October 22, 2001

Mr. David A. Christian
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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE NORTH ANNA NUCLEAR STATION, UNITS 1 AND 2, AND SURRY NUCLEAR STATION, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION

Dear Mr. Christian:

By letter dated May 29, 2001, Virginia Electric and Power Company (Dominion) submitted for Nuclear Regulatory Commission (NRC) review an application, pursuant to 10 CFR Part 54, to renew the operating licenses for the North Anna Nuclear Station, Units 1 and 2, and Surry Nuclear Station, Units 1 and 2. The NRC staff is reviewing the information contained in license renewal application and has identified, in the enclosure, areas where additional information is needed to complete its review. Specifically, the enclosed requests for additional information (RAIs) are from Section 2.1, “Scoping and Screening Methodology”, Section B2.0, “Aging Management Activities,” Section 4.1, “Identification of Time-Limited Aging Analyses,” Section 4.3, “Metal Fatigue,” and Section 4.7.4, “Spent Fuel Pool Liner.”

Please provide a schedule by letter, or electronic mail for the submittal of your responses within 30 days of the receipt of this letter. Additionally, the staff would be willing to meet with Dominion prior to the submittal of the responses to provide clarifications of the staff’s requests for additional information.

Sincerely,

/***RA***/

Robert J. Prato, Project Manager
License Renewal and Standardization Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos. 50-338, 50-339, 50-280, and 50-281

Enclosure: As stated

cc w/encl: See next page

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Request for Additional Information
North Anna Nuclear Station, Units 1 and 2, and
Surry Nuclear Station, Units 1 and 2

Section 2.1, "Scoping and Screening Methodology"

RAI 2.1-1. During the scoping and screening methodology audit conducted at the applicant's engineering offices from September 10 -14, 2001, the audit team reviewed implementation procedures and Engineering reports which describe the scoping and screening methodology implemented by the applicant. On the basis of this review, the audit team determined that the Criterion 2 report did not provide a clear description and account of all essential activities in the scoping and screening process related to the determination of Criterion 2 systems, structures, and components (SSCs). While the audit team determined that the actual process implemented by the applicant was conducted in accordance with the requirements of 10 CFR Part 54, the team also concluded that the applicant needs to update these procedures to reflect the actual scoping and screening process upon which the applicant relies. The applicant indicated that they were continuing to develop an implementation program to address the continued use of the scoping and screening process and to incorporate the existing implementation guidance and lessons learned reports from the initial license renewal application (LRA) effort into such a process.

The applicant is requested to confirm that its engineering renewal scoping and screening procedures affected by this issue will be updated to clearly reflect the actual process used, and to specify the time-frame during which this update will be accomplished. As part of the response to this issue please summarize the actual process which was implemented for the LRA scoping and screening of Criterion 2 SSCs.

RAI 2.1-2 In both LRAs, Section 2.1.3.6, "Criterion 2 Report," item b, the applicant states, in part, that non-safety-related (NSR) piping that is attached to safety-related (SR) piping and that is required to be seismically designed and supported up to the first equivalent anchor point beyond the SR/NS or SR/non-seismically qualified (NSQ) boundary, has not been identified during screening. In both LRAs, Section 2.1.3.6, item c, the applicant, in part, states that "[i]t should be noted that NS and NSQ mechanical components (e.g., piping, tanks, ducting) have not been included within the scope of license renewal for Seismic II/I because the failure of this equipment during a seismic event has not been postulated in the CLB."

The audit team discussed these issues with the applicant and requested specific clarification regarding the applicants approach to scoping and screening NSR SSCs in accordance with the requirements of 10CFR54.4(a)2. The audit team determined that the applicant did, in fact, bring into scope those SR/NS and SR/NSQ piping segments up through the first equivalent anchor point beyond the SR/NS or SR/NSQ boundary as part of their scoping and screening methodology implementation process, but did not uniquely identify those segments on the applicable plant drawings differently than the SR piping to which they were attached. However, the staff is requesting that the applicant document the fact that it did include SR/NS and SR/NSQ piping segments up through the firstequivalent anchor point beyond the SR/NS or SR/NSQ boundary and describe the implementation process used to include those SSCs.

