

Public Service
Electric and Gas
Company

Stanley LaBruna

Public Service Electric and Gas Company

P.O. Box 236, Hancocks Bridge, NJ 08038 609-339-1700

Vice President - Nuclear Engineering

AUG 04 1993

NLR-N93125

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

RESPONSE TO GENERIC LETTER 92-01, REVISION 1
REACTOR VESSEL STRUCTURAL INTEGRITY, 10CFR50.54(f)
REQUEST FOR ADDITIONAL INFORMATION
SALEM GENERATING STATION UNIT NOS. 1 AND 2
FACILITY OPERATING LICENSE NOS. DPR-70 AND DPR-75
DOCKET NOS. 50-272 AND 50-311

PSE&G submitted the response to Generic Letter 92-01 (Rev. 1), Reactor Vessel Structural Integrity, to the NRC in Letters NLR-N92081 dated June 30, 1992, and NLR-N92150 dated December 30, 1992 (for Salem Unit 2). By letter dated June 7, 1993, the NRC documented the results of their initial review of these responses and requested additional information to complete their review of Generic Letter 92-01, Rev. 1. PSE&G hereby submits the responses to the request for additional information for Salem Units 1 and 2 in Attachment 1.

Should you have any questions, please contact us.

Sincerely,



Attachment
Affidavit

100069

9308110209 930804
PDR ADOCK 05000272
P PDR

A028

AUG 04 1993

C Mr. T. T. Martin, Administrator - Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. J. Stone, Licensing Project Manager
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Mr. T. P. Johnson (S09)
USNRC Senior Resident Inspector

Mr. K. Tosch, Manager, IV
NJ Department of Environmental Protection
Division of Environmental Quality
Bureau of Nuclear Engineering
CN 415
Trenton, NJ 08625

STATE OF NEW JERSEY)
)
COUNTY OF SALEM) SS.

S. LaBruna, being duly sworn according to law deposes and says:

I am Vice President - Nuclear Engineering of Public Service Electric and Gas Company, and as such, I find the matters set forth in the above referenced letter, concerning Salem Generating Station, Unit Nos. 1 and 2, are true to the best of my knowledge, information and belief.

S. LaBruna

Subscribed and Sworn to before me
this 4th day of August, 1993

Kimberly Jo Brown
Notary Public of New Jersey

My Commission expires on _____
KIMBERLY JO BROWN
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 21, 1998

NLR-N93125

ATTACHMENT 1

SALEM UNIT NOS. 1 AND 2
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
GENERIC LETTER 92-01, REVISION 1
REACTOR VESSEL STRUCTURAL INTEGRITY

ATTACHMENT 1

The following text gives each NRC request followed by the PSE&G response. Each of the NRC requests is numbered the same as the corresponding question in GL 92-01.

SALEM UNIT 1

Question 2a in GL 92-01:

"The response to GL 92-01 indicates that the initial upper-shelf energy (USE) for all beltline welds, except for the surveillance weld, are not known. Either provide the Charpy USE for each beltline weld or provide the Charpy USE and analysis from welds that were fabricated using the same vendor, fabrication time frame, fabrication process and material specification to demonstrate that the surveillance weld is representative of the beltline welds and that all beltline welds will meet USE requirements of Appendix G, 10 CFR Part 50. If this cannot be demonstrated, then provide an analysis which demonstrates that lower values of USE will provide a margin of safety against fracture equivalent to those required by Appendix G of the ASME Code."

Response:

Based on a review of the Salem Unit 1 reactor vessel Purchase Order and Equipment Specification, the following conclusions can be drawn:

- The sample pieces of weld metal used for the surveillance tests were obtained per the requirements of the ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Vessels, 1965, and applicable Code cases, Addenda for Class A Vessels and the ASME Boiler and Pressure Vessel Code, Section IX, Welding Qualifications, 1965.
- The surveillance weld metal supplied by Combustion Engineering was representative of the weld metal used in Category A welds.

