VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

December 13, 2005

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

Serial No. 05-834
NL&OS/ETS R0
Docket Nos. 50-338
50-339
License Nos. NPF-4
NPF-7

VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)
NORTH ANNA POWER STATION UNITS 1 AND 2
UPDATE TO REACTOR VESSEL INTEGRITY DATABASE
TO REFLECT LICENSE RENEWAL PERIOD

Dominion recently implemented new Reactor Coolant System Pressure/Temperature Limit Curves and Low Temperature Overpressure Protection System (LTOPS) setpoints which are valid to the end of the 60-year license renewal period. These changes were submitted to the NRC by letter dated July 1, 2004. The revised P/T limits and LTOPS setpoints are based on reactor vessel neutron fluence projections for the period of license renewal, corresponding to cumulative core burnups of 50.3 Effective Full Power Years (EFPY) for North Anna Unit 1, and 52.3 EFPY for North Anna Unit 2. NRC approval of the revised P/T limits and LTOPS setpoints was granted in a letter dated July 8, 2005.

In the submittal of July 1, 2004, Dominion made a commitment to provide an update to the NRC's Reactor Vessel Integrity Database to reflect license renewal values (60-year license period) for North Anna Power Station. The information contained herein is provided in fulfillment of this commitment.

Dominion has previously provided updates to the NRC's Reactor Vessel Integrity Database (RVID) by letters dated November 19, 1999, September 19, 2000, and most recently April 27, 2001. These updates considered available reactor vessel materials surveillance data, including data obtained from the North Anna Units 1 and 2 plant-specific surveillance program as well as from other utilities' surveillance programs. However, these RVID updates were limited to the period of the original 40-year operating license, and did not apply to the renewed license period (i.e. 60-year operation).

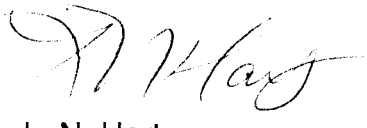
The attachment to this letter provides revised North Anna Unit 1 and Unit 2 data tables for the NRC's Reactor Vessel Integrity Database (RVID) and a discussion of changes relative to the previous RVID update for North Anna Units 1 and 2. The RVID update provided herein is based on peak fast neutron fluence ($E > 1.0$ MeV) values for North Anna Unit 1 and Unit 2 reactor pressure vessels at the end of the license renewal period.

These evaluations consider the impact of the peak fast neutron fluence values for North Anna Unit 1 and Unit 2 reactor pressure vessels at the end of the license renewal period on (a) licensing basis reactor coolant system (RCS) pressure/temperature (P/T) limit curves, (b) the associated Low Temperature Overpressure Protection System (LTOPS) setpoints and enabling temperature, (c) 10 CFR 50.61 Pressurized Thermal Shock (PTS) screening calculations, and (d) 10 CFR 50 Appendix G requirements for Upper Shelf Energy. The evaluation is performed in a manner consistent with applicable regulatory guidance. Evaluation results are presented in a format consistent with the data requirements of the NRC's Reactor Vessel Integrity Database (RVID).

As documented in the attached evaluation, the RT_{PTS} reference temperature calculation results for North Anna Unit 1 and Unit 2 continue to meet the applicable PTS screening criteria in 10 CFR 50.61. The Upper Shelf Energy values for North Anna Units 1 and 2 beltline materials meet the 50 ft-lb acceptance criteria of 10 CFR 50 Appendix G at end of the current 60-year license period. Further, the RT_{NDT} value used in the development of the current North Anna Unit 1 and Unit 2 Technical Specification Pressure/Temperature limits, LTOPS setpoints, and LTOPS enabling temperature remains valid and conservative for cumulative core burnups up to 50.3 EFPY for North Anna Unit 1, and 52.3 EFPY for North Anna Unit 2, corresponding to the end of the current 60-year license period.

If you should have any questions regarding this submittal, please contact Mr. Thomas Shaub at (804) 273-2763.

