VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

10 CFR 50.90

February 4, 2015

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

Serial No.: 15-023
NLOS/GDM: R2
Docket Nos.: 50-280/281
License Nos.: DPR-32/37

**VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
PROPOSED LICENSE AMENDMENT REQUEST
CLARIFICATION OF REACTOR COOLANT SYSTEM
HEATUP AND COOLDOWN LIMITATIONS TECHNICAL SPECIFICATION FIGURES
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

By letter dated June 3, 2014 (Serial No. 14-262), Virginia Electric and Power Company (Dominion) submitted a license amendment request (LAR) to revise the Surry Power Station (Surry) Units 1 and 2 Technical Specifications (TS) Figures 3.1-1 and 3.1-2, *Surry Units 1 and 2 Reactor Coolant System Heatup Limitations* and *Surry Units 1 and 2 Reactor Coolant System Cooldown Limitations*, respectively. The two TS figures are being revised for clarification and to be fully representative of the allowable operating conditions during Reactor Coolant System (RCS) startup and cooldown evolutions. On January 9, 2015, the NRC Project Manager for Surry provided a request for additional information (RAI) to facilitate NRC review of the LAR. The RAI and Dominion's response are provided in the attachment.

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

Respectfully,

Mark D. Sartain
Vice President – Nuclear Engineering

Vicki L. Hull
NOTARY PUBLIC
Commonwealth of Virginia
Reg. # 140542
My Commission Expires May 31, 2018

COMMONWEALTH OF VIRGINIA )
)
COUNTY OF HENRICO )

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Mr. Mark D. Sartain, who is 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 foregoing document in behalf of that company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 4TH day of February, 2015.

My Commission Expires: May 31, 2018.

Vicki L. Hull
Notary Public

A001
NRR

Attachment: Response to NRC Request for Additional Information

Commitments contained in this letter:

1. If the revision of the fluence model indicates the neutron fluence exposure of the inlet and outlet nozzles would be greater than $1x10^{17}$ n/cm$^2$ (E > 1 MeV) at the end of the licensed operating period, Dominion will advise the NRC accordingly and provide a schedule for determining the impact on the Surry Units 1 and 2 TS P-T limits curves.

cc: U.S. Nuclear Regulatory Commission - Region II
Marquis One Tower
245 Peachtree Center Avenue, NE Suite 1200
Atlanta, GA 30303-1257

State Health Commissioner
Virginia Department of Health
James Madison Building – 7th floor
109 Governor Street
Suite 730
Richmond, VA 23219

Ms. Karen Cotton Gross
NRC Project Manager – Surry
U.S. Nuclear Regulatory Commission
One White Flint North
Mail Stop 08 G-9A
11555 Rockville Pike
Rockville, MD 20852-2738

Dr. V. Sreenivas
NRC Project Manager – North Anna
U.S. Nuclear Regulatory Commission
One White Flint North
Mail Stop 08 G-9A
11555 Rockville Pike
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Surry Power Station

# Attachment

## RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION

Virginia Electric and Power Company
(Dominion)
Surry Station Units 1 and 2

**Response to NRC Request for Additional Information**
**Surry Power Station Units 1 and 2**

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**NRC Request for Additional Information**

*BACKGROUND*

*Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix G requires that pressure-temperature (P-T) limits be developed to bound all ferritic materials in the reactor vessel (RV). Further, Sections I and IV.A of 10 CFR Part 50, Appendix G specify that all ferritic reactor coolant pressure boundary (RCPB) components outside of the RV must meet the applicable requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section III, "Rules for Construction of Nuclear Facility Components."*

*ISSUE*

*As clarified in Regulatory Information Summary (RIS) 2014-11, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components" (ADAMS Accession No. ML14149A165), P-T limit calculations for ferritic RV components other than those materials with the highest reference temperature, may define curves that are more limiting than those calculated for the RV beltline shell materials because the consideration of stress levels from structural discontinuities (such as nozzles) may produce a lower allowable pressure.*

*REQUEST*

*Describe how the P-T limit curves for Surry Units 1 and 2 consider all ferritic pressure boundary components of the reactor vessel that are predicted to experience a neutron fluence exposure greater than $1x10^{17}$ $n/cm^2$ (E > 1 MeV) at the end of the licensed operating period.*

*If the current P-T limit curves do not consider all ferritic pressure boundary components of the reactor vessel that are predicted to experience a neutron fluence exposure* *greater than $1x10^{17}$ $n/cm^2$ (E > 1 MeV) at the end of the licensed operating period, provide appropriately revised P-T limit curves to the NRC for review.*

