**DRAFT**
**(9/10/02)**

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

Serial No.: 02-332A
LR/DWL R0
Docket Nos.: 50-280/281
50-338/339
License Nos.: DPR-32/37
NPF-4/7

Gentlemen:

**VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)**
**SURRY AND NORTH ANNA POWER STATIONS UNITS 1 AND 2**
**REQUEST FOR ADDITIONAL INFORMATION**
**LICENSE RENEWAL APPLICATIONS**

Based on several conversations with the NRC during August 2002, the staff requested supplemental information related to certain responses previously provided to Requests for Additional Information (RAIs) concerning the Surry and North Anna license renewal applications (LRAs). By letter dated June 13, 2002 (Serial No. 02-332), Dominion provided supplemental information regarding RAI 4.3-6 that addressed the effects of environmentally assisted fatigue on the safety injection (SI) and charging line nozzles at Surry and North Anna.

The evaluation, documented in the June 13,2002 supplemental information for RAI 4.3-6, provided acceptable cumulative usage factor (CUF) results for each of the SI and charging line nozzles. The approach and methodology used was consistent with current industry methods, including recent EPRI research on the topic of environmentally assisted fatigue. However, certain aspects of this calculational methodology have not been generically accepted for use by the NRC staff. Accordingly, certain methods are not available for use in the evaluation of the environmentally assisted fatigue effects on the SI and charging nozzles. Removal of these methods from the adjusted CUF calculations results in an increase in the CUF values that requires aging management of the SI and charging line nozzles be performed.

The aging management approach for the SI and charging line nozzles has several options available to ensure that the nozzles perform their intended function during the period of extended operation. Dominion identifies these options in the Surry and North Anna UFSAR Supplements (Section 18.3.2.4, Environmentally Assisted Fatigue). These revised UFSAR Supplement sections are provided in Attachments 1 and 2 of this letter for Surry and North Anna, respectively.

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

Very truly yours,

Leslie N. Hartz
Vice President – Nuclear Operations and Services

Attachment

Commitments made in this letter: None

# Attachment 1

## License Renewal – Response to RAI
## Serial No. 02-332A

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

## Revised Surry UFSAR Supplement Sections
## (Changes Indicated in Margins)

**Virginia Electric and Power Company**
**(Dominion)**

# EXCERPT FROM SURRY UFSAR SUPPLEMENT

## 18.2.1 Augmented Inspection Activities

The purpose of the Augmented Inspection Activities is to perform examinations of selected components and supports in accordance with requirements identified in the Technical Specifications, UFSAR, license commitments, industry operating experience, and good practices for the station. Augmented inspections are outside the required scope of ASME Section XI. The scope of Augmented Inspection Activities to be performed during each refueling outage is identified by Engineering in accordance with controlled procedures. Component conditions are monitored to detect degradation due to loss of material and cracking. Inspections include visual, surface, and volumetric examinations. The extent of each component inspection is defined within the Augmented Inspection Activities program description.

Augmented Inspection Activities include:

- Sensitized stainless steel (Class 1) circumferential, longitudinal, branch connection, and socket welds on for the Pressurizer spray line welds in the RC System.
- Sensitized stainless steel (Class 2) circumferential, longitudinal, branch connection, and socket welds on the SI, and CS systems.
- High Energy Lines Outside of Containment (Main Steam and Feedwater)
- Reactor vessel incore detector thimble tubes
- Component supports
- Steam generator feedwater nozzles
- Pressurizer instrument connections
- Reactor vessel head

The Augmented Inspection Activities will also include an inspection of the core barrel hold-down spring. The inspection will address the aging effect of loss of pre-load. The initial inspection will be performed prior to the end of year 40 of operation. Additionally, Augmented Inspection Activities will include an inspection of the pressurizer surge line connection to the reactor coolant system hot-leg loop piping. The inspection will address the aging effect of thermal fatigue failure of the weld due to environmental effects, as described in NRC Generic Safety Issue GSI-190. Inspection details regarding scope, frequency, qualifications, methods, etc. will be submitted to the NRC for review. The initial baseline inspection will be completed prior to the end of year 40

of operation. Additional inspections will be performed during each subsequent 40-month inspection period. Industry efforts to study the environmental effects on weld thermal fatigue failure will continue to be evaluated by Dominion. If warranted, alternatives to this planned inspection (re-evaluation, replacement, or repair) will be submitted to the NRC for review.

The acceptance standards for non-destructive examinations for the Augmented Inspection Activities are consistent with guidance provided in ASME Section XI or are provided within applicable examination procedures. Evidence of loss of material, loss of pre-load, or cracking requires engineering evaluation for determination of corrective action. Occurrence of significant degradation that is adverse to quality will be entered into the Corrective Action System. Corrective action provides reasonable assurance that conditions adverse to quality are promptly corrected.

