VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

August 31, 2020

10 CFR 50.90

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

Serial No.: 20-264
NRA/DEA: R1
Docket Nos.: 50-338/339
License Nos.: NPF-4/7

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
PROPOSED LICENSE AMENDMENT REQUEST
ADDITION OF ANALYTICAL METHODOLOGY TO THE CORE OPERATING LIMITS REPORT FOR A FULL SPECTRUM LOSS OF COOLANT ACCIDENT (FSLOCA) GAMMA ENERGY REDISTRIBUTION INFORMATION

By letter dated October 30, 2019 [Agencywide Document Access and Management System (ADAMS) Accession No. ML19309D197], Virginia Electric and Power Company (Dominion Energy Virginia) submitted a license amendment request (LAR) to revise the Technical Specifications (TS) for North Anna Power Station (NAPS) Units 1 and 2, to add Westinghouse Topical Report WCAP-16996-P-A, "Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)," to the list of approved analytical methods used to determine the core operating limits as listed in TS 5.6.5, "Core Operating Limits Report (COLR)."

As part of its review of the LAR, the U. S. Nuclear Regulatory Commission (NRC) staff is in the process of conducting an audit. During the audit, a teleconference was held on July 2, 2020, during which the NRC identified the LAR may not have included a description of a Westinghouse analysis error correction pertaining to gamma energy redistribution. Further investigation by Dominion Energy Virginia confirmed the oversight in the LAR regarding omission of the gamma energy redistribution information and the NRC was subsequently notified.

The purpose of this letter is to provide the gamma energy redistribution information for the October 30, 2019 LAR. The attachment provides this information.

If there are any questions or if additional information is needed, please contact Mrs. Diane E. Aitken at (804) 273-2694.

Sincerely,

Gerald T. Bischof
Senior Vice President – Nuclear Operations and Fleet Performance

COMMONWEALTH OF VIRGINIA)
)
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 Senior Vice President – Nuclear Operations and Fleet Performance 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 31ST day of August, 2020.

My Commission Expires: 12/31/20

CRAIG D SLY
Notary Public
Commonwealth of Virginia
Reg. # 7518653
My Commission Expires December 31, 2020

Notary Public

Commitments made in this letter: None

Attachment:

Gamma Energy Redistribution Information for 10/30/19 FSLOCA LAR Submittal

cc: U.S. Nuclear Regulatory Commission, Region II
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Attachment

GAMMA ENERGY REDISTRIBUTION INFORMATION FOR 10/30/19 FSLOCA LAR SUBMITTAL

Virginia Electric and Power Company
(Dominion Energy Virginia)
North Anna Power Station Units 1 and 2

The following parts of Attachment 4 of the October 30, 2019 FSLOCA LAR submittal did not describe a Westinghouse analysis error correction pertaining to gamma energy redistribution (change briefly explained in parenthesis):

- Section 2.3 Compliance with FSLOCA EM Limitations and Conditions, Limitation and Condition Number 2 (with the exception of the first two sentences, the Compliance section is changed in its entirety)
- Section 3.2 Analysis Results (sentence in 1st paragraph, Section 3.2 modified)
- Table 5 North Anna Units 1 and 2 Analysis Results with the FSLOCA EM (first line item revised, and a footnote added)
- Figure 1 North Anna Units 1 and 2 Peak Cladding Temperature for all Rods for the Region II Analysis PCT Case Assuming LOOP (note added at bottom of Figure)

The replacement information for the above parts of Attachment 4 of the October 30, 2019 FSLOCA LAR submittal are shown below with the changes identified in ***bold italics***.

REPLACEMENT INFORMATION

Section 2.3 Compliance with FSLOCA EM Limitations and Conditions

Limitation and Condition Number 2

Compliance

North Anna Units 1 and 2 are Westinghouse-designed 3-loop PWRs with cold-side injection, so they are within the NRC-approved methodology. The analysis for North Anna Units 1 and 2 utilizes the NRC approved FSLOCA methodology, except for the changes which were previously transmitted to the NRC pursuant to 10 CFR 50.46 in Reference 5, and with the exception of only including an analysis for Region II.

