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SUBJECT: Provides suppl response to Rev 1, Suppl 1 to GL 92-01, "RV Structural Integrity." Results of FPL review of ABB CEOG activities to establish comprehensive RPV info database provided.

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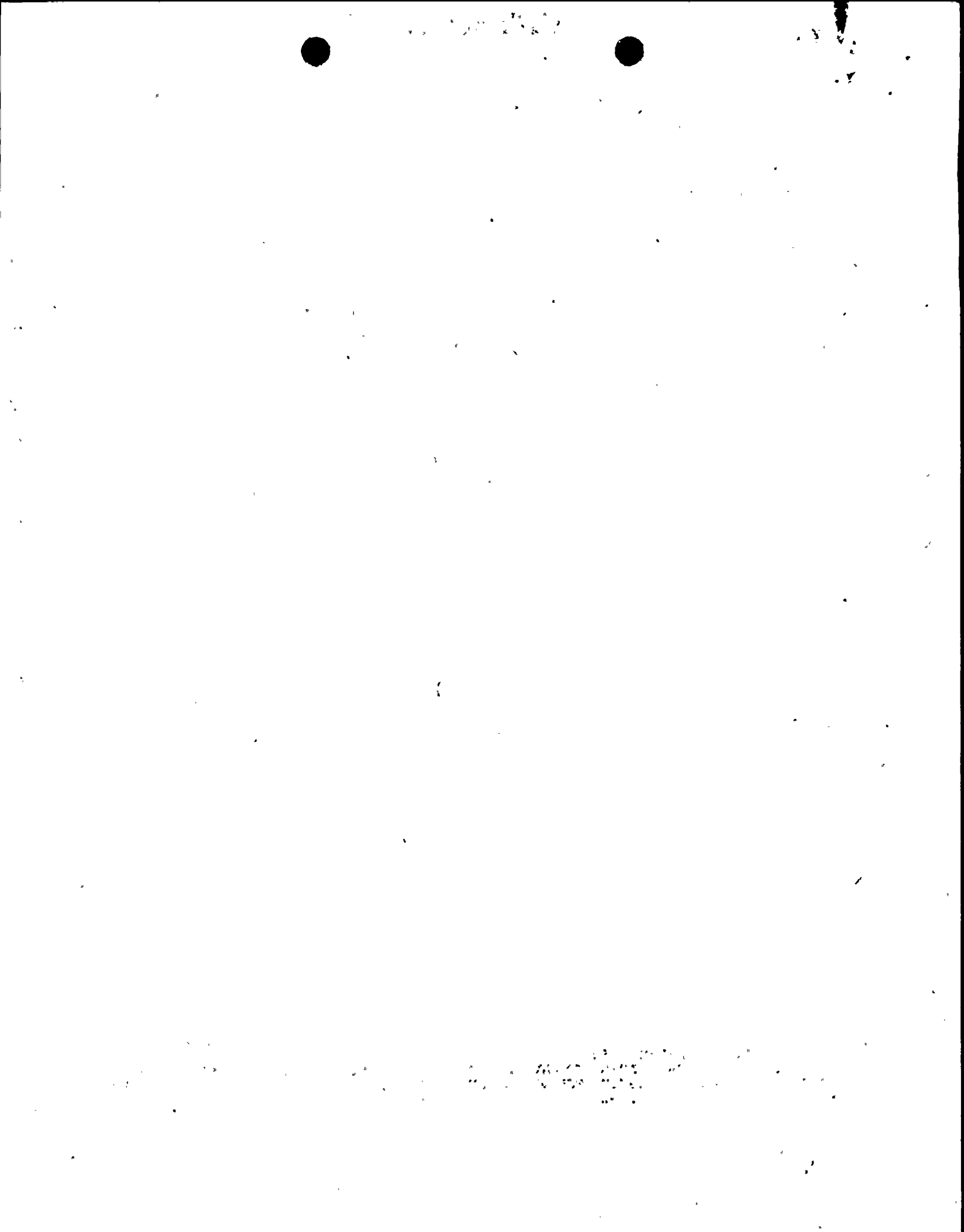
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August 28, 1997

