June 13, 2003

Mr. David A. Christian
Senior Vice President - Nuclear Operations
and Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING THE SURRY INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE RENEWAL APPLICATION AND EXEMPTION REQUEST (TAC NOs. L23455 and L23456)

Dear Mr. Christian:

On April 29, 2002, Virginia Electric and Power Company (Dominion) submitted an application to the U. S. Nuclear Regulatory Commission (NRC) to renew its license for the Surry Independent Spent Fuel Storage Installation (ISFSI). Additionally, your license renewal application was accompanied by an exemption request to extend the license renewal period to 40 years. These two documents were reviewed concurrently. The staff has determined that additional information is required to assess compliance of the license renewal application with 10 CFR Part 72. Enclosed is the staff's Request for Additional Information (RAI) for the continued review of your application and exemption request.

The NRC requests that Dominion respond to the RAI by providing a response to each question in the RAI. We would be willing to meet with you to discuss and clarify any portion of the enclosed RAI. Your response is expected by September 12, 2003. If you are unable to meet this milestone, you must notify us in writing, at least two weeks prior to the due date. Your notification must identify your new response date and the reason for the delay. The staff will then assess the impact of the new response date and issue a revised schedule.

If your response contains proprietary information please include a complete separate non-proprietary version of the response. Please refer to Docket No. 72-2 and TAC Nos. L23455 and L23456 in future correspondence related to this request. If you have any questions regarding our review, please contact me at (301) 415-3781.

Sincerely,

/RA/

Mary Jane Ross-Lee, Senior Project Manager
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Docket No. 72-2

Enclosure: Request for Additional Information

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**Virginia Electric Power Company**
**Surry Independent Spent Fuel Storage Installation**
**Docket No. 72-2**

**Request for Additional Information**

This Request for Additional Information (RAI) contains questions identified by the U. S. Nuclear Regulatory Commission (NRC) staff during its review of Virginia Electric and Power Company (Dominion) application for renewal of the Surry Independent Spent Fuel Storage Installation (ISFSI) and exemption request for the license renewal period. This information is required to:

- establish and confirm that the systems, structures, and components (SSCs) of the ISFSI can, with reasonable assurance, continue to function in a safe manner and meet applicable regulatory requirements for the license renewal period;

- provide a complete description of the environmental setting in the vicinity of the Surry ISFSI and assist with an analysis of the environmental and health impacts from the continued operation of the facility; and

- establish the technical justification for granting an exemption to the license renewal period of 20 years, and grant a renewal for 40 years.

Each individual RAI describes information needed by the staff to complete its review of the license renewal application and exemption request, determine whether Dominion has demonstrated compliance with regulatory requirements, and provide the necessary information and references for the required Safety Evaluation Report (SER) and Environmental Assessment (EA). Where an individual RAI relates to Dominion's need to meet one or more regulatory requirements for the renewal period or where an RAI specifically focuses on compliance issues associated with specific regulatory requirements, such requirements will be specified in the RAI.

The Dominion ISFSI request for license renewal is unique in that it is the first dry cask storage ISFSI to request a license renewal. The NRC provided preliminary guidance for 10 CFR Part 72 license renewal to Dominion on March 29, 2001. The staff applied this guidance to the license renewal review of the Surry ISFSI, in addition to the appropriate regulations of 10 CFR Part 72.

AREAS EVALUATED DURING REVIEW OF THE LICENSE RENEWAL APPLICATION

Based on the preliminary guidance for license renewal for a site-specific ISFSI, the NRC staff review of the renewal application for the Surry ISFSI focused on the following areas:

1. Identification of ISFSI systems, structures, and components (SSCs), and their intended function(s) that are important to safety or whose failure may prevent an important safety function from being fulfilled.

2. For each of the SSCs identified, they are evaluated to determine if:
   a. The appropriate aging effects have been identified; and
   b. Dominion has adopted methods designed to manage the effects of aging for SSCs considered important to safety or important to the operation of a safety system.

3. The applicant has reviewed the existing maintenance and monitoring programs used to

inspect and verify the operability of the identified SSCs to assure that the programs are complete and sufficient and provided information to ensure timely corrective actions, as required.

