

**VIRGINIA ELECTRIC AND POWER COMPANY**

**RICHMOND, VIRGINIA 23261**

**August 26, 2003**

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

Serial No. 03-313B  
NLOS/ETS  
Docket Nos. 50-338/339  
License Nos. NPF-4/7

**VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)**  
**NORTH ANNA POWER STATION UNITS 1 AND 2**  
**REVISED REALISTIC LARGE BREAK LOCA (RLBLOCA) RESULTS**  
**REFLECTING ASSESSMENT OF VESSEL FLUID VOLUME INPUT ERROR**  
**FOR USE OF FRAMATOME ANP ADVANCED MARK-BW FUEL**  
**PROPOSED TECHNICAL SPECIFICATIONS CHANGES AND EXEMPTION**  
**REQUEST FOR USE OF FRAMATOME ANP ADVANCED MARK-BW FUEL**

In letters dated May 6, 2003 (Serial No. 03-313), and July 18, 2003 (Serial No. 03-407), Dominion submitted results of the Realistic Large Break LOCA (RLBLOCA) analyses for Advanced Mark-BW fuel in North Anna Units 2 and 1, respectively. The RLBLOCA information was presented in the form of supplements to the evaluation report provided in our March 28, 2002 letter (specifically, report Section 7.2). In subsequent reviews of these results, Framatome ANP has discovered an input error that affects the analyses for North Anna Units 1 and 2. The error involves an incorrect calculation of the fluid volume for the upper plenum and upper head fluid nodes, which is described in further detail in Attachment 1. Summary results for the limiting case from both the Unit 1 and the Unit 2 analyses are also presented in Attachment 1. The calculated changes in the limiting case peak cladding temperature (PCT) results are minimal and are as follows: Unit 1 (+33°F); Unit 2 (no change). The results in Attachment 1 are provided to supplement the material originally submitted in the letters cited above, and to allow NRC staff to continue their review. It is anticipated that this change will only negligibly impact the ongoing NRC review for use of the Advanced Mark-BW fuel at North Anna.

To support the use of Framatome Advanced Mark-BW fuel in North Anna Unit 2, Cycle 17, we respectfully request the NRC to complete their review and approval of the license amendment and exemptions by September 30, 2003. We appreciate your consideration of our technical and scheduler requests. 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

A001

**cc: U.S. Nuclear Regulatory Commission  
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**Docket Nos.: 50-338/339**

### Reflecting Assessment of Vessel Fluid Volume Input Error

### Proposed TS Change

COUNTY OF HENRICO

**Acknowledged before me this 26th day of August, 2003.**

Maggie McClure  
Notary Public



**Attachment 1**

**Revised Realistic Large Break LOCA (RLBLOCA) Results  
Reflecting Assessment Of Vessel Fluid Volume Input Error  
North Anna Power Station Units 1 and 2**

**Framatome Fuel Transition Program  
Technical Specification Change**

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

## **Revised RLBLOCA Analysis – Corrected Reactor Vessel Fluid Volumes**

This summary provides a description of revised RLBLOCA analyses results for Framatome ANP (FANP) Advanced Mark-BW fuel in North Anna Power Station Units 1 and 2. These analyses were revised to correct an error discovered in the prior RLBLOCA analyses submitted for North Anna Units 1 and 2 (References 1 and 2). The fluid volumes in the reactor vessel (RV) upper plenum and upper head were incorrectly calculated. The region contained additional liquid (approximately 220 ft<sup>3</sup>) attributable to upper control rod guide tube structures, which are modeled separately from the upper plenum/head region. Hence, the guide tube fluid was double accounted for - incorrectly in the upper plenum/head control volumes and correctly in the guide tube control volumes. The extra liquid volume was removed from the upper plenum/head region and the case sets for both units were rerun (the random number seeds from the original case sets were unchanged). All other input parameters and limits supported by the analyses are identical to those submitted in References 1 and 2. No significant change in results was noted. The criteria of 10CFR50.46(b) are met with ample margins.

### **NAPS Unit 1 Large Break LOCA Results**

The limiting PCT is 2,025 °F. In the Reference 1 analysis, the limiting PCT was 1992°F. The revised case is characterized in Tables 1 and 2. The maximum oxidation (2.5%) and total oxidation (0.07%) results are reported in Table 2. The plots of key parameters exhibit the same trends as the original analysis. The hot fuel rod results and event times for the limiting PCT case are provided in Tables 2 and 3, respectively. The nominal PCT is 1,503°F.