- The surveillance program weldment was purchased from Combustion Engineering (the vessel supplier) and was metallurgically similar in thermal and fabrication history (such as preliminary heat treatment, quench and tempering, post-weld heat treatment and forming) to the final vessel material condition.
- The surveillance program materials (both plate and weldment) were processed with the reactor vessel so that both the surveillance material and the vessel would have the same thermal history.

The surveillance program weldment was fabricated by the same vender as the vessel, in the same time frame as the vessel and by the same fabrication process and material specification as the vessel. Thus, this demonstrates that the surveillance weld is representative of the beltline welds. The evaluation of the surveillance weldment presented in the following text provides the Charpy USE and analysis of the surveillance weld. Results indicate that the surveillance weldment meets the requirements of Appendix G, 10 CFR Part 50. Since the surveillance weldment is representative of the beltline vessel weldment, it is concluded that the beltline welds of the Salem Unit 1 reactor vessel meet the requirements of Appendix G, 10 CFR Part 50, including the USE requirements.

Table 1 presents the chemical analysis of surveillance weld metal as reported in WCAP-8511, "PSE&G Co. Salem Unit No. 1 Reactor Vessel Radiation Surveillance Program", November 1975. In addition to the WCAP-8511 chemical analysis data, an analysis was done on an irradiated weld specimen from surveillance Capsule Y. These results are reported in WCAP-10694, "Analysis of Capsule Y from the Public Service Electric and Gas Company Salem Unit 1 Reactor Vessel Radiation Surveillance Program", December 1984, and are also presented in Table 1.

Table 2 summarizes the copper and nickel analyses, and gives mean values.

Table 1		
Chemical Analyses of Salem 1 Surveillance Program Weld Metal		
Element	Analysis (1)	Analysis (2)
C	0.08	0.22
Mn	1.14	1.28
P	0.019	0.015
S	0.016	0.015
Si	0.17	0.16
Ni	1.26	1.14
Mo	0.53	0.49
Cu	0.16	0.16
Al	0.01	----
Cr	0.04	0.04
Sn	0.007	----
(1) WCAP-8511		
(2) WCAP-10694		

TABLE 2		
Mean Weight Percent Values of Cu and Ni for Salem 1 Surveillance Program Weld Metal		
wt. % Cu	wt. % Ni	Reference
0.16	1.26	WCAP-8511
0.16	1.14	WCAP-10694
0.16	1.2	Mean values

Based on the unirradiated data presented in WCAP-8511, the initial USE of the surveillance program weldment is 104.2 ft-lbs. Per letter SCI-92-0357, dated June 11, 1992, from J. Perrin (PSE&G) to J. Chicots (W), the End of License (EOL) peak vessel fluence is 1.38×10^{19} n/cm² (E > 1.0 MeV). The corresponding EOL 1/4 T peak vessel fluence is 0.823×10^{19} n/cm² (E > 1.0 MeV).

Utilizing the above information including the mean value of 0.16 wt % for copper in the USE prediction methodology given in Regulatory Guide 1.99, Revision 2, the EOL weld metal USE value is estimated to be 75 ft-lbs.

Question 2b in GL 92-01:

"The response reports two sets of chemical compositions for plates B2402-1, B2402-2, and B2402-3: one is from WCAP-10694, and the other is from WCAP-8511. Specify and provide justification for the selection of the chemical compositions which will be used in future ΔRT_{NDT} and ΔUSE calculations for these three plates."

Response:

Per Regulatory Guide 1.99, Revision 2, the mean values of copper and nickel are to be used for ΔRT_{NDT} and ΔUSE calculations. It is planned that mean weight percent values of copper and nickel will be used for future ΔRT_{NDT} and ΔUSE calculations.

Tables 3 through 5 document the measured and mean weight percent values of copper and nickel for plates B2402-1, B2402-2, and B2402-3. These include values from the previously referenced WCAP-8511, and from WCAP-11955, "Analysis of Capsule Z from the Public Service Electric and Gas Company Reactor Vessel Radiation Surveillance Program", September 1988.