4. A demonstration that an overall evaluation that the ISFSI will be able to perform the required safety-related function for the full duration of the renewed license, and extended license renewal period, has been performed.

5. A demonstration that a review of operational experiences and lessons-learned from other ISFSIs to identify applicable aging effects and potential events that could impact the operability of the identified SSCs, has been performed with the results described in the license renewal application.

6. The proposed exemption request contains clear justification and is in compliance with current NRC Regulations, 10 CFR 72.2.

7. Sufficient information has been provided in order to allow a comprehensive evaluation of the environmental and health impacts on the surrounding area from continued operation of the ISFSI.

**Materials:**

The basis for the following questions is U. S. Nuclear Regulatory Commission, "Preliminary Guidance for License Renewal for Site-Specific Independent Spent Fuel Storage Installations," March 2001 (Preliminary Staff Guidance).

1. Justify why the performance of polymeric materials is not a concern for license renewal period of 40 years. Discuss any Time Limited Aging Analysis (TLAA) or monitoring that is used to ensure that the performance of the polymeric materials will meet the safety requirements (i.e. shielding) during the period of license renewal.

   A The following are examples of cask systems that have components made of polymeric materials:

   - Castor X/33 Moderator Rods contain polyethylene;
   - Westinghouse MC-10 B outer shielding contains BISCO NS-3 enclosed in stainless steel;
   - TN-32 top neutron shield contains polypropylene encased in steel and the radial neutron shield contains polyester encased in aluminum; and,
   - Nuclear Assurances Corporation (NAC) I-28 upper neutron shield and radial neutron shield contains BISCO NS-4 FR.

   B Explain the following sentence: "These elastomeric O-rings were not credited in the aging management review of the cask; therefore, the potential for loss of material of the carbon steel components below the closure is managed." (Page 3-18, para 1).

   C Justify why an aging management review was not performed for nonmetallic seals, nor an aging management program implemented, e.g., NAC I-28 uses polyethylene seals . (Section 3.2.2, page 3-14, 3-16, and 3-41).

   This information is required because polymeric materials and nonmetallic seals must continue to perform their safety function throughout the license renewal period. The operative degradation mechanisms for polymeric materials suggests higher susceptibility of polymerics to the effects of radiation and time at elevated temperatures as compared to that of metallics. As such, provide an evaluation of the mechanisms of degradation and the cumulative expected exposures for each component vis-a-vis the tolerable exposure derived from laboratory data and literature sources. One concern is that a nonmetallic seal may be in a weakened state and, as such, they may not function as effectively during accident conditions.

   This information is required to verify that these materials were considered in the evaluations performed in accordance with Sections III.C, III.D, and III.E of the Preliminary Staff Guidance.

2. Justify why "lead slumping" is not a concern for a license renewal period of 40 years in the NAC I-28 gamma shield.

This information is required to determine whether slumping of lead has been taken into account in a manner that ensures the safety functions continue to be provided.

This information is needed to verify that this material was considered in the evaluation performed in accordance with Sections III.B, and III.D of the Preliminary Staff Guidance.

3. Justify the use of EPRI references (6 and 8) in Section 3 of the license renewal application. These documents generalize the maximum temperatures and their duration for the five DCSSs at Surry, based on information (experiences gained) from only the Castor V21 cask.

   This information is required to verify that the evaluations were performed in accordance with Sections III.A and III.C of the Preliminary Staff Guidance, and is required for completeness of the application.

4. Provide an evaluation or data that demonstrates that the properties of zirconium fuel cladding continue to be sufficient to satisfy the safety requirements for the proposed 40-year license renewal period.

   This information is required to verify that cladding material properties were adequately considered in the evaluations performed in accordance with Sections III.C, III.D, and III.E of the Preliminary Staff Guidance.

5. Justify the continued use of the thermal neutron absorber materials during the license renewal period for the following casks cited in Table 3.2.3: aluminum and borated aluminum in fuel baskets, basket poison, and poison plates of MC-10, TN-32, and NAC I-28. The applicant did not identify the absorber material (if any) used in the Castor V/21 and X/33 systems.

