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Roy A. Anderson
Vice President
Brunswick Nuclear Plant
919 457-2496

May 13, 1994

SERIAL: BSEP 94-0179
10 CFR 50.54(f)

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

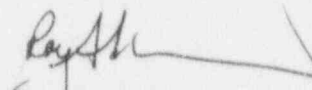
BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER 92-01,
"REACTOR VESSEL STRUCTURAL INTEGRITY, 10 CFR 50.54(f)" - REVISION 1

Gentlemen:

The purpose of this letter is to provide the NRC staff information requested in an April 1, 1994 letter regarding Revision 1 to Generic Letter (GL) 92-01, "Reactor Vessel Structural Integrity, 10 CFR 50.54(f)," for Carolina Power & Light Company's (CP&L) Brunswick Steam Electric Plant, Units 1 and 2. Enclosure 1 contains CP&L's response to the April 1, 1994 request for additional information. Enclosure 2 provides a summary of commitments for this letter.

Please refer any questions regarding this submittal to Mr. R. P. Lopriore, Manager-Regulatory Affairs, at (910) 457-2212.

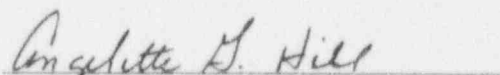
Sincerely,


Roy A. Anderson

KAH/

Enclosures

Roy A. Anderson, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, and agents of Carolina Power & Light Company.


Notary (Seal)

My commission expires: Nov. 25/1996

cc: Mr. S. D. Ebnetter, Regional Administrator, Region II
Mr. P. D. Milano, NRR Senior Project Manager - Brunswick Units 1 and 2
Mr. R. L. Prevatte, Brunswick NRC Senior Resident Inspector

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ENCLOSURE 1
GENERIC LETTER (GL) 92-01, REVISION 1,
"REACTOR VESSEL STRUCTURAL INTEGRITY"
BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
(TAC NOS. M83441 AND M83442)

NRC REQUEST:

"The initial RT_{NDT} values determined by General Electric's (GE) initial methodology have not been validated and the BWR Owners Group Report, GE-NE-523-109-0893, entitled, "Basis for GE RT_{NDT} Estimation Method," did not resolve the issue. GE is in the process of validating its methodology for resolving the initial RT_{NDT} determination issue and will document the results in a topical report. The BWR Owners Group is obtaining approval from its members to provide the GE topical report to the NRC staff for its review and approval. We request that you submit within 30 days a commitment to the BWR Owners Group effort or a schedule for a plant-specific analysis to resolve this issue."

CP&L RESPONSE:

CP&L's licensing basis for the Brunswick Plant has included the use of initial drop weight NDTT values as initial RT_{NDT} for reactor vessel shell materials. This issue was addressed in Section 6 of NEDO-24161 and Section 6 of NEDO-24157 Revision 1, which were submitted to the NRC on January 8, 1979 [Serial: GD-79-060; E. E. Utley (CP&L) to Mr. T. A. Ippolito (NRR)]. The use of the initial drop weight NDTT values as the initial RT_{NDT} values was also included in the submittals pertaining to Technical Specification Amendment 140 (Brunswick Unit 1) and 172 (Brunswick Unit 2) which were approved by NRC on February 15, 1990 [Docket Nos. 50-325 and 50-324, TAC Nos. 71112 and 71113; Ngoc B. Le (NRR) to Mr. Lynn W. Eury (CP&L)].

CP&L is committed to the BWR Owners Group effort to resolve questions about the initial RT_{NDT} . Unless more accurate RT_{NDT} data are derived in the future from either surveillance testing or the testing of unirradiated archive reactor vessel materials, CP&L will use the GE methodology for determining initial RT_{NDT} in future submittals, once the methodology is approved by the NRC.

The attached Tables 1 and 2 (pages 4-6) provide a comparison of beltline base material initial RT_{NDT} values based on both the current licensing basis methodology and the new GE methodology. Once the GE methodology is approved by the NRC, CP&L will address the significance of the change for those initial RT_{NDT} values which are increased by the GE BWROG approach (see Table 1). This comparison will be completed and differences included in the submittal of the Unit 1 reactor vessel surveillance test report, which will be submitted to the NRC by August 17, 1994.

