VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

February 11, 2002

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Serial No. 02-068
NL&OS/ETS R0
Docket No. 50-339
License No. NPF-7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNIT 2
PROPOSED IRRADIATION OF ONE LEAD FUEL ASSEMBLY
WITH ADVANCED CLADDING MATERIALS
BEYOND CURRENT LEAD ROD BURNUP LIMIT

Pursuant to 10 CFR 50.90 and 50.12, Virginia Electric and Power Company (Dominion) requests 1) an amendment to Facility Operating License Number NPF-7 for North Anna Power Station Unit 2 and 2) exemptions from 10 CFR 50.44, 10 CFR 50.46, and Appendix K of 10 CFR 50. The amendment and exemptions will permit Dominion to irradiate a lead test assembly in North Anna Unit 2 Cycle 16 to an end of life assembly average burnup of about 70 GWD/MTU. The lead rod average burnup in this assembly is expected to approach 73 GWD/MTU. Irradiation of this fuel assembly will provide data on fuel and material performance that will support industry goals of extending the current fuel burnup limits and address Nuclear Regulatory Commission (NRC) questions related to fuel performance at higher burnups. However, in a letter dated December 14, 1993, the NRC imposed a 60 GWD/MTU lead rod burnup limit on Dominion's Surry and North Anna units. Since the fuel rods in the lead test assembly would exceed this limit, NRC concurrence is required for this program to proceed.

The assembly to be used for this program is one of four lead test assemblies fabricated by Framatome Advanced Nuclear Power that have been irradiated for three cycles in North Anna Unit 1. The lead test assemblies used two advanced zirconium based alloys that are not currently discussed in North Anna Unit 2 Technical Specification 5.3.1. (One of these materials, M5, is now approved by the NRC for use in reload batches of fuel.) Prior NRC approval to irradiate these assemblies at North Anna Units 1 and 2 limited their use to three operating cycles. Because the zirconium-based alloys used in this assembly do not fit the specifications for either Zircaloy or ZIRLO, exemptions from 10 CFR 50.44, 10 CFR 50.46, and Appendix K of 10 CFR 50 are also requested to support irradiation of the assembly for an additional operating cycle. The basis for the exemption from the requirements of these sections of the Code of Federal Regulations is included in Attachment 2.

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As discussed in Attachment 1, the use of this fuel assembly will be fully evaluated as part of our normal reload design process. It is expected that all design criteria will be satisfied. The proposed irradiation of this lead test assembly to high burnup will not compromise the safe operation of the unit. The North Anna Technical Specifications and UFSAR allow for irradiation of limited numbers of lead test assemblies with NRC approval, so changes to the Technical Specifications and UFSAR are not required. A proposed license condition that would allow irradiation of this assembly for one additional cycle is provided in Attachment 3. It has also been determined that the proposed irradiation of a lead test assembly to high burnup does not constitute a significant hazard as defined in 10 CFR 50.92, as discussed in Attachment 4. The proposed license condition and supporting preliminary evaluation have been reviewed and approved by the Station Nuclear Safety and Operating Committee and the Management Safety Review Committee.

Attachment 1 contains information proprietary to Framatome Advanced Nuclear Power. This classification is supported by an affidavit (Attachment 5) signed by Framatome, the owner of the information. Attachment 6 provides a non-proprietary version of Attachment 1. In order to conform with the requirements of 10 CFR 2.790 concerning the protection of proprietary information, proprietary information is contained within brackets. Where the proprietary information has been deleted in the non-proprietary version, only the brackets remain. Accordingly, it is requested that the information which is proprietary to Framatome be withheld from public disclosure in accordance with 10CFR 2.790 of the Commission's regulations.

The fourth irradiation cycle for the lead test assembly is planned for North Anna Unit 2 Cycle 16, which is scheduled to begin operation in October 2002. To minimize the potential for a significant redesign effort late in the normal reload design process, Dominion requests that the NRC provide a preliminary assessment of the acceptability of irradiating the lead test assembly for an additional cycle by mid-April 2002 and approval of this irradiation program by August 15, 2002, to support completion of the North Anna 2 Cycle 16 design under the normal reload design schedule.