   In Section B2.2 on Evaluations and Discussion of the Identified TLAAs, the depletion of boron used for criticality control is discussed for the MC-10 (Section B2.2.3) but the depletion is not discussed in Section B2.2 for the other cask systems. Continued efficacy of the absorber materials used in each of the DCSS is required throughout the license renewal period.

   This information is required to verify that these materials were adequately considered in the evaluations performed in accordance with Sections III.C,and III.E of the Preliminary Staff Guidance.

6. Clarify the following statement in footnote 3 to Table 3.2-4 (pages 3-40 and 3-44): “Small gaps may exist where metal-to-metal or metal-to-polymer sub-components interface. These gaps ....not required.”

   This statement is ambiguous. Clarify whether or not these gaps communicate with the atmosphere and could be subject to weather borne moisture intrusion or other degrading elements.

   This information is required to verify that the evaluations were adequately performed in accordance with Section III.C of the Preliminary Staff Guidance and is required for completeness of the application.

7. Clarify the term “none” in Table 3.2.1 (page 3-25) under the heading of intended function. If there is indeed an elastomeric seal, its function and continued safety should be addressed under the above question regarding polymeric materials.

   This information is required to verify that the evaluations were adequately performed in accordance with Section III.C of the Preliminary Staff Guidance. The information is required for completeness of the application.

8. Provide additional discussion on when a cask bottom will be inspected prior to the issuance of the renewed license.

   Appendix A, page A-2, of the Surry License Renewal Application states: “....visual inspection of the normally inaccessible areas of casks in the event they are lifted in preparation for movement or an environmental cover is removed for maintenance.”

   In accordance with the NRC’s Preliminary Staff Guidance, Section III.D, an inspection of at least one cask bottom (of the population of casks in use at an ISFSI) is to be performed prior to renewal of the license.

9. Provide details and a discussion of those parts of the cask systems (except the bottom, as discussed in the previous question, and the interior portion containing the fuel) that the licensee considers “normally inaccessible” and provide a justification for not performing a special one-time inspection of a representative area.

   Page A-3 of License Renewal Application Appendix A states: “Visual inspection of normally inaccessible areas of the casks are on an opportunity only basis and will be evaluated on a case-by-case basis and not trended.”

   In accordance with the NRC’s Preliminary Staff Guidance, Section III.D, a one-time inspection of normally inaccessible areas (not including the interior) of casks should be performed prior to the end of the license period. It is not clear to the staff just how this provision of the staff guidance will be accomplished. (This question is directed at those portions of casks that may have external weather communication but which are not directly visible by normal line of sight or are hidden by some sort of removable (not welded) cover. It is not directed at spaces filled with lead or polymeric shield material).

10. Provide a discussion and details of the plan and schedule for inspecting the bottom of the CASTOR V/21 cask.

    Page A-4 of the Surry License Renewal Application Appendix states that the EPRI Dry Cask Characterization Project documented corrosion of bolts holding the rear breech plate on the CASTOR V/21 cask, and that such conditions could exist at Surry. It is not clear to the NRC staff if there is a plan for an inspection for this potential degradation mechanism, prior to the issuance of the renewed license.

    This information is needed to ensure adequate evaluations were performed in accordance with Section III.D of the Preliminary Staff Guidance and is required for completeness of the application.

11. Ensure that all age-related degradation mechanisms experienced by the five different storage cask designs at the ISFSI have been identified.

The applicant indicated that one of the DCSSs currently in use at the Surry ISFSI has been identified by EPRI to have age-related degradation. The EPRI Dry Cask Storage Characterization Project documented the occurrence of corrosion on one of the bolts holding the rear breech plate on the CASTOR V/21 cask. It is not clear whether the applicant experienced other age-related degradation associated with other DCSSs that are currently in use at the Surry ISFSI. The staff agrees it is important to review documents such as drawings and SARs of each cask design currently in use at the Surry ISFSI to determine the cask components that require aging management review (AMR). Further discussion of the engineering evaluations/judgements and operating experience with respect to age-related degradation of each cask currently in use at the Surry ISFSI would clarify that no component important to AMR is overlooked.

This information is required to ensure adequate evaluations were performed in accordance with Section III.C of the Preliminary Staff Guidance.