ENCLOSURE 1
GENERIC LETTER (GL) 92-01, REVISION 1,
"REACTOR VESSEL STRUCTURAL INTEGRITY"
BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
(TAC NOS. M83441 AND M83442)
(continued)

NRC REQUEST:

"Further, we request that you provide confirmation of the plant-specific applicability of the topical report, NEDO-32205, Revision 1, (as specified in Appendix B of that report), and submit a request for approval of the topical report as the basis for demonstrating compliance with 10 CFR Part 50, Appendix G, Paragraph IV.A.1."

CP&L RESPONSE:

Confirmation of the applicability of topical report, NEDO-32205, Revision 1, is provided in attached pages (pages 7-11), as specified by Appendix B of the topical report. Approval for use of the report is requested as the basis for demonstrating compliance with 10 CFR Part 50, Appendix G, Paragraph IV.A.1.

Surveillance tests have only recently been completed for Unit 1 at 8.7 Effective Full Power Years (EFPY); therefore, the surveillance report has not been finished (10CFR50 Appendix H report to be submitted to NRC by August 17, 1994). The Charpy curves, developed for weld and base metal (base metal Heat No. C4487-1) during these tests are attached for information (pages 12-18). Since the Unit 1 surveillance capsule dosimetry report is not complete, unverified dosimetry results have been used to make small changes in the fast neutron values used in the attached Appendix B pages (pages 8-11).

The first surveillance capsule to be removed from Unit 2 will be after 10 EFPY (approximate fluence of $3.6E17 \text{ n/cm}^2 > 1 \text{ MeV}$). The plant is currently at 9.45 EFPY. Therefore, for predicting the % decrease in Upper Shelf Energy (USE) for Unit 2 (pages 10-11), the 32 EFPY fluence projection was based on the currently unverified Unit 1 surveillance capsule dosimetry results.

While applicability of NEDO-32205, Revision 1, is confirmed, Table 5 in the report has the Brunswick Units reversed. A marked-up copy of Table 5 is included on page 20 of this response.

ENCLOSURE 1
GENERIC LETTER (GL) 92-01, REVISION 1,
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BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
(TAC NOS. M83441 AND M83442)
(continued)

NRC REQUEST:

"We further request you verify the information you have provided for BSEP has been accurately entered in the data base."

CP&L RESPONSE:

CP&L has recently discovered that the materials in the reactor vessel for Unit 1 have been mis-identified as belonging to Unit 2 and vice versa (reference LER 1-94-005 Supplement 1). This reversal occurred in December 1978 when General Electric (GE) issued NEDO-24161 for Unit 1 and NEDO-24157 Revision 1 for Unit 2 describing the reactor vessel and surveillance program for each unit. These reports, which were submitted to the NRC on January 8, 1979 [Serial: GD-79-060; E. E. Utley (CP&L) to Mr. T. A. Ippolito (NRR)], were also referenced in CP&L's response to GL 92-01 for the Brunswick Plant. Therefore, CP&L, based on information to date, is updating the information previously provided for the NRC data base to correct materials chemistry and mechanical property data for each vessel. As part of the 10 CFR 50 Appendix H submittal, due to the NRC on August 17, 1994, CP&L will further update our response to Generic Letter 92-01 for the Brunswick Plant, as necessary.

As part of the ongoing investigation, GE and CP&L are currently revising the referenced NEDO reports to correct the assignment of materials for each reactor vessel. Although it appears that the NEDO assignments have simply been reversed between the two units, an extensive effort is underway to reverify the materials and corresponding chemical and mechanical properties for each vessel based on original fabrication records. This verification process and reissuance of the revised NEDOs will be completed by the end of the current Unit 2 refuel outage, as indicated in LER 1-94-005, Supplement 1. In an effort to update the information contained within Enclosures 1 and 2 of the above referenced April 1, 1994 letter from NRC to CP&L, CP&L has used data available to-date from this ongoing investigation to check the information contained within the Enclosures. If additional changes to the Enclosure information are warranted, CP&L will notify the NRC.