After completion of the analysis for North Anna Units 1 and 2, three errors were discovered in the WCOBRA/TRAC-TF2 code. The first error was regarding the calculation of radiation heat transfer to liquid, which could be incorrectly calculated under certain conditions. The second error was regarding vapor temperature resetting, where under certain conditions the vapor temperature could incorrectly be reset to the saturation temperature for heat transfer calculations. These first two errors were found to have a negligible impact on analysis results with the FSLOCA EM as described in Reference 12.

The third error impacted the gamma energy redistribution multiplier and was identified after completion of the analysis for North Anna Units 1 and 2. The treatment for the uncertainty in the gamma energy redistribution is discussed on pages 29-75 and 29-76 of Reference 1, and the equation for the assumed increase in hot rod and assembly relative power is presented on page 29-76. The power

increase in the hot rod and hot assembly due to energy redistribution in the application of the FSLOCA EM to North Anna Units 1 and 2 was calculated incorrectly. This error resulted in a 0% to 5% deficiency in the modeled hot rod and hot assembly rod linear heat rates on a run-specific basis, depending on the as-sampled value for the multiplier uncertainty. The effect of the error correction was evaluated against the application of the FSLOCA EM to North Anna Units 1 and 2.

The error correction has only a limited impact on the power modeled for a single assembly in the core. As such, the error correction has a negligible impact on the system thermal-hydraulic response during the postulated LOCA. For the Region II analysis, parametric PWR sensitivity studies, derived from a subset of uncertainty analysis simulations covering various design features and fuel arrays, were examined to determine the sensitivity of the analysis results to the error correction. The PCT impact from the error correction was found to be different for the transient phases (i.e., blowdown versus reflood) based on the PWR sensitivity studies. The correction of the error is estimated to increase the Region II analysis PCT by 31°F, leading to an analysis result of 1893° for the Region II analysis.

All of the analysis results, including the error correction, continue to demonstrate compliance with the 10 CFR 50.46 acceptance criteria.

Section 3.2 Analysis Results

The North Anna Units 1 and 2 Region II analysis was performed in accordance with the NRC-approved methodology in Reference 1 with exceptions identified under Limitation and Condition Number 2 in Section 2.3. The analysis was performed assuming both LOOP and OPA, and the results of both of the LOOP and OPA analyses are compared to the 10 CFR 50.46 acceptance criteria. The most limiting ECCS single failure of one ECCS train is assumed in the analysis as identified in Table 1. The results of the North Anna Units 1 and 2 Region II LOOP and OPA uncertainty analyses are summarized in Table 5***, and include the impact of the gamma energy redistribution error correction.*** The sampled decay heat multipliers for the Region II analysis cases are provided in Table 7.

Table 5. North Anna Units 1 and 2 Analysis Results with the FSLOCA EM

Outcome	Region II Value (LOOP)	Region II Value (OPA)
95/95 PCT *	1862°F ***+ 31°F = 1893°F***	1857°F ***+ 31°F = 1888°F***
95/95 MLO	6.43%	6.85%
95/95 CWO	0.79%	0.63%

**** The PCT values presented in the table shows the analysis of record result, which is the sum of the uncertainty analysis result plus the impact of the energy redistribution error correction. The figures presenting the analysis results correspond to the uncertainty analysis results. The MLO and CWO were confirmed to demonstrate compliance with the 10 CFR 50.46 acceptance criteria with the error correction.***

Figure 1 North Anna Units 1 and 2 Peak Cladding Temperature for all Rods for the Region II Analysis PCT Case Assuming LOOP