**Dominion Response**

The existing P-T limits curves for Surry Units 1 and 2 are based upon the ferritic pressure boundary materials from the reactor flange, as well as those materials classified as the traditional beltline materials immediately surrounding the reactor vessel core. The existing fluence projection calculations considered implementation of Measurement Uncertainty Recapture (MUR) core power uprates at Surry Units 1 and 2. These fluence calculations were performed with a methodology consistent with the requirements of NRC Regulatory Guide (RG) 1.190, *Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence.*

At the time the P-T limits curves for Surry Units 1 and 2 were developed, the fluence model used to project neutron fluence exposure was limited to the ferritic pressure boundary materials immediately adjacent to the reactor core. The geometry of the core consists of vertical baffles of different widths such that the reactor is octant symmetric. The axial extent of the current model extends from approximately 1-foot below the active fuel to approximately 1-foot above the active fuel. The inlet and outlet nozzles are located outside the axial extent of the current fluence model. The fluence around the circumference of the reactor vessel varies from a minimum value to a maximum value corresponding to the core geometry and symmetry. Neutron fluence projections are typically determined at 5 degree azimuthal locations to ensure the maximum calculated neutron fluence.

To ensure the P-T limits curves are bounding, the maximum calculated fluence values for each of the traditional beltline materials have been determined at various azimuthal locations around the reactor vessel and combined with the initial material properties and margins to identify the most limiting adjusted material properties. The resulting limiting material properties have been used in combination with stress intensity formulas for a postulated 1/4T and 3/4T flaw to produce conservative P-T limits curves for Surry Units 1 and 2. Details of the methodology used to produce the P-T limits curves for Surry Units 1 and 2 are outlined in WCAP-14040-A, *Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves.*

Since the fluence model is limited to approximately 1-foot below the active fuel to approximately 1-foot above the active fuel, and the inlet and outlet nozzles are located outside this region, the precise position of a demarcation line around the circumference of the reactor vessel for a neutron fluence threshold of $1 \times 10^{17}$ $n/cm^2$ (E > 1 MeV) has not been determined to date. When the P-T limits curves were constructed, the maximum fluence projections typically determined at 5 degree azimuthal locations were used to produce the various adjusted reference temperatures for the materials adjacent to the core. However, the existing P-T limits curves did not use adjusted reference temperature values for the inlet and outlet nozzles because the fluence projections are beyond the limits of the model and are thought to have neutron fluence exposures less than 1 x $10^{17}$ n/$cm^2$ (E > 1 MeV).

Upon receipt of the NRC RAI, Dominion initiated discussions with Westinghouse to determine a schedule for amending the axial extent of the fluence model to encompass the reactor vessel inlet and outlet nozzles. Westinghouse indicated they can complete the requested revision of the fluence model by June 30, 2015. Following completion of the fluence model revision, Dominion will be able to validate whether the inlet and outlet nozzles will have a neutron fluence of less than 1x$10^{17}$ n/$cm^2$ (E > 1 MeV) at the end of the licensed operating period.

The existing P-T limits curves for Surry Units 1 and 2 are considered conservative based upon information available at the time the fluence values were determined, since maximum fluence values have been combined with material properties representing the traditional beltline region in a manner that produces limiting adjusted material properties. Based on available information from the existing fluence model, the position of the active region of the core, and the location of the inlet and outlet nozzles, it is expected that revision of the fluence model will confirm that neutron fluence exposure of the inlet and outlet nozzles is less than 1x$10^{17}$ n/$cm^2$ (E > 1 MeV) at the end of the licensed operating period. Once the fluence model is revised, and the inlet and outlet nozzles are confirmed to have less than 1x$10^{17}$ n/$cm^2$ (E > 1 MeV), it can be concluded that ferritic pressure boundary components of the reactor vessel that are predicted to experience a neutron fluence exposure greater than 1 x$10^{17}$ n/$cm^2$ (E > 1 MeV) at the end of the licensed operating period have been used to derive the existing P-T limits curves for Surry Units 1 and 2.

Although not expected, should the revision of the fluence model indicate the neutron fluence exposure of the inlet and outlet nozzles would be greater than 1x$10^{17}$ n/$cm^2$ (E > 1 MeV) at the end of the licensed operating period, Dominion will advise the NRC accordingly and provide a schedule for determining the impact on the Surry Units 1 and 2 TS P-T limits curves.