L-97-223
10 CFR 50.4

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

RE: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
Reactor Vessel Structural Integrity
Generic Letter 92-01 Revision 1 Updated Information

The purpose of this letter is to supplement the responses to Generic Letter (GL) 92-01, Revision 1, Supplement 1, *Reactor Vessel Structural Integrity*, for St. Lucie Units 1 and 2. This supplement provides the results of the Florida Power & Light Company (FPL) review of the ABB Combustion Engineering Owners Group (CEOG) activities to establish a comprehensive reactor pressure vessel information database. FPL was requested by NRC letter dated August 6, 1996, to provide the results of the CEOG program relative to our plants.

The NRC issued GL 92-01 R1 on March 6, 1992 and supplemented the GL by letters dated July 28, 1993, May 26, 1994, May 17, 1995, and May 19, 1995. The purpose of the GL was to require licensees to identify, collect, and report any new data pertinent to analysis of structural integrity of their reactor pressure vessels (RPV). It also requires an assessment of the impact of this new data on RPV integrity analyses relative to the requirements of 10 CFR 50.60, 10 CFR 50.61, Appendices G and H to 10 CFR 50, and any potential impact on low temperature over pressure (LTOP) limits or pressure-temperature (PT) limits. This GL was closed for St. Lucie Units 1 and 2 by NRC Letter dated August 6, 1996, with the request that FPL provide the applicable results from the CEOG Reactor Vessel Weld Properties Database Project.

FPL responded to Revision 1 of the GL by letter, L-92-189 on July 1, 1992, and supplemented the response by FPL letters, L-93-232 dated September 3, 1993, L-93-286 dated November 12, 1993, L-94-169 dated June 27, 1994, L-95-214 dated July 25, 1995, and L-95-232 dated August 16, 1995.

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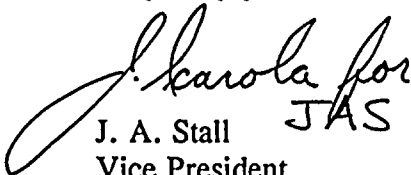
The information attached and the referenced CEOG Report, *Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds*, CE-NPSD-1039 Revision 2, indicate that the St. Lucie Unit 1 limiting weld material (Weld 305424) chemistry factor should be adjusted downward for future 10 CFR 50.61 and PT limit curve calculations. However our assessment is that the current Unit 1 evaluations remain conservative and valid.

Changes to the St. Lucie Unit 2 best estimate weld chemistry values will have no impact on the reactor vessel evaluations since the welds are low copper and low nickel, and the vessel is plate limited. Therefore the current Unit 2 PTS and PT limit/low temperature over pressure (LTOP) evaluations remain valid.

This letter contains no new regulatory commitments. It provides information requested by the NRC based on FPL participation in the CEOG Reactor Vessel Weld Properties Database Project.

Please contact us if there are any questions about this submittal.

Very truly yours,

A handwritten signature in cursive script that reads "J. A. Stall". To the right of the signature, the initials "JAS" are printed in a bold, sans-serif font.

J. A. Stall
Vice President
St. Lucie Plant

JAS/GRM

Attachment

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, St. Lucie Plant



BACKGROUND

The NRC has demonstrated that some reactor pressure vessel (RPV) integrity evaluations are very sensitive to consideration of new data. For example, under certain conditions, changing the mean copper content for the limiting vessel beltline material by a few hundredths weight percent can change the predicted date for reaching the pressurized thermal shock (PTS) screening criteria of 10 CFR 50.61 by several years or reduce the period of applicability for pressure-temperature (PT) limit curves. For this reason, the NRC requested that utilities consider all data in the determination of best estimate chemistry of RPV beltline welds.

A complete background of the weld chemistry and property variability issue for RPV beltline welds is provided in NRC Generic Letter (GL) 92-01, Revision 1, Supplement 1.