TABLE 3		
Measured and Mean Weight Percent Values of Cu and Ni for Salem 1 Plate B2402-1		
wt. % Cu	wt. % Ni	Reference
--	0.52	Combustion Engineering Materials Certification Report
0.24	--	Letter from Lukens Steel Company dated December 6, 1973 (and WCAP 10694)
0.22	0.53	WCAP-8511
0.263	0.535	WCAP-11955
0.241	0.528	Mean values to be used in future calculations

TABLE 4		
Measured and Mean Weight Percent Values of Cu and Ni for Salem 1 Plate B2402-2		
wt. % Cu	wt. % Ni	Reference
----	0.50	Combustion Engineering Materials Certification Report
0.24	----	Letter from Lukens Steel Company dated December 6, 1973 (and WCAP 10694)
0.23	0.54	WCAP-8511
0.24	0.534	WCAP-11955
0.237	0.525	Mean values to be used in future calculations

TABLE 5		
Measured and Mean Weight Percent Values of Cu and Ni for Salem 1 Plate B2402-3		
wt. % Cu	wt. % Ni	Reference
----	0.50	Combustion Engineering Materials Certification Report
0.22	----	Letter from Lukens Steel Company dated December 6, 1973 (and WCAP 10694)
0.22	0.52	WCAP-8511
0.219	0.505	WCAP-11955
0.220	0.508	Mean values to be used in future calculations

SALEM UNIT 2Question 2a in GL 92-01:

"The response to GL 92-01 indicates that the initial USE for about half of the beltline welds, except for the surveillance weld, are not known. Either provide the Charpy USE for the remaining beltline welds or provide the Charpy USE and analysis from welds that were fabricated using the same vender, fabrication time frame, fabrication process and material specification to demonstrate that the surveillance weld is representative of the remaining beltline welds and that all beltline welds will meet USE requirements of Appendix G, 10 CFR Part 50. If this can not be demonstrated, then provide an analysis which demonstrates that lower values of USE will provide a margin of safety against fracture equivalent to those required by Appendix G of the ASME Code."

Response:

Based on a review of the Salem Unit 2 reactor vessel Purchase Order and Equipment Specification, the following conclusions can be drawn:

- The sample pieces of weld metal used for the surveillance tests were obtained per the requirements of the ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Vessels, 1965, and the 1966 Winter Addenda and the ASME Boiler and Pressure Vessel Code, Section IX, Welding Qualification, 1965.

- The surveillance weld metal supplied by Combustion Engineering was representative of the weld metal used in category A welds.
- The surveillance program weldment was purchased from Combustion Engineering (the vessel supplier) and was metallurgically similar in thermal and fabrication history (preliminary heat treatments, quench and tempering, post-weld heat treatment and forming) to the final vessel material condition.
- The surveillance program materials (both plate and weldment) was processed with the reactor vessel so that both the surveillance material and the vessel would have the same thermal history.

The surveillance program weldment was fabricated by the same vender as the vessel, in the same time frame as the vessel and by the same fabrication process and material specification as the vessel. Thus, this demonstrates that the surveillance weld is representative of the beltline welds. The evaluation of the surveillance weldment presented in the following text provides the Charpy USE and analysis of the surveillance weld and indicates that the surveillance weldment meets the requirements of Appendix G, 10 CFR 50. Since the surveillance weldment is representative of the beltline vessel weldment, it is concluded that the beltline welds of the Salem Unit 2 reactor vessel meet the requirements of Appendix G, 10 CFR Part 50, including the USE requirements.