### 18.3.2.4 Environmentally Assisted Fatigue

Generic Safety Issue (GSI)-190 identifies a NRC staff concern about the effects of reactor water environments on reactor coolant system component fatigue life during the period of extended operation. The reactor water's environmental effects as described in GSI-190, are not included in the current licensing basis. As a result, the criterion specified in 10 CFR 54.3(a)(6) is not satisfied. Hence, environmental effects are not TLAAs. GSI-190, which was closed in December 1999, has concluded that environmental effects have a negligible impact on core damage frequency, and as such, no generic regulatory action is required. However, as part of the closure of GSI-190, the NRC has concluded that licensees who apply for license renewal should address the effects of coolant environment on component fatigue life as part of their aging management programs. As demonstrated in the preceding sections, fatigue evaluation in the original transient design limits remain valid for the period of extended operation. Confirmation by transient cycle counting will ensure that these transient design limits are not exceeded. Secondly, the reactor water's environmental effects on fatigue life were evaluated using the most recent data from laboratory simulation of the reactor coolant environment.

As a part of the industry effort to address environmental effects for operating nuclear power plants during the current 40-year licensing term, Idaho National Engineering Laboratories evaluated, in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components", fatigue-sensitive component locations at plants designed by all four U. S. Nuclear Steam Supply System vendors. The pressurized water reactor calculations, especially the early-vintage Westinghouse PWR calculations, are directly relevant to the Dominion stations. The description of the "Older Vintage Westinghouse Plant" evaluated in NUREG/CR-6260 applies to the Surry station. In addition, the transient cycles considered in the evaluation match or bound the design. The results of NUREG/CR-6260 analyses, and additional data from NUREG/CR-6583 and NUREG/CR-5704, were then utilized to scale up the plant-specific cumulative usage factors (CUF) for the fatigue-sensitive locations to account for environmental effects.

Based on these adjusted CUFs (using the environmental fatigue penalty factor), it has been determined that the surge line connection at the reactor coolant system's hot leg pipe exceeds the design threshold of 1.0, consequently, aging management is required. Additionally, the CUFs that were adjusted for environmental effects for the safety injection (SI) and charging line nozzles were initially determined to exceed the design threshold of 1.0. A more detailed evaluation of these nozzles was performed. The resulting environmental effect CUFs were improved but remained slightly above 1.0. Therefore, the SI and charging line nozzles also require aging management.

The approach to manage environmentally assisted fatigue for the surge line welds and the SI and charging line nozzles will be developed from one or more of the following options and submitted to the NRC for review prior to the period of extended operation:

1. Further refinement of the fatigue analysis (e.g., NB-3200 analysis) to lower the CUFs to below 1.0, or
2. Repair of the affected locations, or
3. Replacement of the affected locations, or
4. Inspection of the affected locations.

The surge line weld at the hot leg pipe connection will be included in an Augmented Inspection Activities (Section 18.2.1). Baseline inspections of the surge line welds are planned prior to entry into the period of extended operation, and they will also be inspected once per 40-month period. The results of these inspections and the results of planned research by the EPRI-sponsored Materials Reliability Program will be utilized to assess the appropriate approach for addressing environmentally assisted fatigue of the surge lines during the period of extended operation.

The use of inspections (Option 4) to manage environmentally assisted fatigue during the period of extended operation, would require inspection details such as scope, qualification, method, and frequency to be provided to the NRC for review prior to entering the period of extended operation. The NRC review would ensure that the inspection intervals for the periodic inspection of the affected locations would be determined by a method accepted by the NRC.

Since the adjusted CUFs for the SI and charging line nozzles exceeded the threshold value by only a small margin, the aging management option most appropriate is the analytical approach (Option 1). If analysis is successful in reducing the CUFs below 1.0, no further action would be required. If not, other listed options would be pursued. In either case, the approach to manage the aging of these nozzles would be submitted to the NRC for review.

Implementation of one or more of the above listed options will ensure that the potential effects of the reactor water environment have been addressed for the period of extended operation as required by GSI-190.

DRAFT
(9/10/02)

**Attachment 2**

# License Renewal – Response to RAI
# Serial No. 02-332A

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

## Revised North Anna UFSAR Supplement Sections
## (Changes Indicated in Margins)

**Virginia Electric and Power Company**
**(Dominion)**

# EXCERPT FROM NORTH ANNA UFSAR SUPPLEMENT

## 18.2.1 Augmented Inspection Activities

The purpose of the Augmented Inspection Activities is to perform examinations of selected components and supports in accordance with requirements identified in the Technical Specifications, UFSAR, license commitments, industry operating experience, and good practices for the station. Augmented inspections are outside the required scope of ASME Section XI. The scope of Augmented Inspection Activities to be performed during each refueling outage is identified by Engineering in accordance with controlled procedures. Component conditions are monitored to detect degradation due to loss of material and cracking. Inspections include visual, surface, and volumetric examinations. The extent of each component inspection is defined within the Augmented Inspection Activities program description.