Florida Power & Light Company (FPL) previously responded to GL 92-01 Revision 1, Supplement 1 (GL), *Reactor Vessel Structural Integrity*, by FPL letter, L-95-232 dated August 16, 1995. In that response, FPL provided the requested information with all material properties and chemistry data available at that time, and indicated that a Combustion Engineering Owners Group (CEOG) project had been initiated to research all fabrication records previously unavailable for inclusion into a report of the "best estimate chemistry" for the RPV beltline welds. This submittal provides the results of the Combustion Engineering Owners Group (CEOG) Report, *Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds*, CE-NPSD-1039 Revision 2, and evaluates the new "best estimate chemistry" values for impact on previous determinations of RPV integrity relative to the St. Lucie Units 1 and 2.

The GL requested addressees to provide the following information:

- (1) a description of those actions taken or planned to locate all data relevant to the determination of RPV integrity, or an explanation of why the existing data base is considered complete as previously submitted;
- (2) an assessment of any change in best-estimate chemistry based on consideration of all relevant data;
- (3) a determination of the need for use of the ratio procedure in accordance with the established Position 2.1 of Regulatory Guide 1.99, Revision 2, for those licensees that use surveillance data to provide a basis for the RPV integrity evaluation; and
- (4) a written report providing any newly acquired data as specified above and (1) the results of any necessary revisions to the evaluation of RPV integrity in accordance with the requirements of 10 CFR 50.60, 10 CFR 50.61, Appendices G and H to 10 CFR Part 50, and any potential impact on the LTOP or P-T limits in the technical specifications or (2)

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a certification that previously submitted evaluations remain valid. Revised evaluations and certifications should include consideration of Position 2.1 of Regulatory Guide 1.99, Revision 2, as applicable, and any new data.

UPDATED INFORMATION

This response provides an update to the four information requests of GL 92-01 (R1,S1) for St. Lucie Unit 1 and Unit 2. It also provides an assessment of the impact of any changes in best estimate chemistry values.

St. Lucie Units 1 and 2 Response to Item 1:

The CEOG Report, *Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds, CE-NPSD-1039 Rev 2*, was transmitted to the NRC on July 14, 1997 by CEOG letter, CEOG-97-264. This CEOG report details how data was compiled, pedigreed and evaluated to determine the "best estimate" copper and nickel values for each heat of weld material. This CEOG report provides the most comprehensive effort to date to include "all pertinent/relevant data" for the determination of best estimate chemistry values applicable to the St. Lucie Unit 1 and 2 RPV beltline welds.

St. Lucie Unit 1 Response to Item 2:

St. Lucie Unit 1 is a weld limited RPV with three different beltline weld heat combinations. Heat 305424 is the limiting material for PTS and is the limiting material for the current PT limit curves and LTOP analysis .

Table 1 lists the beltline weld copper (Cu) and nickel (Ni) values that were used in these most recent evaluations along with the new best estimate values determined from the CEOG report. The corresponding chemistry factors (CF) calculated from the table in 10 CFR 50.61 are provided for easy comparison only to determine if the new chemistry values result in a significant change (increase) in CF. The actual CF's for both heats 305424 and 90136 have been determined from reactor vessel surveillance capsule testing.

TABLE 1: St. Lucie Unit 1 Reactor Vessel Beltline Weld Current Weld Chemistry Compared to New Best Estimate Weld Chemistry Values Determined from CE-NPSD-1039 Rev 2.

Weld Heat #	% Cu	% Ni	CF From PTS Table (°F)	COMMENTS
Current Cu & Ni values used in PTS and PT limit curves				
305424	0.28	0.63	191.7	Limiting material for PTS & PT limits
A8746/ 34B009	0.19	0.10	91.5	Single arc with 2 heats of wire used.
90136	0.23	0.11	109.8	
New "Best Estimate" Cu & Ni values from CE-NPSD-1039 Rev 2.(See Note)				
305424	0.27	0.63	188.8	
A8746	0.15	0.09	NA	Single wire
34B009	0.19	0.09	NA	Single wire
A8746/ 34B009	0.19	0.09	90.6	Combined most limiting Cu & Ni of both wires.
90136	0.27	0.07	124.2	

Note: New best estimate values rounded to 2 significant figures

Limiting Weld Heat 305424: The new best estimate Cu and Ni (.27% & .63% respectively) value for this limiting weld heat would not impact reactor vessel integrity calculations (PT limits, LTOP or PTS) if used, because the new values result in a lower CF value. Therefore the current Cu and Ni (.28% & .63% respectively) value used in submitted evaluations for PT limits and LTOP and the current PTS submittals are conservative and remain valid.

