VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

10 CFR 50.90

August 14, 2006

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Serial No. 06-146
NL&OS/GDM R4
Docket Nos. 50-280
50-281
License Nos. DPR-32
DPR-37

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
LICENSE AMENDMENT REQUEST
PROPOSED INCREASE IN THE LEAD ROD AVERAGE BURNUP LIMIT

Ref.: 1. Letter from Westinghouse (B. F. Maurer) to the U.S. Nuclear Regulatory Commission, "Licensing Burnup Limits (Non-Proprietary)," LTR-NRC-06-21, April 19, 2006.

2. Letter from U.S. Nuclear Regulatory Commission (J. D. Peralta), "Approval for Increase In Licensing Burnup Limit to 62,000 MWD/MTU (TAC NO. MD1486)," May 25, 2006.

By letter dated March 17, 2005 (Serial No. 05-108), Virginia Electric and Power Company (Dominion) requested amendments to the Operating Licenses for Surry Power Station Units 1 and 2 to extend the lead rod average burnup limit to 62,000 MWD/MTU. Surry Units 1 and 2 are currently restricted to a lead rod average burnup of 60,000 MWD/MTU. In letters dated August 1 and December 15, 2005 (Serial Nos. 05-453 and 05-811, respectively), Dominion provided supplemental information to facilitate NRC review of the license amendment requests. A subsequent meeting was held with the NRC staff on February 15, 2006 to further discuss the information previously provided and to determine if the staff needed additional information to complete their review. At that meeting, the staff requested Dominion to provide the NRC with a specific Fuel Criteria Evaluation Process (FCEP) evaluation for the Surry fuel product that would show that the Standard Review Plan (SRP) Section 4.2 requirements would be met at 62,000 MWD/MTU.

On April 10, 2006, the NRC conducted an audit regarding the use of the Westinghouse FCEP to extend the lead rod average burnup (Reference 1) to 62,000 MWD/MTU. As part of this audit, Westinghouse provided several plant specific reload calculations to the NRC staff for their review. This included specific FCEP calculations for the Surry fuel product. The NRC report of the audit regarding the use of the Westinghouse FCEP

to extend the burnup limit indicates that Westinghouse fuel products evaluated with the PAD 4.0 code (WCAP-15063-P-A) and referencing WCAP-12610-P-A have margin to the design limits at a burnup of 62,000 MWD/MTU. The NRC indicated that it would be acceptable to burn Westinghouse fuel products evaluated with the PAD 4.0 code to 62,000 MWD/MTU without further use of the FCEP.

The attachment to this letter provides the evolution of the Surry fuel product from the introduction of Surry Improved Fuel (SIF) to its present design and also demonstrates the applicability of WCAP-12610-P-A to the current Surry fuel product. Since the current Surry fuel product is evaluated with the PAD 4.0 code and WCAP-12610-P-A is applicable, Dominion is requesting that the lead rod average burnup limit imposed upon Westinghouse be the present limit and future means for controlling the limit for Surry fuel. This request is based upon Reference 1 and NRC approval of an increase in the licensing burnup limit to 62,000 MWD/MTU provided in their May 25, 2006 audit report (Reference 2). This limit would be in lieu of the current lead rod average burnup limit of 60,000 MWD/MTU imposed upon Surry by NRC letters dated December 14, 1993, and April 20, 1994. Correspondingly, Dominion modifies its proposal of March 17, 2005, requesting license conditions specifying the lead rod average burnup limit and requests instead NRC approval to use a vendor specific burnup limit for Surry fuel, which will be specified and maintained in the Surry Units 1 and 2 Updated Final Safety Analysis Report. This approach is consistent with discussions held with the NRC during the February 15, 2006 meeting.

The additional information provided herein does not affect the significant hazards consideration determination or environmental assessment that were previously provided in support of the proposed license amendment request.

If you have any questions or require additional information, please contact Mr. Gary D. Miller at (804) 273-2771.