Augmented Inspection Activities include:

- High energy lines outside Containment (Main Steam and Feedwater)
- Reactor vessel incore detector thimble tubes
- Component supports
- Steam generator feedwater nozzles
- Reactor vessel head
- Turbine throttle valves
- Steam generator supports

The Augmented Inspection Activities will also include an inspection of the core barrel hold-down spring. The inspection will address the aging effect of loss of pre-load. The initial inspection will be performed prior to the end of year 40 of operation. Additionally, Augmented Inspection Activities will include an inspection of the pressurizer surge line connection to the reactor coolant system hot-leg loop piping. The inspection will address the aging effect of thermal fatigue failure of the weld due to environmental effects, as described in NRC Generic Safety Issue GSI-190. Inspection details regarding scope, frequency, qualifications, methods, etc. will be submitted to the NRC for review. The initial baseline inspection will be completed prior to the end of year 40 of operation. Additional inspections will be performed during each subsequent 40-month inspection period. Industry efforts to study the environmental effects on weld thermal fatigue failure will continue to be evaluated by Dominion. If warranted, alternatives to this planned inspection (re-evaluation, replacement, or repair) will be submitted to the NRC for review.

The acceptance standards for non-destructive examinations for the Augmented Inspection Activities are consistent with guidance provided in ASME Section XI or are provided within applicable examination procedures. Evidence of loss of material, loss of pre-load, or cracking requires engineering evaluation for determination of corrective action. Occurrence of significant degradation that is adverse to quality will be entered into the Corrective Action System. Corrective action provides reasonable assurance that conditions adverse to quality are promptly corrected.

### 18.3.2.4 Environmentally Assisted Fatigue

Generic Safety Issue (GSI)-190 identifies a NRC staff concern about the effects of reactor water environments on reactor coolant system component fatigue life during the period of extended operation. The reactor water's environmental effects as described in GSI-190, are not included in the current licensing basis. As a result, the criterion specified in 10 CFR 54.3(a)(6) is not satisfied. Hence, environmental effects are not TLAAs. GSI-190, which was closed in December 1999, has concluded that environmental effects have a negligible impact on core damage frequency, and as such, no generic regulatory action is required. However, as part of the closure of GSI-190, the NRC has concluded that licensees who apply for license renewal should address the effects of coolant environment on component fatigue life as part of their aging management programs. As demonstrated in the preceding sections, fatigue evaluation in the original transient design limits remain valid for the period of extended operation. Confirmation by transient cycle counting will ensure that these transient design limits are not exceeded. Secondly, the reactor water's environmental effects on fatigue life were evaluated using the most recent data from laboratory simulation of the reactor coolant environment.

As a part of the industry effort to address environmental effects for operating nuclear power plants during the current 40-year licensing term, Idaho National Engineering Laboratories evaluated, in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components" , fatigue-sensitive component locations at plants designed by all four U. S. Nuclear Steam Supply System vendors. The pressurized water reactor calculations, especially the early-vintage Westinghouse PWR calculations, are directly relevant to the Dominion stations. The description of the "Older Vintage Westinghouse Plant" evaluated in NUREG/CR-6260 applies to the North Anna station. In addition, the transient cycles considered in the evaluation match or bound the design. The results of NUREG/CR-6260 analyses, and additional data from NUREG/CR-6583 and NUREG/CR-5704, were then utilized to scale up the plant-specific cumulative usage factors (CUF) for the fatigue-sensitive locations to account for environmental effects.

Based on these adjusted CUFs (using the environmental fatigue penalty factor), it has been determined that the surge line connection at the reactor coolant system's hot leg

pipe exceeds the design threshold of 1.0, consequently, aging management is required. Additionally, the CUFs that were adjusted for environmental effects for the safety injection (SI) and charging line nozzles were initially determined to exceed the design threshold of 1.0. A more detailed evaluation of these nozzles was performed. The resulting environmental effect CUFs were improved but remained slightly above 1.0. Therefore, the SI and charging line nozzles also require aging management.

The approach to manage environmentally assisted fatigue for the surge line welds and the SI and charging line nozzles will be developed from one or more of the following options and submitted to the NRC for review prior to the period of extended operation:

1. Further refinement of the fatigue analysis (e.g., NB-3200 analysis) to lower the CUFs to below 1.0, or
2. Repair of the affected locations, or
3. Replacement of the affected locations, or
4. Inspection of the affected locations.

The surge line weld at the hot leg pipe connection will be included in an Augmented Inspection Activities (Section 18.2.1). Baseline inspections of the surge line welds are planned prior to entry into the period of extended operation, and they will also be inspected once per 40-month period. The results of these inspections and the results of planned research by the EPRI-sponsored Materials Reliability Program will be utilized to assess the appropriate approach for addressing environmentally assisted fatigue of the surge lines during the period of extended operation.

The use of inspections (Option 4) to manage environmentally assisted fatigue during the period of extended operation, would require inspection details such as scope, qualification, method, and frequency to be provided to the NRC for review prior to entering the period of extended operation. The NRC review would ensure that the inspection intervals for the periodic inspection of the affected locations would be determined by a method accepted by the NRC.

Since the adjusted CUFs for the SI and charging line nozzles exceeded the threshold value by only a small margin, the aging management option most appropriate is the analytical approach (Option 1). If analysis is successful in reducing the CUFs below 1.0, no further action would be required. If not, other listed options would be pursued. In either case, the approach to manage the aging of these nozzles would be submitted to the NRC for review.

Implementation of one or more of the above listed options will ensure that the potential effects of the reactor water environment have been addressed for the period of extended operation as required by GSI-190.