Non Limiting Weld Heats A8746/34B009: The new best estimate Cu and Ni (.19% & .09% respectively) value for this non limiting combination of weld heats would not impact reactor vessel integrity calculations if used because the new values result in a lower CF value.

Non Limiting Weld Heat 90136: The new best estimate Cu and Ni (.27% & .07% respectively) values for this non limiting girth weld heat results in a higher CF value. However, the FPL PTS submittal, the actual CF of 84.35°F was determined from credible surveillance data as opposed

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to chemistry values. Since the CF for this non limiting weld is significantly below that of the limiting weld (305424) both have the same initial RT_{NDT} and margin value, weld 90136 can not become limiting without a significantly greater localized fluence ($>$ by a factor of 2) which is not present in the St. Lucie Unit 1 reactor vessel beltline. Therefore, the current evaluations for PT limits and LTOP and PTS submittals remain valid.

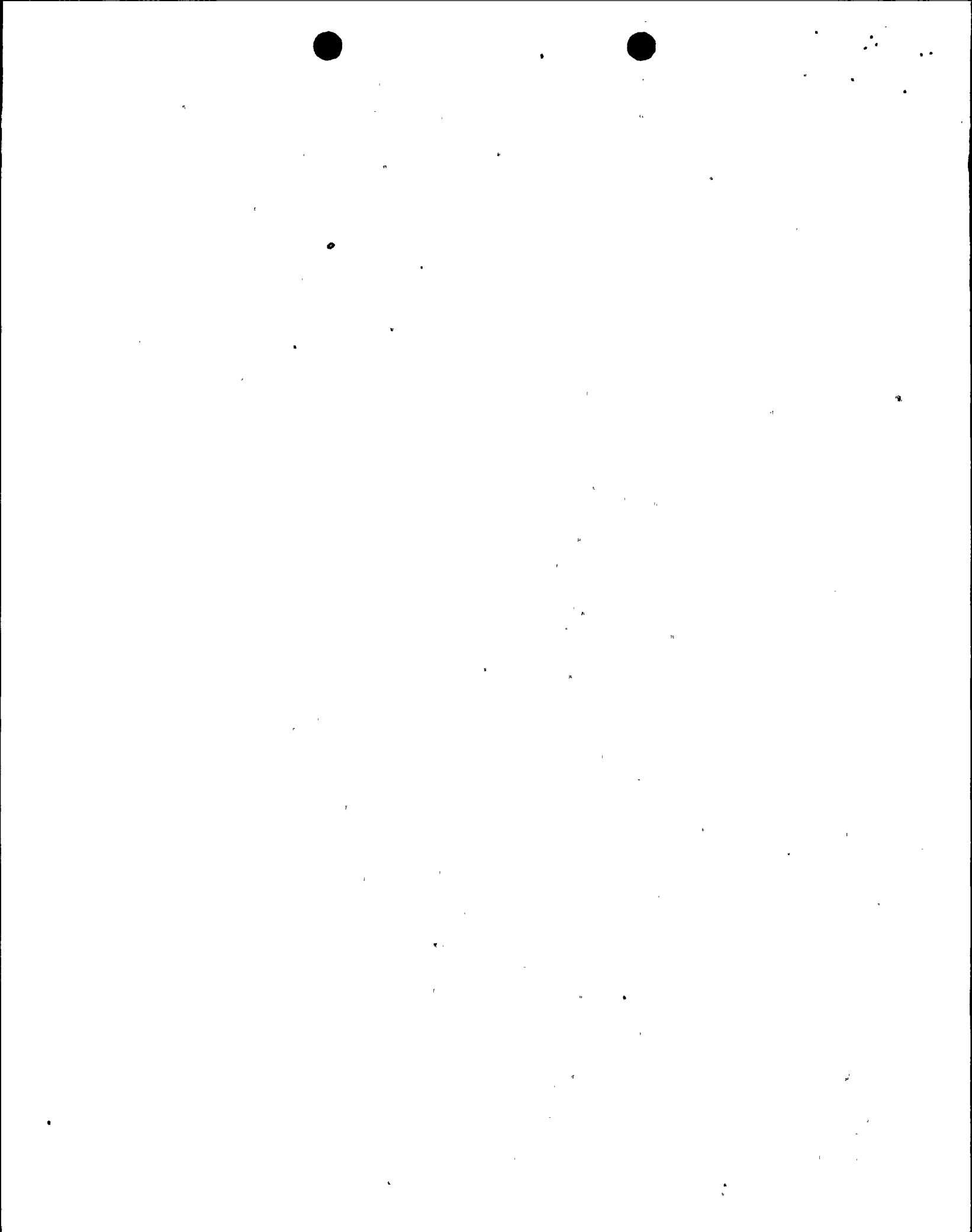
No update to the current FPL PTS submittals is required for the non limiting weld heat 90136 since the chemistry change would not affect the calculation of CF or RT_{PTS} (determined from surveillance data) and therefore, would not result in a significant change in projected values of RT_{PTS} as identified in 10 CFR 50.61 (b)(1).