RAI 2.1-3 In addition to the SR/NS and SR/NSQ piping segments discussed above, an applicant needs to consider NSR piping systems which are not connected to SR piping, but have a spatial relationship such that their failure could adversely impact on the performance of an intended safety function. For this piping system configuration, the applicant has two options when performing its scoping evaluation; a mitigative option or a preventive option.

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

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

Finally, an applicant may determine that in order to ensure adequate protection of the SR SSC, a combination of mitigative features and NSR SSCs must be brought within scope. Regardless, it is incumbent upon the applicant to provide adequate justification for the approach taken with respect to scoping of NSR SSCs in accordance with the Rule. Therefore the applicant is requested to

identify which option is used for NSR piping systems which are not connected to SR piping, but have a spatial relationship such that their failure could adversely impact on the performance of an intended safety function.

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

a. the mitigative feature(s) that is credited for protection
b. the hazard (e.g., failure mechanisms and postulated failure locations) for which the mitigative feature(s) is providing protection
c. a summary discussion (including references, such as reports, analyses, calculations, etc.) of the basis for the conclusion that the mitigative feature(s) is adequate to protect SR SSCs.

RAI 2.1-4 Given the methodology used to identify piping systems that meet the 10 CFR 54.4(a)(2) scoping criterion, the staff is concerned that there may be other non-safety-related mechanical or structural components which would normally be included within the scope of license renewal, but are excluded because mitigative features have been credited for protecting SR SSCs from the failure of the NSR mechanical or structural component. If such credit is being taken, please identify these NSR mechanical or structural components and indicate:

a. the mitigative feature(s) that is credited for protection
b. the hazard (e.g., failure mechanisms and postulated failure locations) for which the mitigative feature(s) is providing protection
c. a summary discussion (including references, such as reports, analyses, calculations, etc.) of the basis for the conclusion that the mitigative feature(s) is adequate to protect SR SSCs

Appendix B - Aging Management Activities

B2.0-1 In the past, applicants have described the aging management programs in term other than the ten elements as defined in the Standard Review Plan (SRP). On the bases of this concern, the staff is asking that the applicant define the elements of their aging management activities for the staff to clearly understand its application throughout Appendix B. The applicant has the option to verify that they used the same definition presented in the SRP in its development of its aging management activities.

In addition, the applicant takes credit for its 10 CFR Part 50, Appendix B program to satisfy three of the ten elements of an aging management program. The staff generically accepts Appendix B activities in fulfillment of the corrective action, confirmation process, and administrative control attributes for an aging management program. However, the staff needs to verify that an applicant is correctly applying its Appendix B program to these attributes. Therefore, please provide a description of how Appendix B is applied to the corrective action, confirmation process, and administrative

control attributes for an aging management program. In addition, the applicant needs to add a summary description of the QAP as it specifically addresses the corrective action, confirmation process, and administrative controls attributes for an aging management programs to its FSAR Supplement.

4.1 Identification of Time-Limited Aging Analyses

RAI 4.1-1 In both LRAs, Table 4.1-1 the applicant did not identify pipe break postulation based on cumulative usage factor (CUF) as a TLAA. Section 3A.46 of the NAS updated final safety analysis report (UFSAR) describes the criteria used to provide protection against pipe whip inside the containment. Part of the criteria specifies the postulation of pipe breaks at locations where the CUF exceeds 0.1. Although the fatigue usage factor calculation was identified as a TLAA, the pipe break criterion was not identified as a TLAA. However, the usage factor calculation used to identify postulated pipe break locations meets the definition of a TLAA as specified in 10 CFR 54.3 and, therefore, the staff considers the associated criteria for pipe break postulation to be a TLAA. Provide a description of the TLAA performed to address the pipe break criteria for North Anna. Also identify any pipe break postulations based on CUF at Surry and describe the TLAA performed for these locations. Indicate how these TLAAs meet the requirements of 10 CFR 54.21(c).

