittent wetting environment is taken and documented in the application.

As discussed in Section C3.1.1 of the application, external surfaces of carbon and low-alloy steel piping and components, located within structures, have not experienced corrosion degradation that would affect the intended function of components due to

humidity in the absence of cyclic or intermittent wetting.

The bus duct enclosures and switchgear enclosures that are in the scope of license renewal are located in normal and emergency switchgear rooms within the Service Building. There are no piping systems that contain boric acid in normal and emergency switchgear rooms. Therefore, the bus duct and switchgear enclosures are not evaluated for boric acid wastage.

The electrical component supports that are within panels and cabinets are not subjected to boric acid leakage because the panels and cabinets are enclosed, and there are no piping systems that contain boric acid within the panels and cabinets.

Dominion considered humidity in the evaluation of potential aging effects for 3M E53A mats, mineral wool batts, and gypsum boards and concluded that, based on a review of manufacturers technical information, humidity does not result in aging effects requiring management. The potential for condensation due to humidity was also considered. The 3M E53A mats and mineral wool batts are wrapped in water-resistant foil with seams sealed with foil tape. The gypsum board is W/R Type C board, which is water-resistant. Therefore, the evaluation concluded that condensation due to humidity would not result in aging effects requiring management. Additionally, a review of operating experience has identified no issues related to degradation of these materials due to humidity.

Section B2.2.6, "Civil Engineering Structural Inspection"

RAI B2.2.6-1:

Under "Parameters Monitored or Inspected," the applicant indicates that the Civil Engineering Structural Inspection includes:

- For concrete structures - cracks, delaminations, honeycombs, water in-leakage, chemical leaching, peeling paint, and discoloration. However, for structural concrete located only in a sheltered air environment, there are no aging effects requiring management.
- For masonry walls - inspections check for cracks of joints and missing or broken blocks.
- For steel structures - inspections look for deformation, alteration, and significant rust on structural members; loose, missing, and damaged anchors, fasteners, and pads; missing and degraded grout under base plates; and cracked welds.
- For earthen structures - inspections look for erosion, cracking, depressed areas, evidence of shifting, settlement, movement, seepage, and leakage.

The staff also has a concern related to masonry walls. Some masonry walls within the LR scope may have been structurally modified with steel supports to meet the requirements of IE Bulletin 80-11. Aging management of these steel supports is as important as inspections for joint cracking and missing/broken blocks. Therefore, the staff requests the applicant to describe its AMR for these supports, identify any aging effects requiring management, and identify the AMA credited for license renewal.

Dominion Response:

Structural supporting steel that is required for masonry wall reinforcement is included within the scope of license renewal and is evaluated as building structural steel (columns and baseplates, steel beams, bracings, etc.). Structural steel that supports these masonry walls is managed for loss of material using the Civil Engineering Structural Inspection activity.

Section B2.2.10, "Inspection Activities - Load Handling Cranes and Devices"

RAI B2.2.10-1:

In the introduction of LRA, Section B2.2.10, the applicant states that the Work Control Process directs structural integrity inspections of applicable cranes which include steps to check the condition of structural girders on the cranes, and the runways along which the cranes move. The visual inspection of the girders checks for corrosion. The aging effect of concern is loss of material. Since LRA Section B2.2.10 is intended to describe the Inspection Activities - Load Handling Cranes and Devices, it is not clear why the applicant describes the Work Control Process. Therefore, the staff requests that the applicant explain why the Work Control Process description is included within the Inspection Activities - Load Handling Cranes and Devices aging management activity.

Dominion Response:

The visual inspections that are performed to detect loss of material from the structural girders of cranes and from the runways along which the cranes move are directed by preventive maintenance procedures that are implemented using the Work Control Process.

RAI B2.2.10-2:

Under operating experience, the applicant states that anomalous conditions with cranes and lifting devices have been identified. These anomalies have principally involved misaligned runways. Such misalignment is not considered age-related degradation and consequently, is not a concern for license renewal. However, the applicant needs to clarify that there is no operating history associated with aging of SC subject to an AMR relating to cranes and lifting devices.

Dominion Response:

A review of operating history did not identify age-related degradation associated with load-bearing elements that are subject to an aging management review for load-handling cranes and devices that are within the scope of license renewal.

Section B2.2.11, "ISI Program - Component and Component Support Inspections"

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.