### **NAPS Unit 2 Large Break LOCA Results**

The limiting PCT is 2,032°F, the same as in the Reference 2 analysis. The case is characterized in Tables 4 and 5. The maximum oxidation (3.7%) and total oxidation (0.09%) results are also reported in Table 5. The plots of key parameters exhibit the same trends as the original analysis. The hot fuel rod results and event times for the limiting PCT case are given in Tables 5 and 6, respectively. The nominal PCT is 1,483°F.

### **Large Break LOCA Conclusions**

The revised RLBLOCA results reported herein represent minimal changes relative to the results originally submitted in References 1 and 2. The revised results were obtained using the identical analytical methodology and inputs as in the original analyses, excepting the RV upper plenum/head liquid volume. The revised results meet the acceptance criteria of 10CFR50.46(b).

## References

1. Letter, Eugene S. Grecheck (Virginia Electric and Power Company) to USNRC, "North Anna Power Station Units 1 and 2, Realistic Large Break Loss of Coolant Accident (RLBLOCA) Analysis Results for the Proposed Technical Specifications Changes and Exemption Request for Use of Framatome ANP Advanced Mark-BW Fuel," Serial No. 03-407, July 18, 2003 [transmits Unit 1 RLBLOCA results]
2. Letter, Leslie N. Hartz (Virginia Electric and Power Company) to USNRC, "North Anna Power Station Units 1 and 2, Realistic Large Break Loss of Coolant Accident (RLBLOCA) Analysis Results for the Proposed Technical Specifications Changes and Exemption Request for Use of Framatome ANP Advanced Mark-BW Fuel," Serial No. 03-313, May 6, 2003 [transmits Unit 2 RLBLOCA results]

**Table 1: Summary of Major Parameters for Limiting NAPS Unit 1 Transient**

Time (hrs)	5,455
Burnup (MWd/mtU)	11,800
Core Power (MWt)	2,862
Core Peaking ( $F_0$ )	2.284
Radial Peak ( $F_{\Delta H}$ )	1.65
Local Peaking ( $F_l$ )	1.06
Break Type	DEGB
Break Size per Side (ft <sup>2</sup> )	2.45 (~60 %)
Offsite Power Available	No
Decay Heat Multiplier	0.9412

**Table 2: Summary of Results for the NAPS Unit 1 Limiting PCT Case**

<b>PCT</b>	
Temperature	2,025 °F
Time	70.7 seconds
Elevation	~9.6 ft
<b>Metal-Water Reaction</b>	
% Oxidation Maximum	2.5 %
% Total Oxidation	0.07 %
Total Hydrogen	1.15 lbm

**Table 3: Calculated Event Times for the NAPS Unit 1 Limiting PCT Case**

Event	Time (sec)
Begin Analysis	0.0
Break Opens	0.0
RCP Trip	0.0
SI ACTUATION SIGNAL Issued	0.8
Start of Broken Loop Accumulator Injection	10
Start of Intact Loop Accumulator Injection	12
End of Bypass	26
Start of HHSI	28
Start of LHSI	28
Beginning of Core Recovery (Beginning of Reflood)	29
Broken Loop Accumulator Empties	40
Intact Loop Accumulators Empty	41, 41
PCT Occurs (2,025 °F)	70.7

Table 4: Summary of Major Parameters for Limiting NAPS Unit 2 Transient

Time (hrs)	.601
Burnup (MWd/mtU)	1,200
Core Power (MWt)	2,926
Core Peaking ( $F_0$ )	2.294
Radial Peak ( $F_{\Delta H}$ )	1.65
Local Peaking ( $F_l$ )	1.12
Break Type	DEGB
Break Size per Side (ft <sup>2</sup> )	3.31 (~80%)
Offsite Power Available	Yes
Decay Heat Multiplier	0.9899

Table 5: Summary of Results for the NAPS Unit 2 Limiting PCT Case

PCT	
Temperature	2,032 °F
Time	70.2 seconds
Elevation	~9.6 ft
Metal-Water Reaction	
% Oxidation Maximum	3.7 %
% Total Oxidation	0.09 %
Total Hydrogen	1.44 lbm

Table 6: Calculated Event Times for the NAPS Unit 2 Limiting PCT Case

Event	Time (sec)
Begin Analysis	0.0
Break Opens	0.0
RCP Trip	N/A
SI ACTUATION SIGNAL Issued	0.7
Start of Broken Loop Accumulator Injection	10
Start of Intact Loop Accumulator Injection	13
Start of HHSI	14
Start of LHSI	14
End of Bypass	25
Beginning of Core Recovery (Beginning of Reflood)	29
Broken Loop Accumulator Empties	38
Intact Loop Accumulators Empty	40, 40
PCT Occurs (2,032 °F)	70.2