Very truly yours,

G. T. Bischof
Vice President – Nuclear Engineering

Commitments contained in this letter:

1. The vendor specific burnup limit for Surry fuel will be maintained in the Surry Units 1 and 2 Updated Final Safety Analysis Report.

cc: U.S. Nuclear Regulatory Commission
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COMMONWEALTH OF VIRGINIA)
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COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Gerald T. Bischof, who is the Vice President – Nuclear Engineering of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the forgoing document in behalf of that Company, and that the statements in the document are true and correct to the best of his knowledge, information, and belief.

Acknowledged before me this 14TH day of August, 2006.

My Commission Expires: May 31, 2010

Vicki L. Hull
Notary Public

(SEAL)

ATTACHMENT

Evolution of the Current Surry Fuel Assembly Design
Surry Power Station Units 1 and 2

The development of the current Surry fuel assembly design began in the late 1980s with the introduction of the Surry Improved Fuel (SIF) assembly design. The SIF fuel design is essentially a Westinghouse 15x15 OFA fuel design, using the OFA mixing vane grid design, guide tube diameter, and three-leaf holddown spring. However, SIF also includes some features of the Westinghouse VANTAGE 5 design to increase the burnup capability of the fuel (slightly shorter nozzles, longer guide thimbles, increased fuel rod length). SIF also uses the VANTAGE 5 reconstitutable top nozzle. The original SIF design used Zircaloy-4 cladding, guide tubes, instrumentation tube, and mixing vane grids. This product was introduced primarily to improve fuel cycle economics by the use of Zircaloy-4 rather than Inconel mid-grids, and to support higher fuel burnups. The use of this product required a license amendment to be submitted to the NRC to change the control rod drop time limit and to change the DNBR correlation specified in the Technical Specifications. This fuel design was approved by the NRC in Amendment 116 to the Surry Unit 1 and Surry Unit 2 Facility Operating Licenses and the first reload batches of this design (Batch 12 for each unit) were irradiated in Cycle 10 at each unit. Since the key feature of the Surry product at this point in time was the Zircaloy-4 mid-grids, the applicable topical report for this product (per Reference 1) was WCAP-9500-A, "Reference Core Report - 17x17 Optimized Fuel." The other changes incorporated in the SIF product (e.g., removable top nozzle) did not affect the methodology discussed in this topical report. Although the specific fuel array analyzed in WCAP-9500-A was the 17x17 array, the methodology described in this report was stated to also be applicable to the 14x14, 15x15, and 16x16 arrays.

Westinghouse subsequently worked with several other customers who use 15x15 fuel to develop designs that met their specific needs. The axial dimensions for several customers were similar to SIF, but not identical, and in 1989, Westinghouse proposed additional minor changes to the Surry fuel rod and fuel assembly axial dimensions that would allow them to standardize the 15x15 fuel product. At the same time, the flow plate of the fuel assembly bottom nozzle was modified (using a large number of small flow holes) to reduce fuel rod debris fretting failures that had affected the Surry fuel in the 1980's. The standardized fuel rod and fuel assembly dimensions and the debris filter bottom nozzle (DFBN) were incorporated into the SIF design starting with the fresh feed to Cycle 11 (i.e., Batch 13) at each unit. These changes to the fuel assembly were implemented under 10 CFR 50.59. The key feature of the Surry product at this point in time remained the Zircaloy-4 mid-grid and therefore, the applicable topical report for the Surry fuel remained WCAP-9500-A. None of the other changes affected the design limits or methodology discussed in WCAP-9500-A.

To further improve the fuel resistance to debris induced failures, an Inconel protective grid (P-grid) was subsequently added to the bottom of the assembly below the first structural grid to capture debris and keep it in the area of the solid end plug on the fuel

rods. The length of the fuel rod bottom end plug was also increased slightly to ensure that any debris trapped by the P-grid would wear against solid metal rather than against the relatively thin wall of the cladding. Small changes were made to the size and pattern of flow holes in the debris filter bottom nozzle at this time so that the straps of the P-grids would be positioned over the flow holes, effectively reducing the size of the holes. The P-grids were added to the SIF design in the Batch 15 fuel, which began irradiation in Cycle 13 at each unit. These changes were implemented under 10 CFR 50.59. None of these changes affected the methodology used to assess the Specified Acceptable Fuel Design Limits (SAFDLs) for the Surry fuel, and WCAP-9500-A continued to be the applicable topical report for the Surry fuel product.