Section B2.2.12, "ISI Program - Containment Inspection"

RAI B2.2.12-1:

Under program scope, the applicant states that the scope of the Subsection IWE Inspection Program for the containment steel liner is in compliance with the requirements of 10 CFR 50.55a, which invokes ASME Section XI. The scope of Subsection IWE inspections described in LRA Section B2.2.12 include the following items and is implemented for accessible areas:

Component Type Category	Category	Method
Containment surfaces	E-A[1]	Visual, VT-3
Containment surfaces requiring augmented inspection	E-C	Visual, VT-1,Volumetric
Pressure retaining bolting	E-G	Visual, VT-1
All pressure retaining components	E-P	Visual, VT-2

E-A[1] - Examination includes attachment welds between structural attachments and the pressure-retaining boundary (i.e., the containment liner).

a. The above footnote, should also indicate that examination includes the reinforcing structures and attachment welds to reinforcing structures (e.g., stiffening rings, manhole frames, and reinforcement around openings) as required by footnotes 2 and 5 of ASME Subsection IWE, Table IWE-2500-1. In addition, the examination of welds should include the weld metal and base metal for ½ in. beyond the edge of the weld. Therefore, the staff requests the applicant to include the examinations related to reinforcing structures and attachment welds to reinforcing structures (if applicable), and the examination of welds needs to include the weld metal and base metal for ½ in. beyond the edge of the weld.

b. The Component Type Category list does not include seals, gaskets, and moisture barriers, identified as Examination Category E-D in ASME Subsection IWE. LRA Table 3.5.1-1 indicates that aging effects for containment O-rings are managed by the Work Control Process. Questions related to the aging management of seals, gaskets (including O-rings), and moisture barriers have been raised in a telecom documented in a letter to applicant date October 11, 2001, staff Items 3.5-6, 3.5-9, 3.5-18. If a plant specific program, such as the Work Control Process, is credited to manage aging effects of seals, gaskets, and moisture barriers used in the containment structure, in lieu of Examination Category E-D of IWE, then sufficient information must be provided so that the staff evaluation can conclude that the effects of aging will be adequately managed by the credited program during the

period of extended operation. Therefore, the staff requests that the applicant describe the scope and aging management activities of the Work Control Process as it applies to seals, gaskets, and moisture barriers used in the containment structure.

c. The above table identifies visual examination, VT-1, for pressure retaining bolting. For bolted connections that are not disassembled and reassembled during the inspection interval, the examination method should require bolt torquing or tension testing in accordance with the requirements contained in ASME Subsection IWE, Table IWE-2500-1. Therefore, the staff requests the applicant to include bolt torquing or tension testing as the examination method for bolted connections that are not disassembled and reassembled during the inspection interval, or provide technical justification for not including this examination requirement.

Dominion Response:

a. Dominion implements the requirements of Footnote 2 of ASME Subsection IWE, Table IWE-2500-1, by performing examinations of reinforcing structures and attachments to reinforcing structures (including stiffening rings and reinforcement around openings for the Surry and North Anna containment buildings). As required by Footnote 5, these examinations include the weld metal and base metal for 1/2 inch beyond the edge of the weld.

b. Dominion uses the Work Control Process to manage the aging of Containment seals and gaskets since that activity involves more thorough and more frequent inspection of the seals and gaskets than do inservice inspections which are required only once per 10-year interval. Confirmation that the Work Control Process is a wide-ranging activity with numerous tasks for a variety of systems and components is described in the response to RAI B2.2.19-3.

   Table 3.5.1-1 (Containment) of the License Renewal Applications for Surry and North Anna confirms the use of the Work Control Process to manage aging effects for seals and gaskets (identified as O-rings in the table).

   There are no moisture barriers incorporated into the design of the Containment structures for Surry or North Anna that are within the scope of ISI-IWE, Category E-D inspections.

c. ASME Subsection IWE, Table IWE-2500-1, Subcategory E-G, requires bolt torquing or tension testing for bolted connections that are not disassembled and reassembled during the inspection interval. For Surry and North Anna, Dominion submitted relief request IWE-5 in 1998 to permit reliance upon 10 CFR 50, Appendix J (Type B) testing in lieu of bolt torque or tension testing for bolted connections that are verified by Appendix J results to not experience unacceptable leakage. This relief request was approved by the NRC as indicated in NRC letter number 99-256, dated April 21, 1999 and establishes the current licensing basis requirement for testing of bolted connections that are not disassembled or reassembled during the inspection interval.

RAI B2.2.12-2:

Under "Monitoring and Trending," the applicant indicates that revision of the IWE/IWL Program Plan for each unit will be implemented prior to the end of each interval, to reflect the appropriate update of the ASME Code, and to reflect any revised inspection requirements. The revision to the IWE/IWL Program Plan should be consistent with the current approved editions of the ASME Code, in accordance with revisions to 10 CFR 50.55a (as stated in the GALL Federal Register notice). The staff requests that the applicant clarify its statement to confirm that it is consistent with this staff position, or provide a more detailed explanation as to why it is different from the staff's position.

Dominion Response:

Dominion will ensure that the IWE/IWL program plan is consistent with the currently approved edition of the ASME Code in accordance with 10 CFR 50. 55a and in effect during the respective 10-year interval for the Surry and North Anna units.