St. Lucie Unit 1 Response to Item 3:

305424: FPL used the reactor vessel surveillance data from the Beaver Valley Unit 1 (BV-1) program for determination of RT_{PTS} for weld heat 305424. In the current PTS submittals, FPL used the ratio procedure in Regulatory Guide 1.99, Rev. 2, position 2.1 to adjust the "best fit" CF of 191.33°F from the surveillance data by the tabulated CF values for the BV-1 surveillance weld chemistry and the St. Lucie Unit 1 (SL-1) vessel weld chemistry. The BV-1 surveillance weld chemistry of 0.26% Cu and 0.62% Ni ($CF=183.2^{\circ}\text{F}$) used in the Unit 1 PTS submittal was from a single measurement from the surveillance program and the SL-1 vessel weld chemistry (305424) of 0.28% Cu and 0.63% Ni ($CF=191.65^{\circ}\text{F}$) was the average of the BV-1 surveillance weld chemistry and another single measurement. The "ratio adjusted" CF value provided in the PTS submittals was determined to be 200.15°F ($191.33^{\circ}\text{F} \times 191.65^{\circ}\text{F} / 183.2^{\circ}\text{F}$)

The CEOG Best Estimate Report, pages 107/108, indicated that the new best estimate chemistry for heat 305424 is based on 34 measurements from 3 separate "group tags" or sources. Group tag "c" was from a cross section of the BV-1 archive surveillance block. The new BV-1 surveillance weld chemistry (tag c) of 0.27% Cu and 0.61% Ni ($CF=185.6^{\circ}\text{F}$) was determined from the 32 measurements from the BV-1 surveillance weld cross section and compares closely to the new best estimate weld heat chemistry of 0.27% Cu and 0.63% Ni ($CF=188.8^{\circ}\text{F}$). These values are within normal and acceptable chemistry variability. However, if the ratio procedure would be conservatively applied to the "best fit" 191.33°F CF determined from the BV-1 surveillance data, the new "ratio adjusted" CF for heat 305424 applicable to St. Lucie Unit 1 would be 194.63°F ($191.33 \times 188.8 / 185.6$) instead of 200.15°F . It is proposed that the "ratio adjusted" CF of 194.63°F be used for future determinations of RT_{PTS} and RT_{NDT} for St. Lucie Unit 1 heat 305424. (The BV-1 surveillance program will be monitored to incorporate additional surveillance data as it becomes available.)

90136: This material is in the SL-1 reactor vessel surveillance program. This non limiting weld uses the CF as determined from the credible surveillance data without using the ratio procedure.



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There is no clear evidence that this material differs from that of the vessel such that it could have an effect on determinations of reactor vessel integrity calculations. This low Ni weld heat has an end of license RT_{PTS} value that is 79°F and is the least limiting beltline material in the vessel.