The information within the NRC data base tables has been reversed between the two units (i.e., the NRC data base tables for Unit 1 should be changed to reference Unit 2 and vice versa). Additionally, updated information is provided in Tables 1 and 2 of this submittal (pages 4-6) for certain items within the NRC data base. Except as noted within Tables 1 and 2, the information within the NRC data base is correct.

TABLES 1 AND 2

TABLE 1
BRUNSWICK 1
EOL: 9/8/2016

BELTLINE IDENT.	HEAT NO.	%CU	%NI	CHEM. FACTOR (TABLE)	EOL ID FLUENCE (24.4 EFPY)	EOL 1/4 T FLUENCE (24.4 EFPY)	INITIAL RT _{NDT} (NDTT) (°F)	INITIAL RT _{NDT} (GE METHOD.) (°F) ¹
Lower Shell	C4535-2	0.12	0.58	82.6	1.23E18	8.96E17	10	34
Lower Shell	C4550-1	0.11	0.60	74	1.23E18	8.96E17	10	-2
Lower Int. Shell	C4487-1	0.12	0.56	82.2	1.5E18	1.09E18	10	28
Lower Int. Shell	B8496-1	0.19	0.58	139.8	1.5E18	1.09E18	10	0
Nozzle N16A	Q2Q1VW	0.16	0.82	123	1.69E17	1.23E17	40	48
Nozzle N16B	Q2Q1VW	0.16	0.82	123	1.69E17	1.23E17	40	48
Axial Welds G1 & G2	S3986	0.05	0.96	68	1.23E18	8.96E17	10	n/a
Axial Welds F1 & F2	S3986	0.05	0.96	68	1.1E18	8.01E17	10	n/a
Circ. Welds	1P4218	0.06	0.87	82	1.23E18	8.96E17	10	n/a

NOTES:

1. Reported for comparison only.

TABLE 2
BRUNSWICK 2
EOL: 12/27/2014

BELTLINE IDENT.	HEAT NO.	%CU	%NI	CHEM. FACTOR (TABLE)	EOL ID FLUENCE (24.8 EFPY)	EOL 1/4 T FLUENCE (24.8 EFPY)	INITIAL RT _{NDT} (NDTT) (°F)	INITIAL RT _{NDT} (GE METHOD.) (°F) ¹
Lower Shell	C4500-2	0.15	0.54	106.7	1.27E18	9.25E17	10	-12
Lower Shell	C4550-2	0.11	0.60	74	1.27E18	9.25E17	10	10
Lower Int. Shell	C4489-1	0.12	0.60	83	1.55E18	1.13E18	10	4
Lower Int. Shell	C4521-2	0.12	0.57	82.4	1.55E18	1.13E18	10	-4
Nozzle N16A	Q2Q1VW	0.16	0.82	123	1.72E17	1.25E17	40	48
Nozzle N16B	Q2Q1VW	0.16	0.82	123	1.72E17	1.25E17	40	48
Axial Welds G1 & G2	S3986	0.05	0.96	68	1.27E18	9.25E17	10	n/a
Axial Welds F1 & F2	S3986	0.05	0.96	68	1.14E18	8.3E17	10	n/a
Circ. Welds	3P4000	0.02	0.90	27	1.27E18	9.25E17	10	n/a

NOTES:

1. Reported for comparison only.

EQUIVALENT MARGIN ANALYSIS
PLANT APPLICABILITY VERIFICATION FORMS

EQUIVALENT MARGIN ANALYSIS
PLANT APPLICABILITY VERIFICATION FORMS

FOR Brunswick 1

BWR/2-6 WELD

Surveillance Weld USE:

% Cu = .055 (measured as part of surveillance testing)

Capsule Fluence = $3.12E17 \text{ n/cm}^2$ > 1 MeV (Preliminary determination, yet to be verified. To be confirmed within CP&L's 10 CFR 50 Appendix H submittal.)

