VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

February 15, 2013

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

Serial No. 13-055
SPS-LIC/CGL R0
Docket Nos. 50-280/281
License No. DPR-32/37

VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)
SURRY POWER STATION UNITS 1 AND 2
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION RELATED TO ASME SECTION XI INSERVICE INSPECTION (ISI) PROGRAM REQUEST FOR ALTERNATIVE – IMPLEMENTATION OF EXTENDED REACTOR VESSEL INSERVICE INSPECTION INTERVAL RELIEF REQUESTS CMP-007 AND CMP-009

By a letter dated April 25, 2012 (Serial No. 12-267), Virginia Electric and Power Company (Dominion) submitted Relief Requests CMP-007 and CMP-009 for Surry Units 1 and 2, respectively. These relief requests proposed an alternative to the requirement of IWB-2412, Inspection Program B, which requires examination of identified reactor vessel (RV) pressure retaining welds once each ten year interval. Pursuant to 10 CFR 50.55a(a)(3)(i), an alternate inspection interval of 20 years was requested.

On January 17, 2013, the NRC requested additional information regarding Relief Requests CMP-007 and CMP-009. The response to the request for additional information is provided in the attachment.

As indicated in our April 25, 2012 letter, Dominion requests approval of Relief Requests CMP-007 and CMP-009 by May 30, 2013 to support performance of the fourth 10-year ISI interval examination of the Surry Units 1 and 2 RVs in 2023 and 2024 in lieu of 2013 and 2014, respectively.

If you have any questions or require additional information, please contact Mrs. Candee G. Lovett at (757) 365-2178.

Sincerely,

N. L. Lane

N. L. Lane
Site Vice President – Surry Power Station

Attachment: Response to Request for Additional Information Regarding Relief Requests CMP-007 for Surry Unit 1 and CMP-009 for Surry Unit 2

Commitments made by this letter: None

A047
NRR

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

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

NRC Senior Resident Inspector
Surry Power Station

Ms. K. R. Cotton, NRC Project Manager - Surry
U. S. Nuclear Regulatory Commission
One White Flint North
Mail Stop O8 G9A
11555 Rockville Pike
Rockville, Maryland 20852

Dr. V. Sreenivas, NRC Project Manager – North Anna
U. S. Nuclear Regulatory Commission
One White Flint North
Mail Stop O8 G9A
11555 Rockville Pike
Rockville, Maryland 20852

Mr. R. A. Smith
Authorized Nuclear Inspector
Surry Power Station

Attachment

Response to Request for Additional Information Regarding Relief Requests CMP-007 and CMP-009

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

REQUEST FOR ADDITIONAL INFORMATION
SURRY POWER STATION, UNITS NO. 1 AND 2
INSERVICE INSPECTION RELIEF REQUEST CMP-007 AND CMP-009
REACTOR VESSEL BELTLINE WELD EXAM EXTENSION
(TAC NOs. ME8573 AND ME8574)

In accordance with 10 CFR 50.55a(a)(3)(i) and the NRC safety evaluation approving the use of WCAP-16168-NP-A, Revision 2 (WCAP), the staff needs the following information to complete the review:

RAI 1

NUREG-1874 and WCAP-16168 were developed to consider the structural integrity of PWR reactor vessels, taking into account the plates, axial welds, circumferential welds, and forgings that make up the potentially limiting materials for the structural integrity of the reactor vessel.

The staff notes that the RVID2 database includes a nozzle shell forging, heat #122V109VA1, for Surry, Unit 1 and another, heat #123V303VA1, for Unit 2. These forgings and their associated welds do not appear in Table 3 of Attachments 1 and 2.

The staff requests that the licensee provide a rollout diagram of the potentially limiting reactor vessel materials (those exposed to a neutron fluence of greater than 1E+17 n/cm^2 for 48 EFPY) showing the planar dimensions and thickness of each plate/weld/forging for each unit along with representative fluence maps. With the use of the rollout diagram and fluence map, justify why the nozzle shell forgings and their associated circumferential welds are not included to represent the structural integrity of Surry, Units 1 and 2 in Table 3 of Attachments 1 and 2.