If you have any questions or require additional information, please contact us.

Very truly yours,

Leslie N. Hartz
Vice President - Nuclear Engineering

Commitments made in this letter: None

Attachments

cc: U.S. Nuclear Regulatory Commission **(Non-Proprietary Version)**
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NRC Senior Resident Inspector
North Anna Power Station

SN: 02-068
Docket No.: 50-339
Subject: Proposed TS Change – Irradiation of One Lead Fuel Assembly

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Leslie N. Hartz, who is Vice President - Nuclear Engineering, of Virginia Electric and Power Company. She has affirmed before me that she 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 her knowledge and belief.

Acknowledged before me this 11th day of February, 2002.

My Commission Expires: March 31, 2004.

Maggie McClure
Notary Public

(SEAL)

Attachment 5

Affidavit to Support Withholding of

Framatome ANP Proprietary Information

from Public Disclosure

AFFIDAVIT

COMMONWEALTH OF VIRGINIA)
) ss.
CITY OF LYNCHBURG)

1. My name is James F. Mallay. I am Director, Regulatory Affairs, for Framatome ANP ("FRA-ANP"), and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by FRA-ANP to determine whether certain FRA-ANP information is proprietary. I am familiar with the policies established by FRA-ANP to ensure the proper application of these criteria.

3. I am familiar with the information contained in one of the attachments to a letter from Dominion Generation to the NRC describing lead test fuel assemblies fabricated by Framatome ANP. This attachment, "Discussion of Proposed License Changes for North Anna 2," contains material developed by Framatome ANP. This attachment is referred to herein as "Document." Information contained in this Document has been classified by FRA-ANP as proprietary in accordance with the policies established by FRA-ANP for the control and protection of proprietary and confidential information.

4. This Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by FRA-ANP and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in this Document as proprietary and confidential.

5. This Document has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in the Document be withheld from public disclosure.

6. The following criteria are customarily applied by FRA-ANP to determine whether information should be classified as proprietary:

(a) The information reveals details of FRA-ANP's research and development plans and programs or their results.

(b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for FRA-ANP.

(d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for FRA-ANP in product optimization or marketability.

(e) The information is vital to a competitive advantage held by FRA-ANP, would be helpful to competitors to FRA-ANP, and would likely cause substantial harm to the competitive position of FRA-ANP.

7. In accordance with FRA-ANP's policies governing the protection and control of information, proprietary information contained in this Document has been made available, on a limited basis, to others outside FRA-ANP only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. FRA-ANP policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

SUBSCRIBED before me this 5th
day of February, 2002.

Ella F. Carr-Payne
NOTARY PUBLIC, STATE OF VIRGINIA
MY COMMISSION EXPIRES: 08/31/05

Attachment 2

Regulatory Basis and Request for

Specific Exemptions

REGULATORY BASIS AND REQUEST FOR SPECIFIC EXEMPTIONS

Virginia Electric and Power Company (Dominion) has irradiated four lead test assemblies (LTAs) fabricated by Framatome Advanced Nuclear Power (Framatome) for three cycles in North Anna Unit 1. The LTAs were very similar to the Framatome Mark-BW design, but incorporated several advanced features, including use of two advanced zirconium-based alloys, M4 and M5, for the fuel rod cladding. We now propose irradiating one of those lead test assemblies for a fourth operating cycle in North Anna Unit 2 Cycle 16. The assembly average burnup at the end of the cycle will be about 70 GWD/MTU.

The majority of the fuel rods in the LTA that will be irradiated for a fourth cycle have cladding fabricated from alloy M5. The NRC has now approved the use of this material for fuel rod cladding in reload batches of fuel (Reference 1). However, several sections of the Code of Federal Regulations continue to refer only to fuel with Zircaloy or ZIRLO cladding. Therefore, the NRC's approval for use of M5 fuel rod cladding specifically indicates that licensees should also submit exemption requests with regard to the provisions of 10 CFR 50.46, 10 CFR 50.44, and other applicable regulations that are relevant to particular fuel cladding materials.