St. Lucie Unit 1 Response to Question 4:

The CEOG Report, CE-NPSD-1039 Rev 2, provides new best estimate values for the St. Lucie Unit 1 beltline weld heats and was submitted to the NRC by CEOG letter, CEOG-97-264, on July 14, 1994. The changes in best estimate weld chemistry for the St. Lucie Unit 1 RPV would not impact reactor vessel integrity calculations (PT limits, LTOP, or PTS) if used, because the new values result in a lower CF value for the limiting material. Therefore, the current submitted evaluations for PT limits and LTOP and the current PTS submittals are conservative and remain valid.

No update to the current PTS submittals is required for the new best estimate changes since the chemistry change would not result in a "significant change in projected values of RT_{PTS} " as identified in 10 CFR 50.61 (b)(1).

No change is required to the RPV materials surveillance program or schedule as a result of the new best estimate values since the current removal schedule is in compliance with 10 CFR 50 Appendix H.

The new values of best estimate chemistry for heats 305424, A8746/34B009 and 90136 will be used for future Reactor vessel integrity submittals.

St. Lucie Unit 2 Response to Question 2:

St. Lucie Unit 2 is a plate limited RPV for both PTS and PT/LTOP limits. The RPV has four different low copper, low nickel beltline weld heat combinations. All the beltline welds have lower initial RT_{NDT} and CF values than the plate materials and therefore can not have an affect of Reactor vessel integrity calculations unless changes in chemistry are "significant" enough to increase the CF greater than the limiting plate materials. All reactor vessel integrity calculations use the vessel maximum fluence so only the materials with the highest CF and initial RT_{NDT} can become limiting. plate M-605-2 is the most limiting material for PTS and plate M-605-1 is the limiting material for the current PT limit curves and LTOP analysis. Table 2 lists the beltline weld copper (Cu) and nickel (Ni) values that were used in these most recent evaluations along with the new best estimate values determine from the CEOG report. The corresponding chemistry factors (CF) calculated from the tables in 10 CFR 50.61 are provided for easy comparison only

to determine if the changes in the weld chemistry values are significant enough to exceed the CF values of the limiting plate material.

TABLE 2: St. Lucie Unit 2 Reactor Vessel Beltline Weld Current Weld Chemistry Compared to New Best Estimate Weld Chemistry Values Determined from CE-NPSD-1039 Rev 2.

Weld Heat #	% Cu	% Ni	CF From PTS Table (°F)	COMMENTS
Current Cu & Ni values used in PTS and PT limit curves				
83637	0.05	0.10	37.5	
83642	0.04	0.07	30.7	
83642/ 83637	0.04	0.07	30.7	Single arc with 2 heats of wire used.
83637/ 3P7317	0.07	0.08	41.2	Tandem arc girth weld
Plate M-605-1	0.11	0.61	74.15	Limiting plate material for PT/LTOP limits
Plate M-605-2	0.13	0.62	91.5	Limiting Plate material for PTS
New "Best Estimate" Cu & Ni values from CE-NPSD-1039 Rev 2 (See Note)				
83637	0.05	0.07	34.05	
83642	0.05	0.09	36.35	
3P7317	0.07	0.07	NA	Single wire
83642/ 83637	0.05	0.09	36.35	Combined most limiting Cu & Ni of both wires.
83637/ 3P7317	0.07	0.07	40.05	Combined most limiting Cu & Ni of both wires.

Note: New best estimate values rounded to 2 significant figures

It can be seen from the comparison of the CF values calculated from the new best estimate chemistry values for the St. Lucie Unit 2 welds that these beltline weld materials will not become limiting and therefore, will not impact reactor vessel integrity calculations (PT limits, LTOP, or

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PTS) if used. Therefore the current submitted evaluations for PT limits and LTOP and the current PTS submittals are conservative and remain valid.

No update to the current PTS submittals is required for the non limiting weld heats since the chemistry changes would not result in a significant change in projected values of RT_{PTS} as identified in 10 CFR 50.61 (b)(1).