Shelf Energy = 97 ft-lb

Measured % Decrease = * (Charpy Curves)

R.G. 1.99 Predicted % Decrease = 8.6 % (R.G. 1.99, Figure 2)

Unirradiated Shelf = 106 ft-lb (R.G. 1.99 back calculation)

Limiting Beltline Weld Use:

% Cu = .06

32 EFPY Fluence = $1.62E18 \text{ n/cm}^2$ > 1 MeV

R.G. 1.99 Predicted % Decrease = 13 % (R.G. 1.99, Figure 2)

Adjusted % Decrease = (R.G. 1.99, Position 2.2)

13 % ≤ 34 %, so vessel welds are bounded by equivalent margin analysis

* Unirradiated not available.

EQUIVALENT MARGIN ANALYSIS
PLANT APPLICABILITY VERIFICATION FORMS

FOR Brunswick 1

BWR/3-6 PLATE

Surveillance Plate USE:

% Cu = .12 (Heat No. C4487-1)

Capsule Fluence = $3.12E17 \text{ n/cm}^2 > 1 \text{ MeV}$ (Preliminary determination, yet to be verified. To be confirmed within CP&L's 10 CFR 50 Appendix H submittal.)

Shelf Energy (long) = 145 ft-lb

Shelf Energy (trans) = 94 ft-lb

Measured % Decrease = * (Charpy Curves)

R.G. 1.99 Predicted % Decrease = 9 % (R.G. 1.99, Figure 2)

Unirradiated Shelf (trans) = 102 ft-lb (R.G. 1.99 back calculation)

Limiting Beltline Plate Use:

% Cu = .19

32 EFY Fluence = $1.62E18 \text{ n/cm}^2 > 1 \text{ MeV}$

R.G. 1.99 Predicted % Decrease = 18.3 % (R.G. 1.99, Figure 2)

Adjusted % Decrease = (R.G. 1.99, Position 2.2)

18.3 % \leq 21 %, so vessel welds are bounded by equivalent margin analysis

* Unirradiated not available.

EQUIVALENT MARGIN ANALYSIS

PLANT APPLICABILITY VERIFICATION FORMS

FOR Brunswick 2BWR/2-6 WELDSurveillance Weld USE:% Cu = * Capsule Fluence = * Measured % Decrease = * (Charpy Curves)R.G. 1.99 Predicted % Decrease = * (R.G. 1.99, Figure 2)

* First capsule to be removed after 10 EFPY at approx. fluence of $3.6E17$ n/cm² > 1 MeV (B212R1). Plant is currently at 9.45 EFPY. Unirradiated USE data not available.

Limiting Beltline Weld Use:% Cu = .05

32 EFPY Fluence = $1.62E18$ n/cm² > 1 MeV (Unverified projection from Unit 1 capsule. To be verified upon removal of Unit 2 surveillance capsule during B212R1 outage.)

R.G. 1.99 Predicted % Decrease = 12.3 % (R.G. 1.99, Figure 2)Adjusted % Decrease = (R.G. 1.99, Position 2.2)

12.3 % ≤ 34 %, so vessel welds are bounded by equivalent margin analysis

EQUIVALENT MARGIN ANALYSIS

PLANT APPLICABILITY VERIFICATION FORMS

FOR Brunswick 2BWR/3-6 PLATESurveillance Plate USE:% Cu = .12 (Heat No. C4489-1)Capsule Fluence = *Measured % Decrease = * (Charpy Curves)R.G. 1.99 Predicted % Decrease = * (R.G. 1.99, Figure 2)

* First capsule to be removed after 10 EFPY at approx. fluence of $3.6E17$ n/cm² > 1 MeV (B212R1). Plant is currently at 9.45 EFPY. Unirradiated USE data not available.

Limiting Beltline Plate Use:% Cu = .15

32 EFPY Fluence = $1.62E18$ n/cm² > 1 MeV (Unverified projection from Unit 1 capsule. To be verified upon removal of Unit 2 surveillance capsule during B212R1 outage.)

