VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

September 23, 1993

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

Serial No. 93-473
NA&F/JRH-CGL R1
Docket Nos. 50-280
50-281
License Nos. DPR-32
DPR-37

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING RESPONSE TO GENERIC LETTER 92-01, REV. 1

The stated purpose of Generic Letter 92-01, Revision 1, was to obtain information needed to assess compliance with requirements and commitments regarding reactor vessel integrity. Virginia Electric and Power Company provided the requested information for Surry Units 1 and 2 in a June 29, 1992 letter (Serial No. 92-211). By letter dated July 21, 1993, the NRC requested additional information regarding the Surry response. The response to your request for additional information (RAI) is provided in Attachment 1.

Consistent with the intent of Generic Letter 92-01, we have also reviewed regulatory requirements governing reactor vessel integrity, the information provided in response to Generic Letter 92-01, and the information and reports provided previously to the NRC regarding reactor vessel material fracture toughness, material surveillance program, and confirmation of fracture toughness requirements for protection against pressurized thermal shock events. Based on our review, we conclude that current compliance with the regulations governing reactor vessel integrity has been demonstrated for Surry Units 1 and 2. Further, we conclude that sufficient information has been provided to demonstrate compliance with applicable reactor vessel regulations through the end-of-license, pending confirmation of actual

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fluences experienced by each unit's reactor vessel. The basis for these conclusions is provided in Attachment 2.

If you have further questions or require additional information, please contact us.

Very truly yours,

for W. L. Stewart
Senior Vice President - Nuclear

Attachments:
1. Response to Request for Additional Information Regarding the Response to Generic Letter 92-01, Revision 1, for Surry Units 1 and 2
2. Basis for Demonstration of Compliance with Regulations Governing Reactor Vessel Integrity for Surry Units 1 and 2

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COMMONWEALTH OF VIRGINIA)
)
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The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by J. P. O'Hanlon who is Vice President - Nuclear Operations, for W. L. Stewart who is Senior Vice President - Nuclear, of Virginia Electric and Power Company. He is duly authorized to execute and file the foregoing document in behalf of that Company, and the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 23TH day of September, 1993.

My Commission Expires: May 31, 1994.

Vicki L. Hull
Notary Public

(SEAL)

ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING THE RESPONSE TO GENERIC LETTER 92-01, REVISION 1, FOR SURRY UNITS 1 AND 2

SURRY UNIT 1

RAI on Question 2a in GL 92-01

Your response only reported the initial Upper Shelf Energy (USE) value for weld SA-1585. The initial USE values for the remaining four types of welds can be found in Report BAW-1803, Rev. 1, where[as] the USE values for welds SA-1494 and J726 cannot be substantiated. An owners group report on USE equivalent margin analysis regarding beltline welds with low USE values for Levels A and B is under preparation by B&WOG; a similar B&WOG report for Levels C and D (BAW-2178P) is under NRC review now. Confirm that these two topical reports will be used as the licensing bases to demonstrate that all beltline welds including welds SA-1494 and J726 will meet the USE requirements of Appendix G, 10 CFR 50.

Response

SA-1494

SA-1494 is a Linde 80 weld material with an initial CvUSE estimate of 70 ft-lb, as documented in Table 3-5 of BAW-1803, Rev. 0 ("Correlations for Predicting the Effects of Neutron Radiation on Linde 80 Submerged-Arc Welds," dated January 1984). This material constitutes the Surry Unit 1 intermediate shell longitudinal welds L3 and L4, and the lower shell longitudinal weld L1. According to a Reg. Guide 1.99, Rev. 2, Paragraph C.1.2 calculation, the USE for this material at the 1/4-T location is conservatively predicted to be above 50 ft-lb at end-of-license. (A fluence of Φ_{IS}=0.639E19 is obtained from WCAP-11017, Rev. 1, "Surry Units 1 and 2 Reactor Vessel Fluence and RT_{PTS} Evaluations for Consideration of Life Extension." This value corresponds to a $\Phi_{1/4\text{-}T}$=0.394E19 for an 8.05 inch thickness. With [Cu]=0.18 wt% and $CvUSE_0$=70 ft-lb, a decrease in CvUSE of 25% is calculated, resulting in a 1/4-T $CvUSE_{EOL}$=52.5.) With the flux reduction program scheduled to be implemented beginning with Surry 1 Cycle 13, the irradiated CvUSE is predicted to be greater than 50 ft-lb at the end of a postulated 20 year license renewal. It is on this basis that Virginia Power has concluded that SA-1494 will meet the USE requirements of 10 CFR 50, Appendix G at the end of the current license period.