Sincerely,



L. N. Hartz
Vice President – Nuclear Engineering

Attachment: Reactor Vessel Integrity Database Updates for the 60-Year License Period

Commitments made in this letter: None

cc: U. S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Suite 23T85
Atlanta, Georgia 30303

Mr. J. T. Reece
NRC Senior Resident Inspector
North Anna Power Station

Mr. J. E. Reasor, Jr. (without attachment)
Old Dominion Electric Cooperative
Innsbrook Corporate Center
4201 Dominion Blvd.
Suite 300
Glen Allen, Virginia 23060

Mr. S. R. Monarque
NRC Project Manager
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop 8-H12
Rockville, Maryland 20852

Mr. R. E. Martin
NRC Lead Project Manager – North Anna and Surry
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852

Attachment

Serial No. 05-834

UPDATE TO REACTOR VESSEL INTEGRITY DATABASE TO REFLECT LICENSE RENEWAL PERIOD

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

UPDATE TO REACTOR VESSEL INTEGRITY DATABASE TO REFLECT LICENSE RENEWAL PERIOD NORTH ANNA, UNITS 1 AND 2 VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION) DOCKET NOS. 50-338 AND 50-339

BACKGROUND

Dominion recently implemented new Reactor Coolant System Pressure/Temperature Limit Curves and Low Temperature Overpressure Protection System (LTOPS) setpoints which are valid to the end of the 60-year license renewal period. These changes were submitted to the NRC by letter dated July 1, 2004 (Reference 1). The revised P/T limits and LTOPS setpoints are based on reactor vessel neutron fluence projections for the period of license renewal, corresponding to cumulative core burnups of 50.3 Effective Full Power Years (EFPY) for North Anna Unit 1, and 52.3 EFPY for North Anna Unit 2. NRC approval of the revised P/T limits and LTOPS setpoints was granted in a letter dated July 8, 2005 (Reference 2).

In the submittal of July 1, 2004, Dominion made a commitment to provide an update to the NRC's Reactor Vessel Integrity Database to reflect license renewal values (60-year license period) for North Anna Power Station. The information contained herein is provided in fulfillment of this commitment.

Dominion has previously provided updates to the NRC's Reactor Vessel Integrity Database (RVID) by letters dated November 19, 1999 (Reference 4), September 19, 2000 (Reference 5), and most recently April 27, 2001 (Reference 6). These updates considered available reactor vessel materials surveillance data, including data obtained from the North Anna Units 1 and 2 plant-specific surveillance program as well as from other utilities' surveillance programs. However, these RVID updates were limited to the period of the original 40-year operating license, and did not apply to the renewed license period (i.e. 60-year operation).

This evaluation provides revised North Anna Unit 1 and Unit 2 data tables for the NRC's Reactor Vessel Integrity Database (RVID) and a discussion of changes relative to the previous RVID update for North Anna Units 1 and 2. The RVID update provided herein is based on peak fast neutron fluence ($E > 1.0$ MeV) values for North Anna Unit 1 and Unit 2 reactor pressure vessels at the end of the license renewal period, as previously submitted to the NRC via Reference 7.

The evaluation documented herein considers the impact of the peak fast neutron fluence values for North Anna Unit 1 and Unit 2 reactor pressure vessels at the end of the license renewal period on (a) licensing basis reactor coolant system (RCS) pressure/temperature (P/T) limit curves, (b) the associated Low Temperature Overpressure Protection System (LTOPS) setpoints and enabling temperature, (c) 10

CFR 50.61 Pressurized Thermal Shock (PTS) screening calculations, and (d) 10 CFR 50 Appendix G requirements for Upper Shelf Energy. The evaluation is performed in a manner consistent with applicable regulatory guidance. Specifically, the calculation of the Reference Temperature for the Nil Ductility Transition (RT_{NDT}) is performed in accordance with Regulatory Guide 1.99 Revision 2 (Reference 8), and the regulatory guidance provided in the meeting minutes from the November 12, 1997 NRC/Industry meeting on reactor vessel integrity (Reference 9). PTS screening calculations were performed in accordance with 10 CFR 50.61 (Reference10). Evaluation results are presented in a format consistent with the data requirements of the NRC's Reactor Vessel Integrity Database (RVID).