Since the Surry units operate at a relatively low power density, cladding corrosion is not generally an issue. However, several failures occurred in Zircaloy-clad fuel during Surry Unit 1 Cycle 12 and 13 that appeared to be corrosion or burnup related. The loading pattern used in these two cycles was atypical in that eight twice burned assemblies were loaded into the interior of the core in their third cycle of operation and were exposed to high relative powers throughout their operating life. To preclude possible corrosion problems, even in atypical cases, the fuel rod cladding material for the SIF product was changed from Zircaloy-4 to ZIRLO. The fuel assembly guide thimbles, instrumentation tube, and mid-grids were also changed from Zircaloy-4 to ZIRLO at the same time, to ensure that 2-sided corrosion and hydrogen uptake in these structural components would not become more limiting than the one-sided corrosion in the ZIRLO-clad fuel rods. The use of this fuel product required a license amendment request to change the Technical Specifications Design Features Section to allow the use of ZIRLO. This change to the Surry fuel design was approved by the NRC under Amendment 202 to the Surry Unit 1 and Surry Unit 2 Facility Operating Licenses. SIF fuel incorporating ZIRLO cladding and structural components was first implemented in Cycle 14 of each Surry unit (the Batch 16 fuel). In addition to the material changes, several minor axial dimensional changes were incorporated into the fuel rod and fuel assembly designs at this time to ensure that the changes in material properties did not result in a loss of burnup capability. These dimensional changes were implemented under 10 CFR 50.59. The key feature of the Surry fuel product at this point in time was the ZIRLO cladding material so, per Reference 1, the applicable topical report for this fuel is WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report." Again, although WCAP-12610-P-A presents information for a 17x17 fuel array, the VANTAGE+ features and the methodology discussed in this report are applicable to all of the arrays manufactured by Westinghouse.

Westinghouse subsequently introduced an additional axial dimensional change to their fuel assembly designs to increase the margin to the fuel rod internal pressure limit. This change (commercially designated 'ZIRLO+2') involved taking advantage of the low growth behavior of ZIRLO (which is approximately half the growth of Zircaloy-4) to increase the fuel assembly and fuel rod lengths by 0.2 inch. Dominion agreed to incorporate some of the modifications into the SIF design - specifically, the increase in fuel assembly length by 0.2 inch - to support vendor product standardization. However, because Surry had experienced a small number of debris-related failures even after the

P-grids were introduced, Dominion requested that on the Surry fuel the additional 0.2 inch increase in fuel rod length be used to increase the bottom end plug length rather than the fuel rod plenum length, as Westinghouse had proposed. The NRC-approved ZIRLO growth model was used to pre-determine the acceptability of these changes to a lead rod average burnup well in excess of 62,000 MWD/MTU from a design standpoint (see WCAP-12610-P-A). Previous growth calculations for ZIRLO fuel had used a multiplier on the Zircaloy-4 growth model (see WCAP-12610-P-A). SIF assemblies incorporating these axial dimension changes were implemented in Cycle 18 of Unit 2 and Cycle 19 of Unit 1 under 10 CFR 50.59. The key feature of the Surry fuel at this point remained the ZIRLO cladding and per Reference 1 the applicable topical report for this fuel product was WCAP-12610-P-A. The modification to the assembly and rod length did not affect the fuel design limits or methodology discussed in WCAP-12610-P-A.