St. Lucie Unit 2 Response to Question 3:

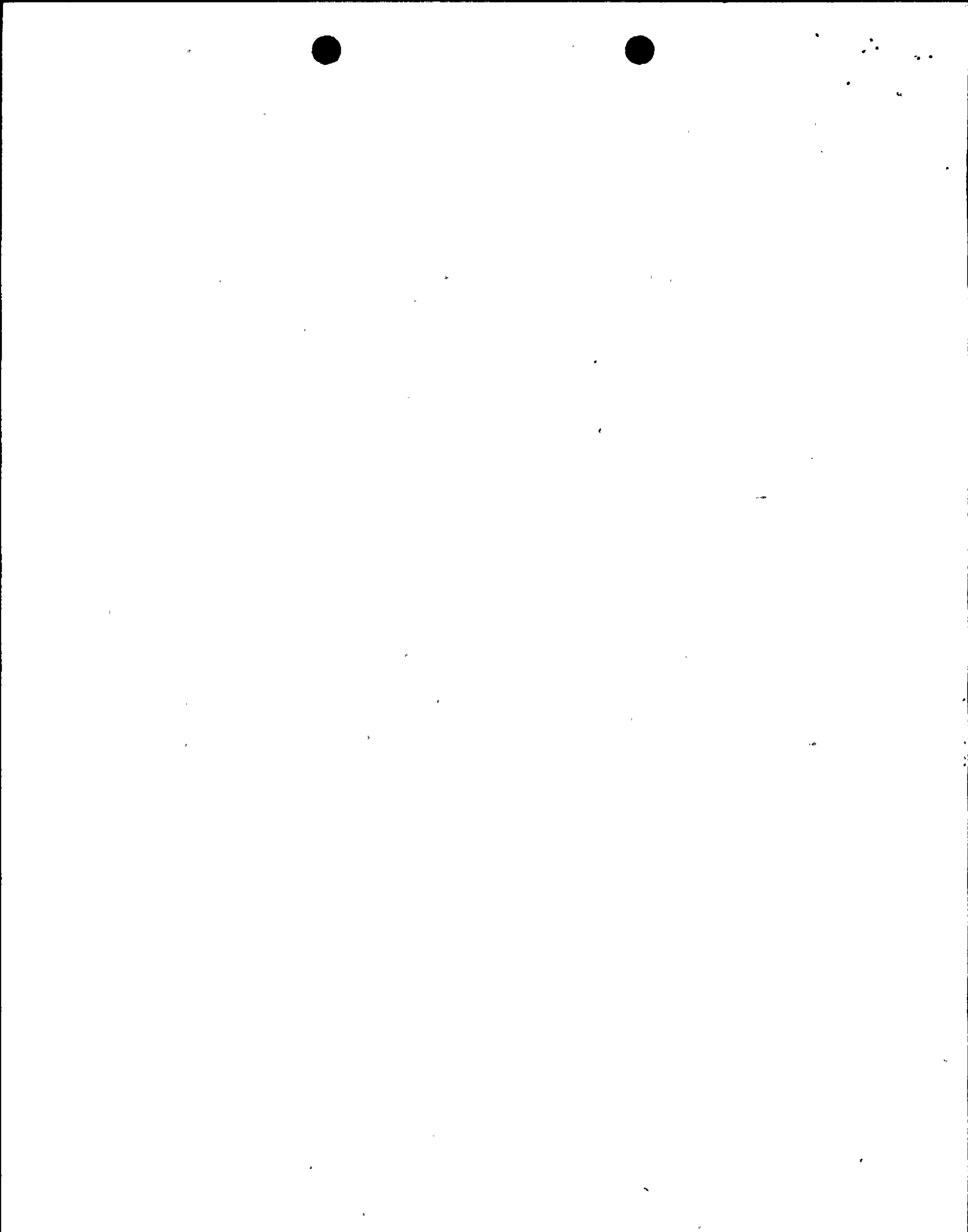
The ratio procedure is not used since the surveillance material is not used as a basis for reactor vessel integrity evaluations. Data is only available for one St. Lucie Unit 2 capsule at this time.