DISCUSSION OF CHANGES TO PREVIOUSLY REPORTED INFORMATION

The RVID update provided herein is based on peak fast neutron fluence (E > 1.0 MeV) values for North Anna Unit 1 and Unit 2 reactor pressure vessels at the end of the license renewal period, as previously submitted to the NRC via Reference 7. The peak reactor vessel inner surface fluence (E> 1.0 MeV) values at the end of the current 60 year operating license (EOL) are:

North Anna Unit 1	5.90 E19 n/cm^2
North Anna Unit 2	5.91 E19 n/cm^2

EVALUATION OF EXISTING P/T LIMITS AND LTOPS SETPOINTS

RT_{NDT} calculations have been performed for all North Anna Unit 1 and Unit 2 reactor vessel beltline materials at the end of the current 60 year operating license (EOL) with neutron fluence values corresponding to 50.3 EFPY for Unit 1 and 52.3 EFPY for Unit 2 (References 1 and 2). The results are presented in Appendix A. After consideration of the EOL fluence values, the most limiting 1/4-T RT_{NDT} value of 218.5 °F bounds the end-of-license renewal limiting material for both North Anna Units 1 and 2 (Unit 2 Lower Shell Forging 990533/297355). This value is unchanged from that previously provided in Reference 1.

EVALUATION OF PTS SCREENING CALCULATIONS

PTS screening calculations have been performed for all North Anna Unit 1 and Unit 2 reactor vessel beltline materials at the end of the current 60 year operating license (EOL) neutron fluence values. The results of these calculations are presented in Appendix A. After consideration of the EOL fluence values, it is concluded that all North Anna Unit 1 and Unit 2 reactor vessel beltline materials continue to meet the 10 CFR 50.61 PTS screening criteria (270 °F for plates, forgings, and axial welds, and 300 °F for circumferential welds). The limiting RT_{PTS} value of 227.7 °F applies to Unit 2 Lower Shell Forging 990533/297355,

as shown in Appendix A. This limiting material is unchanged from that provided in Reference 1.

EVALUATION OF UPPER SHELF ENERGY CALCULATIONS

The decrease in Charpy Upper Shelf Energy due to peak end-of-license fluence at the ¼-T location is calculated from Regulatory Guide 1.99, Rev. 2 Figure 2 trend curves. The ¼-T Upper Shelf Energy values for North Anna Units 1 and 2 beltline materials meet the 50 ft-lb acceptance criteria of 10 CFR 50 Appendix G at end of the current 60-year license period.

CONCLUSIONS

The RT_{PTS} reference temperature calculation results for North Anna Unit 1 and Unit 2 continue to meet the applicable PTS screening criteria in 10 CFR 50.61. The Upper Shelf Energy values for North Anna Units 1 and 2 beltline materials meet the 50 ft-lb acceptance criteria of 10 CFR 50 Appendix G at the end of the current 60-year license period. Further, the RT_{NDT} value used in the development of the current North Anna Unit 1 and Unit 2 Technical Specification Pressure/Temperature limits, LTOPS setpoints, and LTOPS enabling temperature remains valid and conservative for cumulative core burnups up to 50.3 EFPY for North Anna Unit 1, and 52.3 EFPY for North Anna Unit 2, corresponding to the end of the current 60-year license period.

NRC REACTOR VESSEL INTEGRITY DATABASE

Dominion requests that information presented in Appendix A be used to update the NRC Reactor Vessel Integrity Database (RVID).