J726

J726 is a Rotterdam weld with a lower bound CvUSE estimate of 90 ft-lb, based on available CvUSE data for similar weld materials documented in BAW-1909, Rev. 1 ("Reactor Pressure Vessel and Surveillance Program Materials Licensing Information for Surry Units 1 and 2," dated August 1986). This material constitutes the Surry Unit 1 nozzle-to-intermediate shell circumferential weld. The available CvUSE data for similar

weld materials consists only of the Surry 2 Surveillance Material (R3008) which has an initial CvUSE of 91 ft-lb. Although J726 has a high bulk copper content (0.33 wt%), it is in a low fluence location, above the active region of the core. According to a Reg. Guide 1.99, Rev. 2, Paragraph C.1.2 calculation, the USE for this material at the 1/4-T location is conservatively predicted to be above 50 ft-lb at end-of-license. (Φ_{IS}=0.396E19 (WCAP-11017, Rev. 1, with an axial multiplier of 10%) corresponds to a $\Phi_{1/4\text{-}T}$=0.244E19 for an 8.05 inch thickness. With [Cu]=0.33 wt%, and $CvUSE_0$=90 ft-lb, a decrease in CvUSE of 34% is calculated, resulting in a 1/4-T $CvUSE_{EOL}$=59.4.)

Discussion

It is Virginia Power's preference to demonstrate compliance with the USE requirements of 10 CFR 50, Appendix G via RG 1.99, Rev. 2 calculations or surveillance data when possible. However, if a Linde 80 material cannot be demonstrated via Reg. Guide calculation or surveillance data to meet the USE requirements of Appendix G, it is necessary to reference the B&WOG Low USE Reports as the basis for compliance. The Surry Unit 1 beltline materials, with the exception of the intermediate-to-lower shell circumferential weld (SA-1585) and the lower shell longitudinal weld L2 (SA-1526), can be demonstrated via RG 1.99, Rev. 2, Paragraph C.1.2 calculations to meet the USE requirements of Appendix G. As described below, SA-1585 and SA-1526 may be demonstrated via RG 1.99, Rev. 2, Paragraph C.2.2 ("Surveillance Data Available") to remain above 50 ft-lb for the current license period without flux reduction, and throughout a postulated 20 year license renewal if the flux reduction program is implemented as planned.

According to RG 1.99, Rev. 2, Paragraph C.1.2 CvUSE calculations based on fluence and chemical composition, the limiting Surry Unit 1 material is the intermediate-to-lower shell circumferential weld, SA-1585. As documented in the Surry Unit 1 response to GL 92-01 (BAW-2166, dated June 1992, transmitted by our June 29, 1992 letter (Serial No. 92-211)), calculations based on surrogate weld data from the Point Beach Unit 1 surveillance weld material SA-1263, performed in accordance with RG 1.99, Rev. 2, Paragraph C.2.2, demonstrate that the CvUSE for SA-1585 will remain above 50 ft-lb throughout the current license period without flux reduction. If flux reduction targets are demonstrated to be met, the CvUSE for SA-1585 will remain above 50 ft-lb throughout a postulated 20 year license renewal. This conclusion will be re-confirmed with additional SA-1585 and surrogate weld data from the B&WOG MIRVSP.

The results of the Surry Unit 1 surveillance Capsule V analysis (WCAP-11415, dated February 1987) demonstrate that SA-1526 has approximately 50 ft-lb CvUSE at a fluence of 1.94×10^{19} n/cm^2. Without flux reduction, the lower shell longitudinal weld L2 (SA-1526) is predicted to experience an inner surface fluence of 6.39×10^{18} n/cm^2 at end-of-license, or 9.83×10^{18} n/cm^2 at the end of a postulated 20 year license renewal. (See WCAP-11017, Rev. 1.) The Surry 1 flux reduction program targets an inner surface

fluence of 7.5 x 10^{18} n/cm^2 at the end of a 20 year license renewal. The 1/4-T fluence will be approximately 62% of these values. With or without flux reduction, it is evident based on this data that the lower shell longitudinal weld L2 (SA-1526) will remain above the 50 ft-lb threshold throughout the current license period, and throughout a 20 year license renewal. This conclusion will be re-confirmed with additional SA-1526 data from the Surry Unit 1 reactor vessel materials surveillance program.