4.3 Metal Fatigue

RAI 4.3-1 In both LRAs, Section 4.3.1, the applicant discusses its evaluation of the fatigue TLAA for ASME Class 1 components. In this discussion, the applicant indicates that, on the bases of its review of the plant operating history, the number of cycles assumed in the design of the ASME Class 1 components are conservative and bounding for the period of extended operation. Table 5.2-4 of the North Anna UFSAR and Table 4.1-8 of the Surry UFSAR contain a list transient design conditions and associated design cycles. Provide the following information for each transient listed in these tables:

a. The current number of operating cycles and a description of the method used to determine the number and severity of the design transients from the plant operating history.

b. The number of operating cycles estimated for 60 years of plant operation and a description of the method used to estimate the number of cycles at 60 years.

c. A comparison of the design transients listed in the UFSAR with the transients monitored by the Transient Cyclic Counting Program (TCCP) as shown in Section B3.2 of the LRAs. Identify any transients listed in the UFSAR that are not monitored by the TCCP and explain why it is not necessary to monitor these transients.

d. Section B3.2 of the NAS LRA indicates that the charging line nozzle has been instrumented to evaluate the impact of charging line flow transients. Describe the instrumentation used to monitor charging flow transients explain how the data obtained from this instrumentation is used by the TCCP.

e. In both LRAs, Table 3.1.3-W1, the applicant provides the response to Renewal Applicant Action Item 11 specified in WCAP -14577, Revision 1-A regarding fatigue TLAA of the reactor vessel internals. The response indicates that the TCCP will assure that the transients will remain within their design values for the period of extended operation. List the transients that contribute to the fatigue usage for each component listed in Table 3-3 of WCAP-14577, Revision 1-A and discuss how the TCCP monitors these transients.

RAI 4.3-2 As discussed in RAI 4.3.1-1, the applicant indicates that the existing design transients and cycle frequencies are conservative and bounding for the period of extended operation. However, the applicant also indicates that the North Anna reactor pressure vessel closure studs and reactor coolant systems (RCS) loop stop valves were reanalyzed. Explain why additional analyses were required for these components in light of the statement in the LRAs that design transients and frequencies are conservative and bounding for the period of extended operation.

RAI 4.3-3 For both LRAs, identify whether calculations that meet the definition of a TLAA were performed in response to NRC Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems." Describe the actions taken to address this bulletin during the period of extended operation.

RAI 4.3-4 The Westinghouse Owners Group issued Topical Report WCAP-14575-A, "Aging Management Evaluation for Class 1 Piping and Associated Pressure Boundary Components," to address aging management of the RCS piping. In both LRAs, Section 3.1.1, the applicant addresses the applicability of WCAP-14575-A to North Anna and Surry. Table 3.1.1-W1 of the LRAs contain the response to the renewal applicant action items developed as a result of the staff review of the topical report. Renewal Applicant Action Item 8 requests that applicants address components labeled I-M and I-RA in Tables 3-2 through 3-16 of WCAP-14575-A. The applicant indicates that the components in Tables 3-2 through 3-16 were addressed by an aging management activity, plant-specific fatigue evaluation or code evaluation. However, the applicant did not provide specific details for each component. Provide a summary of the resolution for each of the components labeled I-M and I-RA in Tables 3-2 through 3-16.

RAI 4.3-5 The Westinghouse Owners Group has issued the generic Topical Report WCAP-14574-A to address aging management of pressurizers. In both LRAs, Section 3.1.4, the applicant discusses the applicability of WCAP-14574-A to North Anna and Surry. In both LRAs, Table 3.1.4-W1, the applicant provides the response to the renewal applicant action items developed as a result of the staff

review of the topical report. Renewal Applicant Action Item 1 requests that the applicant demonstrate that the pressurizer sub-component CUFs remain below 1.0 for the period of extended operation. Table 2-10 of WCAP-14574-A indicates that the ASME Section III Class 1 fatigue CUF criterion could be exceed at several pressurizer sub-component locations during the period of extended operation. WCAP-14574-A also identified recent unanticipated transients that were not considered in the original ASME Section III Class 1 fatigue analyses, including inflow/outflow thermal transients. The response to applicant action item 1 refers to the TLAA evaluation in Section 4.3 of the LRA. The discussion of the pressurizer surge line indicates that the inflow/outflow transients have been evaluated for the pressurizer components. Provide the following information:

a. Confirm that the additional transients discussed in WCAP-14574-A, not considered in the original design, have been addressed at North Anna and Surry.