Response to RAI 1:

The nozzle shell forging, heats #122V109VA1 and #123V303VA1 for Surry Units 1 and 2, respectively, and the adjacent nozzle-to-intermediate shell circumferential welds were not originally included in the evaluation as these materials are not immediately adjacent to the active core in both units. However, due to the close proximity of these materials in both units to the top of the active core, Dominion agrees that the nozzle shell forgings, heat #122V109VA1 and #123V303VA1 for Surry Units 1 and 2, respectively, and the adjacent nozzle-to-intermediate shell circumferential welds should be included as part of the RV weld 10-year ISI interval extension evaluation. These materials have been included in previous reactor vessel integrity analyses for Surry Units 1 and 2. The tables below are updated versions of Table 3 provided in the April 25, 2013 letter for Surry Units 1 and 2.

The through-wall cracking frequency (TWCF) for the nozzle shell forgings ($TWCF_{95\text{-}FO}$) was calculated for each unit. These results were added to the total TWCF ($TWCF_{95\text{-}TOTAL}$). For Surry Unit 1, the magnitude of $TWCF_{95\text{-}FO}$ was several orders of magnitude below $TWCF_{95\text{-}TOTAL}$ and, therefore, did not change the previously reported TWCF value. Thus, $TWCF_{95\text{-}TOTAL}$ for Surry Unit 1 remains 1.41E-08 events per year. For Surry Unit 2, the magnitude of $TWCF_{95\text{-}FO}$ was similar to that calculated for Unit 1; however, $TWCF_{95\text{-}TOTAL}$ for Unit 2 was also of a similar magnitude. Therefore, the Surry Unit 2 $TWCF_{95\text{-}TOTAL}$ has been updated and increased from 1.17E-12 to 1.28E-12 events per year.

The nozzle to intermediate shell circumferential welds were also incorporated into the evaluation; however, these welds were not the controlling circumferential weld material for either unit and, therefore, inclusion of these welds did not change the TWCF for circumferential welds ($TWCF_{95\text{-}CW}$) for Surry Units 1 and 2.

Regarding the NRC's request for a rollout diagram of the potentially limiting reactor vessel materials, Dominion does not possess the information required to define the region of the RV with a neutron fluence of greater than 1E+17 n/cm^2 at end-of-license, and additional analyses would be required to determine the extent of the fluence region within the RV that is greater than 1E+17 n/cm^2 at end-of-license. The RAI indicates that the purpose for this diagram would be to provide justification as to why the nozzle shell forgings and their associated circumferential welds were not included in this evaluation. Inclusion of these materials in evaluation and updated results are being provided (versus a rollout diagram) in response to RAI 1.

In conclusion, the total TWCFs for the Surry Units 1 and 2 reactor vessels, including the nozzle shell forgings and circumferential welds, remain bounded by the WCAP-16168-NP TWCF acceptance criteria of 1.76E-08 events per year for Westinghouse plants.

Table 3:
Details of TWCF Calculation for Surry Unit 1 at 48 Effective Full Power Years (EFPY)

Inputs

Reactor Coolant System Temperature, T_{RCS}[°F]:	N/A	Nozzle Shell T_{wall} [inches]:	9.283
		Beltline T_{wall} [inches]:	8.209

No.	Region and Component Description	Material Heat No.	Cu(1) [wt%]	Ni(1) [wt%]	R.G. 1.99 Pos.	CF(1) [°F]	$RT_{NDT(u)}$ (1) [°F]	Fluence [10^{19} Neutron/cm^2, E > 1.0 MeV]
1	Inter. Shell Long. Weld L3	SA-1494/8T1554	0.16	0.57	1.1	143.9	-5	0.897
2	Inter. Shell Long. Weld L4	SA-1494/8T1554	0.16	0.57	1.1	143.9	-5	0.897
3	Lower Shell Long. Weld L1	SA-1494/8T1554	0.16	0.57	1.1	143.9	-5	0.897
4	Lower Shell Long. Weld L2	SA-1526/299L44	0.34	0.68	1.1	220.6	-7	0.897
5	Nozzle To Inter. Shell Circ. Weld W06	J726/25017	0.33	0.10	1.1	152.0	0	0.775
6	Inter. To Lower Shell Circ. Weld W05	SA-1585/72445 SA-1650/72445	0.22	0.54	1.1	158.0	-5	4.51
7	Nozzle Shell Forging	122V109VA1	0.11	0.74	1.1	76.1	40	0.775
8	Intermediate Shell	C4326-1	0.11	0.55	1.1	73.5	10	4.51
9	Intermediate Shell	C4326-2	0.11	0.55	1.1	73.5	0	4.51
10	Lower Shell	C4415-1	0.11	0.50	2.1	85.0	20	4.51
11	Lower Shell	C4415-2	0.11	0.50	1.1	73.0	0	4.51