Summary

To summarize, the Surry 1 beltline materials have been demonstrated to remain above 50 ft-lb throughout the current license period. For beltline materials other than the intermediate-to-lower shell circumferential weld (SA-1585) and the lower shell longitudinal weld L2 (SA-1526), compliance with the requirements of 10 CFR 50, Appendix G may be demonstrated on the basis of RG 1.99, Rev. 2, Paragraph C.1.2 calculations.

The limiting CvUSE material (SA-1585) has been demonstrated via RG 1.99, Rev. 2, Paragraph C.2.2 calculations, based on surrogate weld data from the Point Beach Unit 1 surveillance weld material SA-1263, to remain above 50 ft-lb throughout the current license period without flux reduction, as well as throughout a postulated 20 year license renewal if flux reduction fluence targets are demonstrated to be met. On the basis of Surry 1 surveillance program data, the lower shell longitudinal weld L2 (SA-1526) has been demonstrated to remain above the 50 ft-lb threshold throughout the current license period, as well as throughout a postulated 20 year license renewal with or without flux reduction.

In the event the RG 1.99, Rev. 2 calculations, surveillance data, or fluence estimates which support the conclusion that the Surry 1 beltline materials remain above 50 ft-lb for the current license period are invalidated, the B&WOG Low USE Reports may be used to demonstrate compliance with the USE requirements of 10 CFR 50, Appendix G. However, it is Virginia Power's preference to demonstrate compliance with the USE requirements of 10 CFR 50, Appendix G via RG 1.99, Rev. 2 calculations or surveillance data.

SURRY UNIT 1

RAI on Question 2b in GL 92-01

Your response indicates that a generic initial RT_{NDT} of -5 °F, which is the mean RT_{NDT} value for 34 Linde 80 welds (BAW-1803, Revision 1), has been used for all welds except the weld J726. Provide justification for not using the generic mean value for Linde 80 welds of 0 °F as required by 10 CFR 50.61.

Response

Use of a -5 °F initial RT_{NDT} for Linde 80 welds is justified by the analysis documented in BAW-1803, Rev. 1 ("Correlations for Predicting the Effects of Neutron Radiation on Linde 80 Submerged-Arc Welds," dated May 1991, page 8-3). Weld J726 is a Rotterdam weld. An initial RT_{NDT} of 0 °F, with a standard deviation of 20 °F, is applicable to Rotterdam welds. (See BAW-1909, Rev. 1. The discussion of SECY 82-465, "Pressurized Thermal Shock," is cited.)

SURRY UNIT 2

RAI on Question 2a in GL 92-01

Your response only reported the initial Upper Shelf Energy (USE) value for weld SA-1585. The initial USE values for the remaining four types of welds can be found in Report BAW-1803, Rev. 1, where[as] the USE value for weld L737 cannot be substantiated. An owners group report on USE equivalent margin analysis regarding beltline welds with low USE values for Levels A and B is under preparation by B&WOG; a similar B&WOG report for Levels C and D (BAW-2178P) is under NRC review now. Confirm that these two topical reports will be used as the licensing bases to demonstrate that all beltline welds including weld L737 will meet the USE requirements of Appendix G, 10 CFR 50.

Response

L737

L737 is a Rotterdam weld with a lower bound CvUSE estimate of 90 ft-lb, based on available CvUSE data for similar weld materials documented in BAW-1909, Rev. 1 ("Reactor Pressure Vessel and Surveillance Program Materials Licensing Information for Surry Units 1 and 2," dated August 1986). This material constitutes the Surry Unit 2 nozzle-to-intermediate shell circumferential weld. The available CvUSE data for similar weld materials consists only of the Surry 2 Surveillance Material (R3008) which has an initial CvUSE of 91 ft-lb. Although L737 has a high bulk copper content (0.35 wt%), it is in a low fluence location, above the active region of the core. According to a Reg. Guide 1.99, Rev. 2, Paragraph C.1.2 calculation, the USE for this material at the 1/4-T location is conservatively predicted to be above 50 ft-lb at end-of-license. (Φ_{IS}=0.343E19 (WCAP-11017, Rev. 1, with an axial multiplier of 10%) corresponds to a $\Phi_{1/4\text{-}T}$=0.212E19 for an 8.05 inch thickness. With [Cu]=0.35 wt%, and $CvUSE_0$=90 ft-lb, a decrease in CvUSE of 34% is calculated, resulting in a 1/4-T $CvUSE_{EOL}$=59.4.)