References

1. Letter from W. R. Matthews (Dominion) to USNRC, "Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Proposed Technical Specifications Change Request, Reactor Coolant System Pressure/Temperature Limits, LTOPS Setpoints and LTOPS Enable Temperatures," Serial No. 04-380, dated July 1, 2004; supplemented by letters dated October 28, 2004 and November 16, 2004.
2. Letter from John Honcharik (USNRC) to D. A. Christian (Dominion), "North Anna Power Station Units 1 and 2 - Issuance of Amendments on Reactor Coolant System Pressure and Temperature Limits (TAC Nos. MC3705 and MC3706)," Dominion Serial No. 05-460, dated July 8, 2005.
3. Letter from John Honcharik (USNRC) to D. A. Christian (Dominion), "Correction to Amendment Nos. 242 and 223, for North Anna Power Station (TAC Nos. MC3705 and MC3706)," Dominion Serial No. 05-594, dated August 23, 2005.
4. Letter from L. N. Hartz (Dominion) to USNRC, "Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Surry Power Station Units 1 and 2, Evaluation of Reactor Vessel Materials Surveillance Data," Serial No. 99-452A, dated November 19, 1999.
5. Letter from L. N. Hartz (Dominion) to USNRC, "Virginia Electric and Power Company, North Anna Power Station Unit 2, Evaluation of Reactor Vessel Materials Surveillance Data," Serial No. 00-463, dated September 19, 2000.
6. Letter from L. N. Hartz (Dominion) to USNRC, "Virginia Electric and Power Company, North Anna Power Station Unit 2, Application of Sequoyah 2 Surveillance Data to North Anna Unit 2 Reactor Vessel Weld Material Fabricated from Weld Wire Heat 4278," Serial No. 01-262, dated April 27, 2001.
7. Letter from L. N. Hartz (Dominion) to USNRC, "Virginia Electric and Power Company (Dominion), Surry and North Anna Power Stations Units 1 and 2, Response to Request for Supplemental Information License Renewal Applications," Serial No. 02-601, dated October 15, 2002.
8. Regulatory Guide 1.99 Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," dated May, 1988.
9. Memorandum from K. R. Wichman to E. J. Sullivan, "Meeting Summary for November 12, 1997 Meeting with Owners Group Representatives and NEI Regarding Review of Responses to Generic Letter 92-01, Revision 1, Supplement 1 Responses," dated November 19, 1997.
10. Title 10, Code of Federal Regulations, Part 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events."

APPENDIX A

REACTOR VESSEL MATERIALS DATA TABLES FOR NORTH ANNA UNIT 1 AND UNIT 2

Facility: North Anna Unit 1
Vessel Manufacturer: Rotterdam Dockyard

RPV Weld Wire Heat or Material ID	Location	Best-Estimate Copper (wt%)	Best-Estimate Nickel (wt%)	EOL ID Fluence (x1E19)	Assigned Material Chemistry Factor	Method of Determining CF	Initial RT(NDT)	Sigma(I)	Sigma(delta)	Margin	Inner Surf. ART or RT(PTS) at EOL	Current Licensing Basis 1/4-T ART *
990286/295213	Nozzle Shell Forging	0.160	0.740	0.211	121.5	Tables	6	30.0	17.0	69.0	145.7	132.6
990311/298244	Intermediate Shell Forging	0.120	0.820	5.900	86.0	Tables	17	0.0	17.0	34.0	174.3	166.1
990400/292332	Lower Shell Forging	0.156	0.817	5.900	82.9	Surv. Data	38	0.0	17.0	34.0	190.9	182.9
25295	Nozzle to Int. Shell Circ Weld (OD 94%)	0.352	0.125	0.211	144.2	Surv. Data	0	20.0	14.0	48.8	132.8	117.2
4278	Nozzle to Int. Shell Circ Weld (ID 6%)	0.120	0.110	0.211	92.4	Surv. Data	0	20.0	26.9	67.0	120.8	110.8
25531	Int. to Lower Shell Circ Weld	0.098	0.124	5.900	56.2	Tables	19	0.0	28.0	56.0	155.6	150.2