Alloy M4 has been used as a cladding material for limited numbers of fuel rods in demonstration assemblies, including three previous cycles of irradiation in North Anna Unit 1. This material has not been approved for reload batches of fuel. Therefore, similar exemptions to the Code of Federal Regulations are necessary to support its use as a cladding material.

In support of the proposed continued irradiation of this lead test assembly in North Anna Unit 2 Cycle 16, exemptions are hereby being requested to 10 CFR 50.46 and 10 CFR 50.44, which specifically refer to fuel with Zircaloy or ZIRLO cladding, and Paragraph I.A.5 of Appendix K to 10 CFR Part 50, which requires use of a specific model that was originally derived for Zircaloy clad fuel.

10 CFR 50.12 states that the Commission may grant an exemption from requirements contained in 10 CFR 50 provided that: 1) the exemption is authorized by law, 2) the exemption will not result in an undue risk to public health and safety, 3) the exemption is consistent with the common defense and security, and 4) special circumstances, as defined in 10 CFR 50.12(a)(2) are present. The requested exemptions to allow the use of advanced zirconium alloys other than Zircaloy or ZIRLO for the fuel cladding material in the Framatome lead test assembly to be irradiated for a fourth cycle at North Anna Unit 2 satisfy these requirements as described below.

1. <u>The requested exemption is authorized by law.</u>

   Lead test assembly programs, irradiation of new materials, and operation to extended fuel burnups are not precluded by law. The Framatome lead test assembly to be irradiated for a fourth cycle in North Anna Unit 2 Cycle 16 contains cladding materials that do not conform to the cladding material designations explicitly defined in 10 CFR 50.44 and 10 CFR 50.46 (i.e., Zircaloy or ZIRLO). However, the criteria of these sections will continue to be satisfied

for the North Anna Unit 2 Cycle 16 core containing the lead test assembly. Similarly, Appendix K of 10 CFR 50 requires use of the Baker-Just equation, which was developed for use with Zircaloy clad fuel. Although the lead test assembly uses different zirconium-based alloys for the fuel rod cladding, the Baker-Just equation has been determined to be appropriate for evaluation of these materials. The equation has been applied to previous LOCA analyses of the Framatome lead test assemblies, and will also be applied to the LOCA evaluations for use of the one lead test assembly for a fourth cycle in North Anna Unit 2 Cycle 16. Therefore, issuance of exemptions to allow the continued use of cladding materials other than Zircaloy or ZIRLO in this North Anna lead test assembly will not result in the violation of the criteria of the applicable sections of 10 CFR 50.

2. The requested exemption does not present an undue risk to the public health and safety.

   Cycle specific safety evaluations will be performed for the use of the Framatome lead test assembly for a fourth operating cycle in North Anna 2 Cycle 16. These evaluations, which are performed for each reload core, confirm that operation of the lead test assembly does not increase the probability of occurrence or the consequences of an accident at North Anna Unit 2, and will not create the possibility for a new or different type of accident that could pose a risk to public health and safety. As part of the Reload Safety Evaluation for North Anna 2 Cycle 16, it will be confirmed that safety analyses that are based on full cores of Westinghouse fuel and which are supported by the applicable North Anna Unit 2 Technical Specifications will remain applicable for a core containing the lead test assembly.

   The reload core design for North Anna Unit 2 Cycle 16 will be specifically evaluated using Dominion's standard reload design methods. This will include consideration of the core physics analysis peaking factors and core average linear heat rate effects. The core containing the lead test assembly will be operated in accordance with the operating conditions identified in the North Anna Unit 2 Technical Specifications. In the unlikely event that cladding failures occur in the lead test assembly during normal operation of the core, the environmental impact will be minimal and bounded by previous environmental assessments.