SURRY UNIT 2

RAI on Question 2b in GL 92-01

Your response indicates that a generic initial RT_{NDT} of -5 °F, which is the mean RT_{NDT} value for 34 Linde 80 welds (BAW-1803, Revision 1), has been used for all welds except the welds L737 and R3008. Provide justification for not using the generic mean value for Linde 80 welds of 0 °F as required by 10 CFR 50.61.

Your response indicates that the phosphorus and sulfur contents for the beltline weld L737 are not known. Confirm this.

Response

Use of a -5 °F initial RT_{NDT} for Linde 80 welds is justified by the analysis documented in BAW-1803, Rev. 1. Welds L737 and R3008 are Rotterdam welds. An initial RT_{NDT} of 0 °F, with a standard deviation of 20 °F, is applicable to Rotterdam welds. (See BAW-1909, Rev. 1. The discussion of SECY 82-465, "Pressurized Thermal Shock," is cited.)

The phosphorus and sulfur contents for the beltline weld L737 (nozzle-to-intermediate shell circumferential weld) are not known.

ATTACHMENT 2

BASIS FOR DEMONSTRATION OF COMPLIANCE WITH REGULATIONS GOVERNING REACTOR VESSEL INTEGRITY FOR SURRY UNITS 1 AND 2

Compliance with the 10 CFR 50.61 Pressurized Thermal Shock Rule: On the basis of our letter dated December 10, 1991 (Serial No. 91-328), Surry Units 1 and 2 reactor vessel beltline materials have been demonstrated to meet the 10 CFR 50.61 PTS screening criteria through end-of-license. This conclusion requires confirmation of actual end-of-license fluences and assumes implementation of the Surry Unit 1 flux reduction program as described in the December 10, 1991 letter.

Compliance with the Fracture Toughness Requirements of 10 CFR 50, Appendix G: On the basis of the Surry Units 1 and 2 response to Generic Letter 92-01 (BAW-2166, "B&W Owners Group Response to Generic Letter 92-01," dated June 1992, transmitted by our June 29, 1992 letter (Serial No. 92-211)), as supplemented by the attached response to your RAI, the Surry Units 1 and 2 beltline materials have been demonstrated to meet the 10 CFR 50, Appendix G requirements for Upper Shelf Energy through end-of-license. Specifically, RG 1.99, Rev. 2 calculations demonstrate that the upper shelf energy of the Surry Units 1 and 2 beltline materials remains above 50 ft-lb through end-of-license. This conclusion requires confirmation of actual end-of-license fluences, but does not require implementation of the Surry Unit 1 flux reduction program.

In the event the RG 1.99, Rev. 2 calculations, surveillance data, or fluence estimates which support the conclusion that the Surry beltline materials remain above 50 ft-lb for the current license period are invalidated, the B&WOG Low USE Reports may be used to demonstrate compliance with the USE requirements of 10 CFR 50, Appendix G.

Compliance with the Surveillance Requirements of 10 CFR 50, Appendix H: Because the limiting Surry Unit 1 and 2 material for Upper Shelf Energy concerns (SA-1585 - Surry 1 intermediate-to-lower shell circumferential weld, and the Surry 2 intermediate shell longitudinal welds L3 (100%) and L4 (ID 50%)) is not included in either the Surry Unit 1 or Unit 2 surveillance program, Virginia Power is participating in the B&WOG Master Integrated Reactor Vessel Surveillance Program (MIRVSP) (as described in BAW-1543, Revision 3, dated September 1989). The MIRVSP includes several capsules with SA-1585. In addition, the Point Beach Unit 1 surveillance program includes a weld material (SA-1263) which has been identified in the MIRVSP documentation as a surrogate for SA-1585. The Surry Units 1 and 2 plant-specific surveillance programs include the weld materials predicted to be limiting in terms of calculated end-of-license PTS reference temperature (i.e., the Surry 1 lower shell longitudinal weld (SA-1526) and the Surry 2 intermediate-to-lower shell circumferential weld (R3008)). With the exception of SA-1585, the Surry 1 and 2 surveillance program will provide sufficient data for evaluation of the irradiated properties and fluences experienced by beltline materials predicted to be limiting in terms of the proximity of end-of-license CvUSE values and PTS reference temperatures to regulatory limits.