12. Clarify the criteria used for determining when corrective actions should be implemented for components identified in the AMR.

Page A-3 of Appendix A indicates that engineering evaluations will be performed to determine whether observed deterioration of material condition is significant enough to compromise the ability of the dry storage cask to perform its intended function. Corrective actions may be taken as a result. Since certain material degradation effects may not always be apparent to visual observations, it is not clear how observed deterioration of material condition can be used quantitatively in the engineering evaluation. It appears that surface corrosion is the primary deterioration mechanism monitored. The adequacy of determining the extent of material degradation by such visual observation should be justified by addressing other potential mechanisms.

This information is required to ensure adequate evaluations were performed in accordance with Section III.C of the Preliminary Staff Guidance.

13. Clarify how the Maximum Cumulative Usage Factor (CUF) for fatigue was calculated for Castor V/21 casks and Castor X/33 casks.

Section B2.2 of Appendix B indicates that the CUF for fatigue for the Castor V/21 casks was calculated to be 0.111 for 30 years and 0.128 for Castor X/33 casks for the same 30 year period. It is not clear why the CUFs are different, since both casks are in the same location and exposed to the same temperature range.

This information is required to ensure adequate evaluations were performed in accordance with Section III.C of the Preliminary Staff Guidance.

**Scoping Methodology:**

1. Clarify how the site-characteristics addressed in Chapter 2 of the FSAR will change (or have changed) in the next 40 years. Specify how the scoping evaluation in the license renewal application considered external factors (such as site characteristics) that are outside the direct control of Dominion Power.

It appears that some information in the SAR is based on 1980-era data and does not

directly address changes to the site-characteristics over the next 40 years. For example, population distribution and site meteorology information (which may change) could affect radiological safety conclusions. It is not clear if the current licensing basis considered the realized and predicted changes in site-specific characteristics over long periods of time such as 60 years.

This information is required to verify that the SSCs important to safety will continue to meet the current licensing basis in accordance with Section II of the Preliminary Staff Guidance and the requirements of 10 CFR 72.104, 72.106, and 72.122(b&c) for an additional 40 years.

2. Discuss Dominion Power's plan to maintain the spent fuel pool for the proposed license life up to 2046.

   The spent fuel pool could be necessary to perform cask maintenance activities, satisfy action requirements in technical specifications, and unload spent fuel. The current licensing basis in the FSAR indicates the spent fuel pool and handling equipment is licensed and regulated under the Part 50 power license. However, the exemption request states that renewed power licenses would expire by 2033. It is not clear what elements of the spent fuel pools structures, systems, and components, as required under Part 50, must be maintained to provide reasonable assurance that these cask activities can be safely performed during storage operations between 2033 and 2046.

   This information is required to determine whether the scoping evaluation considered predicted changes in the current licensing basis for retrievability in accordance with Section II of the Preliminary Staff Guidance and the requirements of 72.122(l).

3. Clarify whether the casks loaded with spent fuel will only be used to store its original contents, or whether they may be reused to store different fuel during the renewed license period. Provide a table of fuel parameters in the currently loaded casks, including the burnup, cooling time, decay heat, fuel type, and fuel condition prior to loading.

   It must be established that the DCSS is capable of handling the thermal and radiation loading of the potential fuel that is allowed by NRC license during the additional 40-year storage period. For example, the application should address whether a cask could be unloaded (and its fuel shipped to a permanent repository) and then reused to store hotter fuel from the spent fuel pool.

   This information is required to determine significant differences in internal conditions between otherwise identical casks, in accordance with Section III.D.8 of the Preliminary Staff Guidance and the requirements of 72.122(a) and (b).

**Aging Management Reviews:**

1. Clarify whether the aging management evaluation of the TN-32 poison plates considered the analysis in Appendix A.5 of the Surry SAR, which addresses the criticality evaluation for a period of only 20 years.

   This information is required to determine whether the aging management evaluation considered the current licensing basis for criticality safety in accordance with Section

III.D.8 of the Preliminary Staff Guidance and the requirements of 72.124.

2. Justify why the fuel pellet is not within the scope of license renewal as stated in Table 3.3-1.

   The physical properties of the pellet are factors that impact the criticality analysis and are considered in the criticality safety design of the casks.