3. The requested exemption will not endanger the common defense and security.

   The lead test assembly is similar in design to normal reload fuel assemblies used at North Anna Unit 2. The special nuclear material in this assembly will continue to be handled and controlled in accordance with approved procedures. Continued use of this lead test assembly for a fourth cycle will not affect the operation of the North Anna Power Station or endanger the common defense and security.

4. Special circumstances are present which necessitate the request for an exemption to the regulations of 10 CFR 50.44, 10 CFR 50.46, and Paragraph I.A.5 of Appendix K to 10 CFR 50.

   Pursuant to 10 CFR 50.12(a)(2), the NRC will not consider granting an exemption to the regulations unless special circumstances are present. The requested exemptions meet the

special circumstances of paragraph (a)(2)(ii), in that application of these regulations in this particular circumstance is not necessary to achieve the underlying purpose of the regulations.

- The underlying purpose of 10 CFR 50.46 is to ensure that nuclear power facilities have adequately demonstrated the cooling performance of their Emergency Core Cooling System (ECCS). The effectiveness of the ECCS at North Anna Unit 2 will not be affected by the insertion of a single lead test assembly for a fourth operating cycle. Although the lead test assembly incorporates cladding materials other than those explicitly defined in 10 CFR 50.46, the criteria of this section will continue to be satisfied for the North Anna Unit 2 Cycle 16 core. Normal reload safety analyses will confirm that safety analyses based on the resident fuel design will remain applicable for this core. Consequently, the use of the advanced zirconium-based claddings in one fuel assembly will not have a detrimental impact on the performance of the North Anna Unit 2 Cycle 16 core under LOCA conditions.

- The intent of 10 CFR 50.44 is to ensure that there is an adequate means of controlling generated hydrogen following a LOCA. One source of the hydrogen produced in a post-LOCA scenario comes from a metal-water reaction. The Baker-Just equation was developed to assess the metal-water reaction rate for Zircaloy-4, but has also been confirmed to conservatively assess the metal-water reaction rates for Framatome's advanced zirconium-based alloys. Therefore, the amount of hydrogen generated by metal-water reaction in these materials will be within the design basis for North Anna Unit 2.

- The intent of Paragraph I.A.5 of Appendix K of 10 CFR Part 50 is to apply an equation for rates of energy release, hydrogen generation, and cladding oxidation from a metal-water reaction that conservatively bounds all post-LOCA scenarios. Application of the Baker-Just correlation has been demonstrated to be conservative for the M5 alloy. The correlation will also conservatively bound all post-LOCA scenarios for a fuel assembly with alloy M4 cladding due to the similarity between the composition of this alloy and Zircaloy-4.

Therefore, the intent of 10 CFR 50.46, 10 CFR 50.44, and 10 CFP Part 50 , Appendix K, will continue to be satisfied for the planned continued operation of the Framatome lead test assembly for a fourth cycle. Issuance of a temporary exemption from the criteria of these regulations for the irradiation of this assembly in North Anna Unit 2 Cycle 16 will not compromise the safe operation of the reactor.

Reference 1: Letter from Stuart A. Richards (U. S. Nuclear Regulatory Commission) to T. A. Coleman (Framatome Cogema Fuels), "Revised Safety Evaluation (SE) for Topical Report BAW-10227P: 'Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel' (TAC No. M99903)," February 4, 2000.

Attachment 3

Proposed License Condition

Proposed License Condition for North Anna Unit 2

Lead Test Assembly

Virginia Electric and Power Company may operate one lead test assembly containing advanced zirconium based alloys for one cycle, to a lead rod burnup not exceeding 75,000MWD?MTU, as described in the licensee's submittal dated February ___, 2002.

Attachment 4

Significant Hazards Consideration

SIGNIFICANT HAZARDS CONSIDERATION

Virginia Electric and Power Company (Dominion) proposes to irradiate one Framatome Advanced Nuclear Power (Framatome) lead test assembly (LTA) for a fourth operating cycle, to high burnup in North Anna Unit 2 Cycle 16. The discharge assembly average burnup will be about 70 GWD/MTU. The LTA has several advanced features, including mid-span mixing grids, advanced zirconium-based alloys for the fuel rod cladding, a fine mesh debris filter bottom nozzle, and a quick release top nozzle design. The assembly design is an evolution of the Framatome Mark-BW design, and is also similar to the resident Westinghouse fuel.