St. Lucie Unit 2 Response to Question 4:

The CEOG Report, CE-NPSD-1039 Rev 2, provides new best estimate values for the St. Lucie Unit 2 beltline weld heats and was submitted to the NRC by CEOG letter, CEOG-97-264, on July 14, 1994. The changes in best estimate weld chemistry for the St. Lucie Unit 2 RPV would not impact reactor vessel integrity calculations (PT limits, LTOP or PTS) if used, because the RPV is plate limited even if the new weld chemistry values were to be used. Therefore the current submitted evaluations for PT limits and LTOP and the current PTS submittal are conservative and remain valid.

No update to the current PTS submittal is required for the new best estimate changes since the chemistry change would not result in a "significant change in projected values of RT_{PTS} " as identified in 10 CFR 50.61 (b)(1).

No change is required to the RPV materials surveillance program or schedule as a result of the new best estimate values since the current removal schedule is in compliance with 10 CFR 50 Appendix H.



CONCLUSION

The CEOG has prepared a group response to GL 92-01 weld variability issue by determining best estimate chemistry values for all ABB Combustion Engineering fabricated welds using all available and relevant data. FPL has evaluated the results of the data applicable to St. Lucie Units 1 and 2 and concluded the following:

1. The changes in best estimate beltline weld chemistry for the St. Lucie Units 1 and 2 would not impact reactor vessel integrity calculations (PT limits, LTOP, or PTS) if used.
2. The current submitted evaluations for PT limits and LTOP and the current PTS submittals are conservative and remain valid.
3. No update to the current PTS submittals is required for the new best estimate changes since the chemistry change would not result in a "significant change in projected values of RT_{PTS} " as identified in 10 CFR 50.61 (b)(1).
4. No change is required to the RPV materials surveillance program or schedule as a result of the new best estimate values since the current removal schedule is in compliance with 10 CFR 50 Appendix H.
5. FPL plans to use the "ratio adjusted" CF of 194.63°F for any future determinations of RT_{PTS} and RT_{NDT} for St. Lucie Unit 1 heat 305424. FPL plans to use the best estimate chemistry values determined from CE-NPSD-1039 Rev 2 for all future reactor vessel integrity calculations for St. Lucie Unit 1 and 2 beltline welds.

REFERENCES

1. NRC Generic Letter 92-01, Revision 1, Supplement 1, *Reactor Vessel Structural Integrity*, May 19, 1995.
2. FPL Letter, L-95-232, *St. Lucie Units 1 & 2 Reactor Vessel Structural Integrity, Generic Letter 92-01 Revision 1 Supplement 1 Response*, August 16, 1995.
3. Combustion Engineering Owners Group, *Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds*, June 1997, CE-NPSD-1039 Revision 2.

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4. CEOG Letter, CEOG-97-264, *CE NPSD-1039 Revision 2, Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds and CE NPSD-1039 Appendix A, Revision 2 CE Reactor Vessel Weld Properties Database Volumes 1 and 2*, Robert O. Hardies to USNRC, July 14, 1997.
5. FPL Letter L-96-112, *St. Lucie Units 1 & 2, 10 CFR 50.61 Evaluation of Pressurized Thermal Shock of Reactor Vessel Beltline Materials*, May 14, 1996.
6. FPL Letter L-97-10, *St. Lucie Units 1 & 2, Request for Additional Information (RAI) Response, 10 CFR 50.61-Pressurized Thermal Shock Evaluation*, January 14, 1997.
7. FPL Letter L-97-136, *St. Lucie Units 1 & 2, Supplemental Request for Additional Information (RAI) Response, 10 CFR 50.61-Pressurized Thermal Shock Evaluation*, May 16, 1997.
8. NRC Letter/Safety Evaluation, St. Lucie Unit 1 Amendment No. 141, Reactor Coolant System Pressure Temperature Limits, October 27, 1995.
9. NRC Letter/Safety Evaluation, St. Lucie Unit 2 Amendment No. 46, Reactor Coolant System Pressure Temperature Limits and Low Temperature Overpressure Protection, August 1, 1990.