b. Show the ASME Section III Class 1 CLB CUFs for the applicable sub-components of the North Anna and Surry pressurizers specified in Table 2-10 of WCAP-14574-A and the corresponding CUFs for the extended period of operation.

c. Discuss the impact of the environmental fatigue correlations provided in NUREG/CR-6583, "Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels," and NUREG/CR-5704, "Effects of LWR Coolant Environments on Fatigue on Fatigue Design Curves of Austenitic Stainless Steels," on the above results.

RAI 4.3-6 In both LRAs, Section 4.3.4, the applicant discusses the impact of the reactor water environment on the fatigue life of components. The applicant references the fatigue sensitive component locations for an early vintage Westinghouse plant identified in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components." The LRAs indicates that the results of the NUREG/CR-6260 studies were used to scale up the North Anna and Surry plant-specific usage factors for the same locations to account for environmental effects. The LRAs also indicates that the later environmental fatigue correlations contained in NUREG/CR-6583, "Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels," and NUREG/CR-5704, "Effects of LWR Coolant Environments on Fatigue on Fatigue Design Curves of Austenitic Stainless Steels," were considered in the evaluation. Provide the results of the usage factor evaluation for each of the six component locations listed in NUREG/CR-6260. Discuss how the factors used to scale up the North Anna and Surry plant-specific usage factors were derived. Also discuss how the later environmental data provided in NUREG/CR-6583 and NUREG/CR-5704 were factored in the evaluations. Discuss the how the North Anna charging line flow transients monitored by the TCCP are factored in these evaluations.

RAI 4.3-7 In both LRAs, Section 4.3.4, the applicant indicates that the pressurizer surge line required further evaluation for environmental fatigue during the period of extended operation. The applicant further indicates that it would use an aging management program to address fatigue of the surge line during the period of extended operation. The aging management program would rely on an augmented inspection program to address surge line fatigue during the period of extended operation. As indicated in the draft safety evaluation on Westinghouse Owners Group generic technical report WCAP -14575, License Renewal Evaluation: Aging Management Evaluation for Class 1 Piping and Associated Pressure Boundary Components," the NRC has not endorsed a procedure on a generic basis which allows for augmented inspections in lieu of meeting the fatigue usage criteria. The applicant has not provided a technical basis demonstrating the technical adequacy of its proposal. Provide a detailed technical evaluation which demonstrates the proposed inspections provide an adequate technical basis for detecting fatigue cracking before such cracking leads to through wall cracking or pipe failure. The detailed technical evaluation should be sufficiently conservative to address all uncertainties associated with the technical evaluation (e.g., fatigue crack initiation and detection, fatigue crack size, and fatigue crack growth rate considering environmental factors). As an alternative to the detailed technical evaluation, provide a commitment monitor the fatigue usage, including environmental effects, during the period of extended operation, and to take corrective actions, as approved by the staff, if the usage is projected to exceed one.

RAI 4.7.4-1 Please provide a tabulated summary of the number of cycles considered in the fatigue analysis for normal, upset, emergency, and faulted conditions together with the temperature ranges considered for each condition.

RAI 4.7.4-2 What is the temperature range considered in calculating the allowable thermal cycles for the most severe thermal cycles?

RAI 4.7.4-3 As the stainless pool liner is attached to the concrete walls and the bottom slab (or basemat), the fatigue characteristics of the liner will be influenced by the integrity of its anchorages to the concrete, and the effects of high sustained (> 15 days) temperature on the concrete. Please provide a summary of procedures used to incorporate these effects in the pool liner time-limited fatigue analysis.