Table 6 presents the chemical analysis of surveillance weld metal as reported in WCAP-8824, "Public Service Electric and Gas Company Salem Unit No. 2 Reactor Vessel Radiation Surveillance Program", January 1977. In addition to the WCAP-8824 data, the table includes analyses which were done on irradiated weld specimens as reported in WCAP-11554, "Analysis of Capsule U from the Public Service Electric and Gas Company Salem Unit 2 Reactor Vessel Radiation Surveillance Program", September 1987, and WCAP-13366, "Analysis of Capsule X from the Public Service Electric and Gas Company Salem Unit No. 2 Reactor Vessel Radiation Surveillance Program", June 1992.

Table 7 summarizes the copper and nickel values, and gives mean values.

TABLE 6

Chemical Analyses of Salem 2 Surveillance Program Weld Metal

Element	Analysis (1)	Analysis (2)	Analysis (3)		
C	0.10	0.107	0.112	0.095	0.100
Mn	1.27	1.33	1.211	1.392	1.224
P	0.017	0.015	0.014	0.014	0.014
S	0.011	0.010	0.0081	0.0100	0.0093
Si	0.29	0.165	0.439	0.173	0.168
Ni	0.71	0.732	0.728	0.734	0.728
Mo	0.45	0.46	0.456	0.473	0.454
Cu	0.23	0.283	0.267	0.244	0.247
Cr	0.015	0.024	0.026	0.032	0.026
Co	0.024	0.015	0.015	0.015	0.014
V	0.001	0.034	0.003	0.003	0.003
Al	0.007	-----	-----	-----	-----
Sn	0.005	-----	-----	-----	-----
Ti	-----	<0.005	-----	-----	-----
N ₂	0.007	-----	-----	-----	-----

(1) WCAP-8824

(2) WCAP-11554

(3) WCAP-13366

TABLE 7		
Mean Weight Percent Values of Cu and Ni for Salem 2 Surveillance Program Weld Metal		
wt. % Cu	wt. % Ni	Reference
0.23	0.71	WCAP-8824
0.283	0.732	WCAP-11554
0.267	0.728	WCAP-13366
0.244	0.734	WCAP-13366
0.247	0.728	WCAP-13366
0.254	0.726	Mean values

Based on the unirradiated data presented in WCAP-8824 and the Combustion Engineering Materials Certification Report, the initial USE of the surveillance program weldment is 112 ft-lbs. Per letter SCI-92-0319, dated May 11, 1992, from J. Perrin (PSE&G) to J. Chicots (W), the End of License (EOL) peak vessel fluence is 1.41×10^{19} n/cm² (E > 1.0 MeV). The corresponding EOL 1/4 T peak vessel fluence is 0.840×10^{19} n/cm² (E > 1.0 MeV).

Utilizing the above information including the mean value of 0.254 wt. % for copper in the USE prediction methodology given in Regulatory Guide 1.99, Revision 2, the EOL weld metal USE value is estimated to be 68 ft-lbs.

Question 2b in GL 92-01:

"The response reports two sets of chemical compositions for plate B4712-2: one is from the Materials Certification Report dated April 23, 1970, from Combustion Engineering, and the other is from WCAP-8824. Specify and provide justification for the selection of the chemical compositions which will be used in future ΔRT_{NDT} and ΔUSE calculations for this plate."

Response:

Per Regulatory Guide 1.99, Revision 2, the mean values of copper and nickel are to be used for ΔRT_{NDT} and ΔUSE calculations. It is planned that mean weight percent values of copper and nickel will be used for future ΔRT_{NDT} and ΔUSE calculations.

Table 8 documents the measured and mean weight percent values of copper and nickel for plate B4712-2.

TABLE 8		
Mean Weight Percent Values of Cu and Ni for Salem 2 Plate B4712-2		
wt. % Cu	wt. % Ni	Reference
----	0.60	Combustion Engineering Materials Certification Report
0.14	----	Letter from Lukens Steel Company dated December 6, 1973
0.10	0.61	WCAP-8824
0.129	0.634	WCAP-11554
0.122	0.625	WCAP-13366
0.123	0.617	Mean values to be used in future calculations