Through Cycle 20, Surry Units 1 and 2 have used discrete burnable absorbers that are attached to baseplates and inserted into the guide tubes of selected fuel assemblies that are not positioned under control rods. Surry Unit 1 Cycle 21 (Batch 23) included fuel rods with Integral Fuel Burnable Absorber (IFBA) in the SIF design. Surry Unit 2 Cycle 21(Batch 23), which is scheduled to be loaded in the fall of 2006 will also include IFBA fuel rods. The IFBA rods include a thin coating of ZrB_2 on some of the fuel pellets in the middle of the fuel stack. Irradiation of the boron in the IFBA generates helium that increases the gas pressure inside the rod. Uncoated annular fuel pellets are therefore used in the top and bottom 6 inches of the fuel stack in rods that include this ZrB_2 coating to provide additional void volume and thus margin to the rod internal pressure design limit. IFBA was incorporated into the SIF design under 10 CFR 50.59. The key feature of the current Surry fuel product continues to be ZIRLO and the applicable Westinghouse topical report remains WCAP-12610-P-A.

Summary

The current Surry fuel design still has the 15x15 OFA grid design and reconstitutable top nozzle introduced with the SIF design. There have been minor adjustments of the fuel assembly and fuel rod length made under 10 CFR 50.59, but the fuel assembly retains the high burnup capability identified as a feature of the original SIF design. The pattern of holes in the bottom nozzle flow plate was changed to improve debris resistance and an Inconel protective grid was also added directly above the bottom nozzle for the same purpose. These changes to the SIF design were made in accordance with 10 CFR 50.59. The operating license was amended to replace the Zircaloy-4 in the guide tubes, instrumentation tube, grids, and fuel rod cladding of the SIF fuel with ZIRLO. The current batch of reload fuel in Surry Unit 1 and the next batch of fuel to be loaded into Unit 2 will also include fuel rods containing integral fuel burnable absorber and annular pellets at the top and bottom of the fuel stack. Implementation of these latest changes to the SIF design has been evaluated and documented in accordance with 10 CFR 50.59.

Feature	***Batch First Used (Year)***	***Licensing Approach***	***Applicable Topical Report***
SIF: 15x15 OFA grids, guide tube diameter, hold down spring; VANTAGE 5 nozzle heights, guide tube length, RTN	Surry 1 Batch 12 (1988) Surry 2 Batch 12 (1989)	License Amendment (No. 116)	WCAP-9500-A
Standardized high burnup assembly dimensions (guide tube length), DFBN	Surry 1 Batch 13 (1990) Surry 2 Batch 13 (1991)	10 CFR 50.59	WCAP-9500-A
P-grid (and associated changes to fuel rod bottom end plug length and DFBN flow holes)	Surry 1 Batch 15 (1994) Surry 2 Batch 15 (1995)	10 CFR 50.59	WCAP-9500-A
ZIRLO clad, guide tubes, instrumentation tube, mid-grids	Surry 1 Batch 16 (1995) Surry 2 Batch 16 (1996)	License Amendment (No. 202)	WCAP-12610-P-A
ZIRLO+2 (assembly length increase, increase in rod length, increase in fuel rod bottom end plug length)	Surry 2 Batch 20 (2002) Surry 1 Batch 21 (2003)	10 CFR 50.59	WCAP-12610-P-A
IFBA, annular 'blanket' pellets in IFBA rods	Surry 1 Batch 23 (2006) Surry 2 Batch 23 (2006) *(planned)*	10 CFR 50.59	WCAP-12610-P-A

In summary, the key features for the Surry Improved Fuel are the 15x15 OFA grids and ZIRLO cladding. Although Dominion still often refers to the current product as OFA because of the OFA mid-grid design, under the Westinghouse nomenclature listed in Reference 1, the current Surry fuel product is classified as VANTAGE +. On this basis, the applicable topical report for the current Surry fuel is WCAP-12610-P-A.

Reference:

1. Letter from Westinghouse (B. F. Maurer) to U. S. Nuclear Regulatory Commission, "Clarification on 62,000 MWD/MTU Lead Rod Average Burnup (Proprietary/Non-Proprietary)," LTR-NRC-05-62, October 20, 2005.