Outputs

Methodology Used to Calculate ΔT_{30}:	Regulatory Guide 1.99, Revision 2(2)

	Controlling Material Region No. (From Above)	RT_{MAX-xx} [°R]	Fluence [10^{19} Neutron/cm^2, E > 1.0 MeV]	FF (Fluence Factor)	ΔT_{30} [°F]	$TWCF_{95-xx}$
Limiting Axial Weld - AW	4	666.55	0.897	0.970	213.88	6.26E-09
Limiting Plate - PL	10	597.10	4.51	1.382	117.43	1.51E-12
Limiting Forging - FO	7	570.33	0.775	0.928	70.66	1.60E-13
Circumferential Weld - CW	6	672.96	4.51	1.382	218.29	6.05E-13
$TWCF_{95-TOTAL}(\alpha_{AW}TWCF_{95-AW} + \alpha_{PL}TWCF_{95-PL} + \alpha_{FO}TWCF95\text{-}_{FO} + \alpha_{CW}TWCF_{95-CW})$:						1.41E-08

(1) WCAP-15130, Revision 1
(2) NRC Regulatory Guide 1.99, Revision 2

Table 3:
Details of TWCF Calculation for Surry Unit 2 at 48 Effective Full Power Years (EFPY)

Inputs

Reactor Coolant System Temperature, T_{RCS}[°F]:	N/A	Nozzle Shell T_{wall} [inches]:	9.283
		Beltline T_{wall} [inches]:	8.209

No.	Region and Component Description	Material Heat No.	Cu[1] [wt%]	Ni[1] [wt%]	R.G. 1.99 Pos.	CF[1] [°F]	$RT_{NDT(u)}$ [1][°F]	Fluence [10^{19} Neutron/cm^2, E > 1.0 MeV]
1	Inter. Shell Long. Weld L3	SA-1585/72445	0.22	0.54	1.1	158.0	-5	0.940
2	Inter. Shell Long. Weld L4[2]	SA-1585/72445	0.22	0.54	1.1	158.0[2]	-5	0.940
3	Lower Shell Long. Weld L1	WF-4/8T1762	0.19	0.57	1.1	152.4	-5	0.940
4	Lower Shell Long. Weld L2[2]	WF-4/8T1762	0.19	0.57	1.1	152.4[2]	-5	0.940
5	Nozzle To Inter. Shell Circ. Weld W06	J737/4275	0.35	0.10	1.1	160.5	0	0.632
6	Inter. To Lower Shell Circ. Weld W05	R3008/0227	0.19	0.55	1.1	149.3	0	4.50
7	Nozzle Shell Forging	123V303VA1	0.11	0.72	1.1	75.8	30	0.632
8	Intermediate Shell	C4331-2	0.12	0.60	1.1	83.0	-10	4.50
9	Intermediate Shell	C4339-2	0.11	0.54	1.1	73.4	-20	4.50
10	Lower Shell	C4208-2	0.15	0.55	1.1	107.3	-30	4.50
11	Lower Shell	C4339-1	0.11	0.54	1.1	73.4	-10	4.50

Outputs

Methodology Used to Calculate ΔT_{30}:	Regulatory Guide 1.99, Revision 2[3]

	Controlling Material Region No. (From Above)	RT_{MAX-XX} [°R]	Fluence [10^{19} Neutron/cm^2, E > 1.0 MeV]	FF (Fluence Factor)	ΔT_{30} [°F]	$TWCF_{95-XX}$
Limiting Axial Weld - AW	1 and 2	609.93	0.940	0.983	155.26	0.00E+00
Limiting Plate - PL	10	577.86	4.50	1.381	148.19	3.08E-13
Limiting Forging - FO	7	555.72	0.632	0.871	66.05	4.29E-14
Circumferential Weld - CW	6	665.87	4.50	1.381	206.20	1.80E-13
$TWCF_{95-TOTAL}(\alpha_{AW}TWCF_{95-AW} + \alpha_{PL}TWCF_{95-PL} + \alpha_{FO}TWCF95_{-FO} + \alpha_{CW}TWCF_{95-CW})$:						1.28E-12