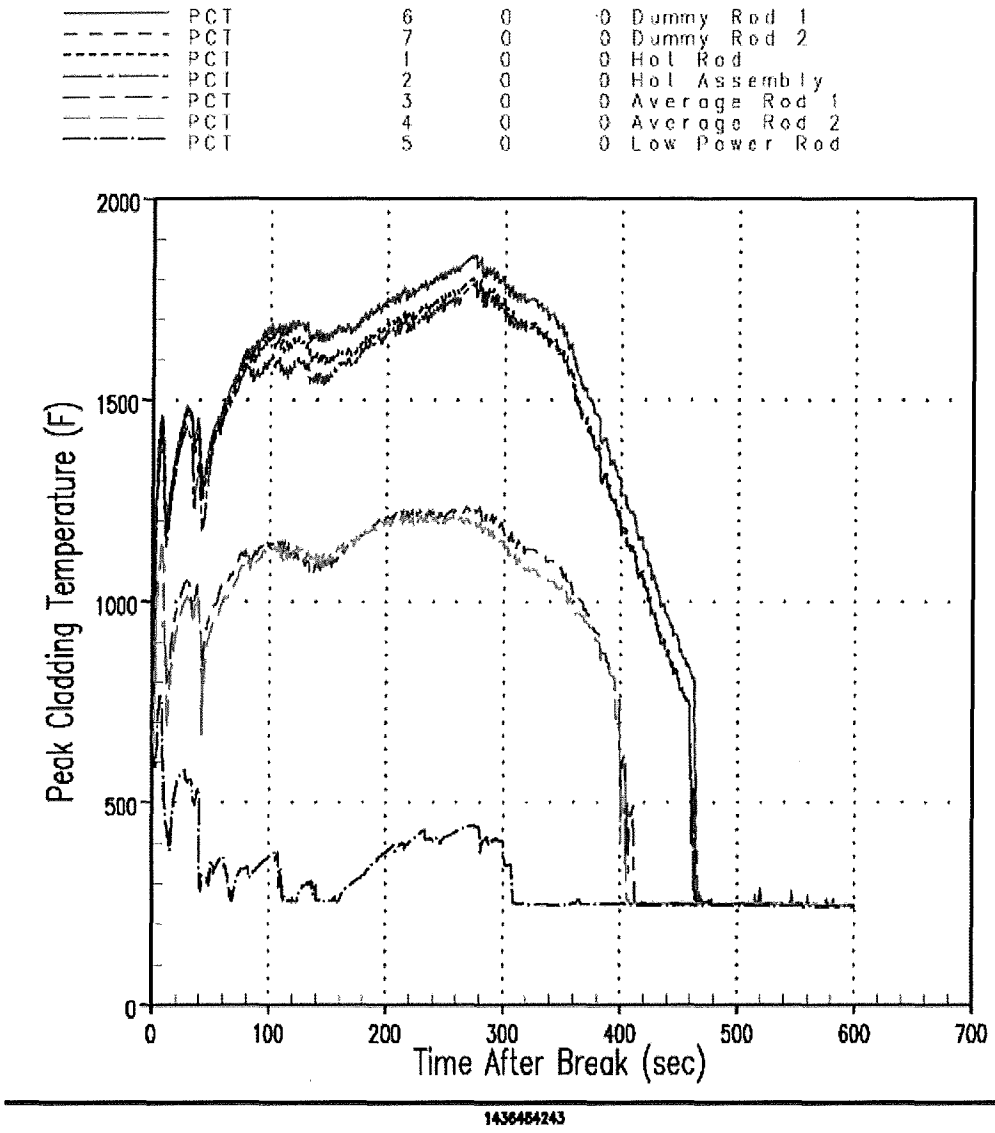

Figure 1: North Anna Units 1 and 2 Peak Cladding Temperature for all Rods for the Region II Analysis PCT Case Assuming LOOP

Note: This figure presents the uncertainty analysis results without the PCT penalty for the gamma energy redistribution error correction