* 1/4-T ART value of 218.5 F was used in the determination of P/T limits

Facility: North Anna Unit 2
Vessel Manufacturer: Rotterdam Dockyard

RPV Weld Wire Heat or Material ID	Location	Best-Estimate Copper (wt%)	Best-Estimate Nickel (wt%)	EOL ID Fluence (x1E19)	Assigned Material Chemistry Factor	Method of Determining CF	Initial RT(NDT)	Sigma(I)	Sigma(delta)	Margin	Inner Surf. ART or RT(PTS) at EOL	Current Licensing Basis 1/4-T ART *
990598/291396	Nozzle Shell Forging	0.080	0.770	0.225	51.0	Tables	9	30.0	15.2	67.3	106.8	101.2
990496/292424	Intermediate Shell Forging	0.107	0.857	5.910	54.1	Surv. Data	75	0.0	17.0	34.0	186.6	181.4
990533/297355	Lower Shell Forging	0.130	0.830	5.910	96.0	Tables	56	0.0	17.0	34.0	227.7	218.5
4278	Nozzle to Int. Shell Circ Weld (OD 94%)	0.120	0.110	0.225	92.4	Surv. Data	0	20.0	27.6	68.2	123.4	113.3
801	Nozzle to Int. Shell Circ Weld (ID 6%)	0.180	0.110	0.225	87.8	Tables	0	20.0	26.2	66.0	118.5	108.9
716126	Int. to Lower Shell Circ Weld	0.066	0.046	5.910	26.8	Surv. Data	-48	0.0	14.0	28.0	18.5	15.9

* 1/4-T ART value of 218.5 F was used in the determination of P/T limits

Note: Shaded cells indicate a changed value relative to values previously submitted in Letter from L. N. Hartz to USNRC, "Virginia Electric and Power Company, North Anna Power Station Unit 2, Application of Sequoyah Surveillance Data to North Anna Unit 2, Reactor Vessel Weld Material Fabricated from Weld Wire Heat 4278," dated April 27, 2001.

Facility: North Anna Unit 1
Vessel Manufacturer: Rotterdam Dockyard

RPV Weld Wire Heat or Material ID	Location	Best-Estimate Copper (wt%)	Best-Estimate Nickel (wt%)	EOL ID Fluence (x1E19)	Unirradiated CvUSE	EOL 1/4-T Fluence (x1E19)	EOL 1/4-T CvUSE	Percent Decrease in CvUSE
990286/295213	Nozzle Shell Forging	0.160	0.740	0.211	74.0	0.132	62.6	15.4
990311/298244	Intermediate Shell Forging	0.120	0.820	5.900	92.0	3.681	65.9	28.4
990400/292332	Lower Shell Forging	0.156	0.817	5.900	85.0	3.681	57.0	33.0
25295	Nozzle to Int. Shell Circ Weld (0D 94%)	0.352	0.125	0.211	111.0	0.132	76.5	31.1
4278	Nozzle to Int. Shell Circ Weld (ID 6%)	0.120	0.110	0.211	105.0	0.132	88.1	16.1
25531	Int. to Lower Shell Circ Weld	0.098	0.124	5.900	102.0	3.681	69.4	31.9

Facility: North Anna Unit 2
Vessel Manufacturer: Rotterdam Dockyard

RPV Weld Wire Heat or Material ID	Location	Best-Estimate Copper (wt%)	Best-Estimate Nickel (wt%)	EOL ID Fluence (x1E19)	Unirradiated CvUSE	EOL 1/4-T Fluence (x1E19)	EOL 1/4-T CvUSE	Percent Decrease in CvUSE
990598/291396	Nozzle Shell Forging	0.080	0.770	0.225	74.0	0.140	65.0	12.2
990496/292424	Intermediate Shell Forging	0.107	0.857	5.910	74.0	3.687	54.2	26.8
990533/297355	Lower Shell Forging	0.130	0.830	5.910	80.0	3.687	56.3	29.7
4278	Nozzle to Int. Shell Circ Weld (0D 94%)	0.120	0.110	0.225	105.0	0.140	87.9	16.3
801	Nozzle to Int. Shell Circ Weld (ID 6%)	0.180	0.110	0.225	90.0	0.140	71.9	20.1
716126	Int. to Lower Shell Circ Weld	0.066	0.046	5.910	107.0	3.687	77.1	27.9