   This information is required to determine whether the aging management evaluation considered potential degradation mechanisms important to criticality safety in accordance with Section III.D.8 of the Preliminary Staff Guidance and the requirements of 72.124.

**Aging Management Activities:**

Discuss how cask seals are inspected under the inspection activities as stated in Table 3.2-4 for aging management. Clarify if the corrective actions and resolution of the TN-32 seal lid failures have addressed an additional 40-year service life for protection against normal conditions, anticipated occurrences, credible accidents, and natural phenomena events within the current licensing basis. Specify whether the cask seals could be in an undetected degraded state that meets normal operating conditions, but not in the required state of integrity to withstand credible accidents.

This information is required to determine whether the aging management maintenance and surveillance program considered the current licensing basis in accordance with Sections III.D.7 and D.8 of the Preliminary Staff Guidance and the requirements of 10 CFR 72.104, 72.106, and 72.122(b&c) for an additional 40 years.

**Environmental Review:**

1. Provide information (dates, quantities, locations, material release) for all reportable spills, releases, and accidental discharges to the environment since the previous Environmental Report (ER), if applicable. Provide a summary of the measured radiological dose impacts in Section 4.0 of Appendix E, during the entire current license period for ISFSI operations, as reported under 10 CFR 72.44(d)(3).

   This information may identify unexpected environmental trends during the current license period, and provides insights on expected environmental trends over an additional 40 years.

   10 CFR 51.61 states that... “The environmental report shall contain the information specified in 51.45 and shall address the siting evaluation factors contained in Subpart E of Part 72 of this chapter.” Furthermore, 10 CFR 72.70 (a) states that each specific licensee for an ISFSI “...shall update periodically...the final safety analysis report (FSAR) to assure that the information included in the report contains the latest information developed.”

2. Revise the environmental report to only address the requested licensing actions in the application.

   The ER provides assessments for modifications of the design with a fourth storage pad.

However, this design modification is not part of the ISFSI design which is requested in the license renewal.

This information is required to determine compliance with 10 CFR 51.45.

3. Delete the line in Appendix E, Table 1-2 regarding the Benefit-Cost Analysis.

   There is no benefit-cost analysis in Section 4.5 of the Environmental Report. In accordance with 10 CFR 51.45(c), one is not required.

4. Modify Appendix E, Section 4.0, Dose to the Public, to provide the most current population data.

   The annual collective dose to the public is based on 1980s population data assuming a 20 percent growth in the number of residents.

   Title 10 CFR 51.61 states that... "The environmental report shall contain the information specified in 51.45 and shall address the siting evaluation factors contained in subpart E of part 72 of this chapter." Furthermore, 10 CFR 72.70 (a) states that each specific licensee for an ISFSI "...shall update periodically...the final safety analysis report (FSAR) to assure that the information included in the report contains the latest information developed."

5. Verify the location of the nearest permanent resident is valid as presented in Appendix E, Figure 4-1, Dose Rate for 84 Base-case Casks versus Distance.

   Figure 4-1 in Appendix E and Figure 7.3-6 in the SAR are identical. Figure 7.3-6 is based on 1980 population data and the nearest resident is 1.5 miles from the site.

   10 CFR 51.61 states that... "The environmental report shall contain the information specified in 51.45 and shall address the siting evaluation factors contained in subpart E of part 72 of this chapter." Furthermore, 10 CFR 72.70 (a) states that each specific licensee for an ISFSI "...shall update periodically...the final safety analysis report (FSAR) to assure that the information included in the report contains the latest information developed."

6. Provide an analysis for residual impacts or unavoidable adverse impacts which remain after mitigation measures have been applied in Section 6.2, Appendix E.

   This information is required to determine compliance with 10 CFR 51.45.

7. Provide a description of the environmental impacts expected from the alternative actions which were considered in Chapter 7.0 Alternatives of Appendix E and complete Table 8-1 of Appendix E where applicable.

   The regulations in 10 CFR Part 51 require the environmental impact from both the proposed action and the alternatives to be described. This information is required to determine compliance with 10 CFR 51.45(c).