Operation of one Framatome lead test assembly to high burnup will not compromise the safe operation of the plant. No Technical Specifications changes are required, although a license condition providing NRC approval is needed to irradiate the assembly for a fourth cycle to burnups exceeding the lead rod burnup limit specified in Section 4.3.1.1 of the North Anna Updated Final Safety Analysis Report (UFSAR). Exemptions are also required to 10 CFR 50.46 and 10 CFR 50.44, which specifically refer to fuel with Zircaloy or ZIRLO cladding, and Appendix K of 10 CFR Part 50, which requires use of a specific model that was originally derived for Zircaloy clad fuel.

The Safety Evaluation Report (SER) approving the use of the Dominion standard reload methodology states that it may be applied only to Westinghouse-supplied fuel. NRC concurrence is therefore also required to apply Dominion's standard reload design methodology to the North Anna 2 core containing the Framatome lead test assembly. It should be noted that a revision of our Reload Nuclear Design Methodology topical report has been submitted to the NRC to qualify the methodology for use with full reload batches of Framatome fuel that are very similar in design to the lead test assembly. Review of this revised topical report is not yet complete. However, if NRC review and approval of this revised topical report is completed prior to the start of North Anna 2 Cycle 16, no special concurrence will be required to apply this methodology to evaluations of the lead test assembly.

Irradiation of one Framatome lead test assembly to high burnup does not involve a significant hazards consideration as defined in 10 CFR 50.92. The basis for this determination is delineated below:

1. The probability of occurrence or the consequences of an accident previously evaluated is not significantly increased. The Framatome lead test assembly is very similar in design to the Westinghouse fuel that comprises the remainder of the core. The reload core design for the North Anna cycle where this assembly will operate to high burnup will meet all applicable design criteria. The performance of the Emergency Core Cooling System will not be affected by the operation of the lead test assembly, and operation of the LTA to high burnup will not result in a change to the North Anna reload design and safety analysis limits. Operation of one Framatome LTA to high burnup will not result in a measurable impact on normal operating plant releases, and will not increase the predicted radiological consequences of accidents postulated in Chapter 15 of the North Anna UFSAR. Therefore,

neither the probability of occurrence nor the consequences of any accident previously evaluated is significantly increased.

2. The possibility for a new or different type of accident from any accident previously evaluated is not created. The Framatome lead test assembly is very similar in design (both mechanical and composition of materials) to the resident Westinghouse fuel. All design and performance criteria will continue to be met and no new single failure mechanisms will be created. The irradiation of this fuel assembly to high burnup does not involve any alteration to plant equipment or procedures which would introduce any new or unique operational modes or accident precursors. Therefore, the possibility for a new or different kind of accident from any accident previously evaluated is not created.

3. The margin of safety is not significantly reduced. The operation of one Framatome lead test fuel assembly to high burnup does not change the performance requirements of any system or component such that any design criteria will be exceeded. The normal limits on core operation defined in the North Anna Technical Specifications will remain applicable for the irradiation of this assembly to high burnup. Evaluations will be performed to confirm that safety analyses based on the resident Westinghouse fuel remain applicable for the core in which the high burnup assembly is irradiated. Therefore, the margin of safety as defined in the Bases to the North Anna Technical Specifications is not significantly reduced.

Based on the above information, the irradiation of one Framatome lead test assembly to high burnup at North Anna, and design of core containing this assembly using standard Dominion reload design methodology, will not involve a significant increase in the probability or consequences of an accident previously evaluated, create the possibility of a new or different kind of accident from any accident previously evaluated, or involve a significant reduction in a margin of safety. It is concluded that the proposed use of the Framatome lead test assembly meets the requirements of 10 CFR 50.92(c) and does not involve a significant hazards consideration.