(1) WCAP-15130, Revision 1
(2) Weld contains two different materials. The material with the most limiting properties was used for this evaluation.
(3) NRC Regulatory Guide 1.99, Revision 2

RAI 2

Regarding observed indications from the most recent (3rd) inservice inspection (ISI) interval examinations for Unit 2 as documented in Table 2 of Proposed Alternative CMP-009, Attachment (2), clearly state the location and size of the four indications that were found in the near-surface region of the reactor pressure vessel beltline area. Were these indications observed in the 1st and/or 2nd ISI interval inspections? Did the size of the indications change during the course of the three inspections? If there was a change in the size of an indication, can that change be attributed to improved inspection procedures?

Response to RAI 2:

Size and location of the indications found in the Surry Unit 2 RPV beltline region are as follows:

The weld #1-03 (Intermediate to Lower Shell Circ. Weld) centerline elevation is at 231.66" relative to the RV flange, and the weld width is 2.4". The upper/lower limits of the weld at the ID are 230.46" to 232.86". The referenced flaws are circumferentially oriented.

Indication #1 is located in the upper fusion zone of weld #1-03 with the center at a vessel theta position of 218.9°. This indication is 0.6" in length, 0.125" in through-wall extent (2a dimension), and is embedded with an 'S' dimension of 0.51" (as measured from the cladding-to-base-metal interface).

Although recorded as in the examination volume of weld #1-03, indication #2 is actually located in weld#1-07, the intersecting Intermediate Long Seam at 225° with a measured center position at a vessel theta position of 226.5°. This indication is 1.1" in length, 0.125" in through-wall extent (2a dimension), and is embedded with an 'S' dimension of 0.78" (as measured from the cladding-to-base-metal interface).

Indication #3 is located in the lower fusion zone of weld #1-03 with the center at a vessel theta position of 181.3°. This indication is 1.1" in length, 0.125" in through-wall extent (2a dimension), and is embedded with an 'S' dimension of 0.21" (as measured from the cladding-to-base-metal interface).

Indication #4 is located near the centerline of weld #1-03 with the center at a vessel theta position of 95.7°. This indication is 0.6" in length, 0.125" in through-wall extent (2a dimension), and is embedded with an 'S' dimension of 0.78" (as measured from the cladding-to-base-metal interface).

These four indications were observed in the 3rd ISI interval inspection only, though the characteristics of the flaws do not support concluding the indications to be service-induced. It is likely that the indications were present but not recorded during the 1st and 2nd ISI interval inspections.

The 3rd ISI interval examination was an Appendix VIII (PDI) examination with a higher sensitivity than either the 1st or 2nd ISI interval Section XI/Regulatory Guide 1.150 examinations. For both the 1st and 2nd ISI interval examination, calibration was performed with the responses from 0.125" diameter side drilled holes normalized to 80% full screen (DAC). Recording criteria was, for the vessel inner 25% thickness, at 20% DAC or 16% full screen height (FSH). For the 3rd ISI interval PDI examination, calibration was performed with the responses from 0.063" diameter side drilled holes set to 80% full screen and then increased by 12dB. The recording criteria was to record all valid flaws. The relative gain difference between the two examinations, considering both the difference in calibration reflector size and the addition of 12dB for the PDI examinations, was approximately 18 dB or 8:1. The recorded maximum amplitudes from the 3rd interval exams of each of the indications in question, along with the probable responses during the 1st and 2nd ISI interval examinations, are summarized as follows:

Indication #	3rd Interval measured amplitude	1st/2nd Interval probable responses
1	42% FSH	~5%FSH
2	75% FSH	~9%FSH
3	27% FSH	~3%FSH
4	42% FSH	~5%FSH

Note that all of these probable responses from the 1st and 2nd ISI interval examination are well below the recording level of 16%FSH (20%DAC).

In summary, although it is likely that these four indications were present but not recorded during the 1st and 2nd ISI interval inspections, the indications were observed only in the 3rd ISI interval inspection, which was performed with a higher sensitivity examination technique.