R.G. 1.99 Predicted % Decrease = 15.7 % (R.G. 1.99, Figure 2)Adjusted % Decrease = (R.G. 1.99, Position 2.2)

15.7 % ≤ 21 %, so vessel welds are bounded by equivalent margin analysis

UNIT 1 SURVEILLANCE TESTING
WELD AND BASE METAL
CHARPY CURVES

PLATE
(Heat No. C4487-1)

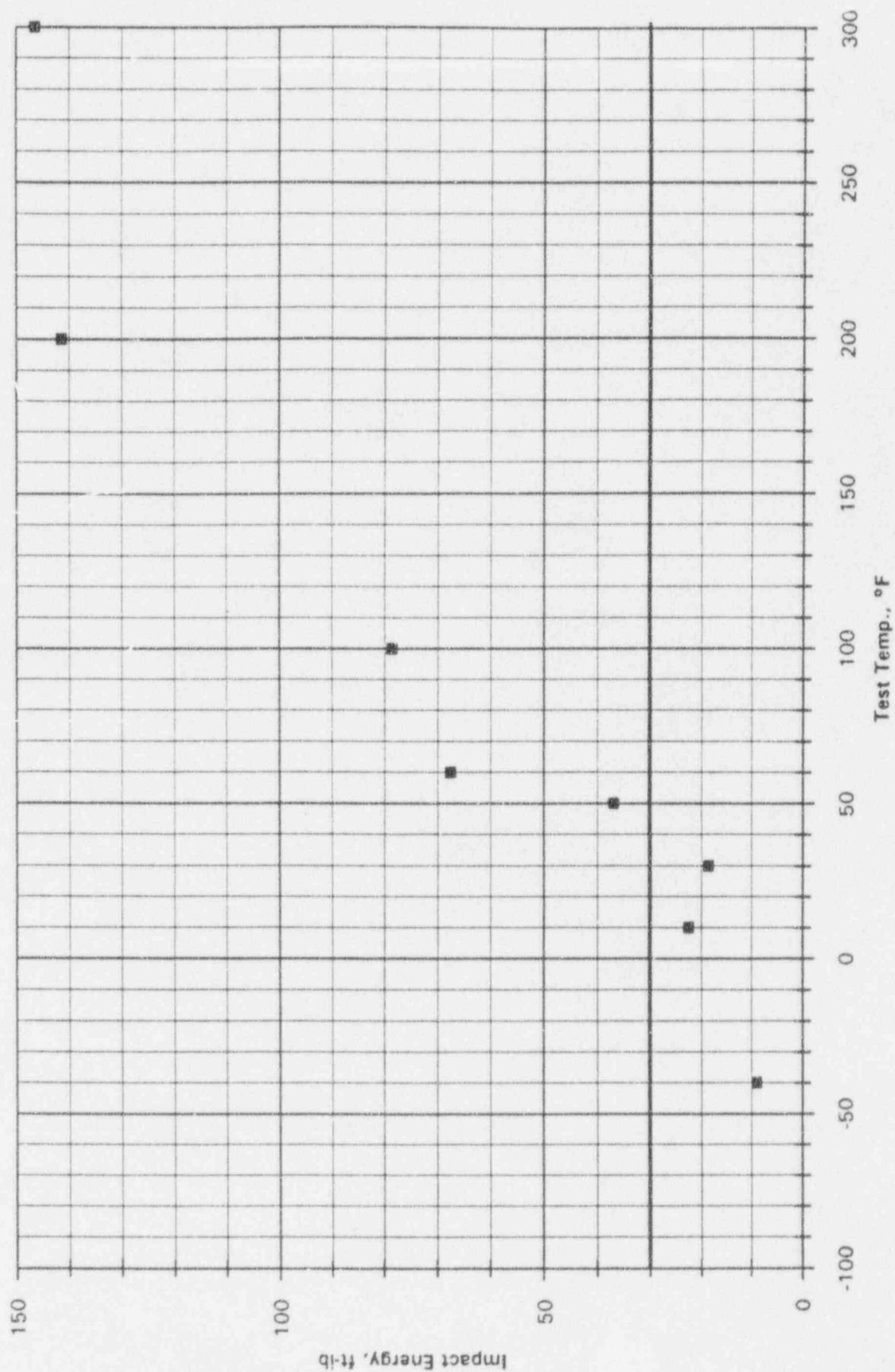


Figure 4-1: Brunswick 1 Irradiated Base Metal impact Energy

PLATE

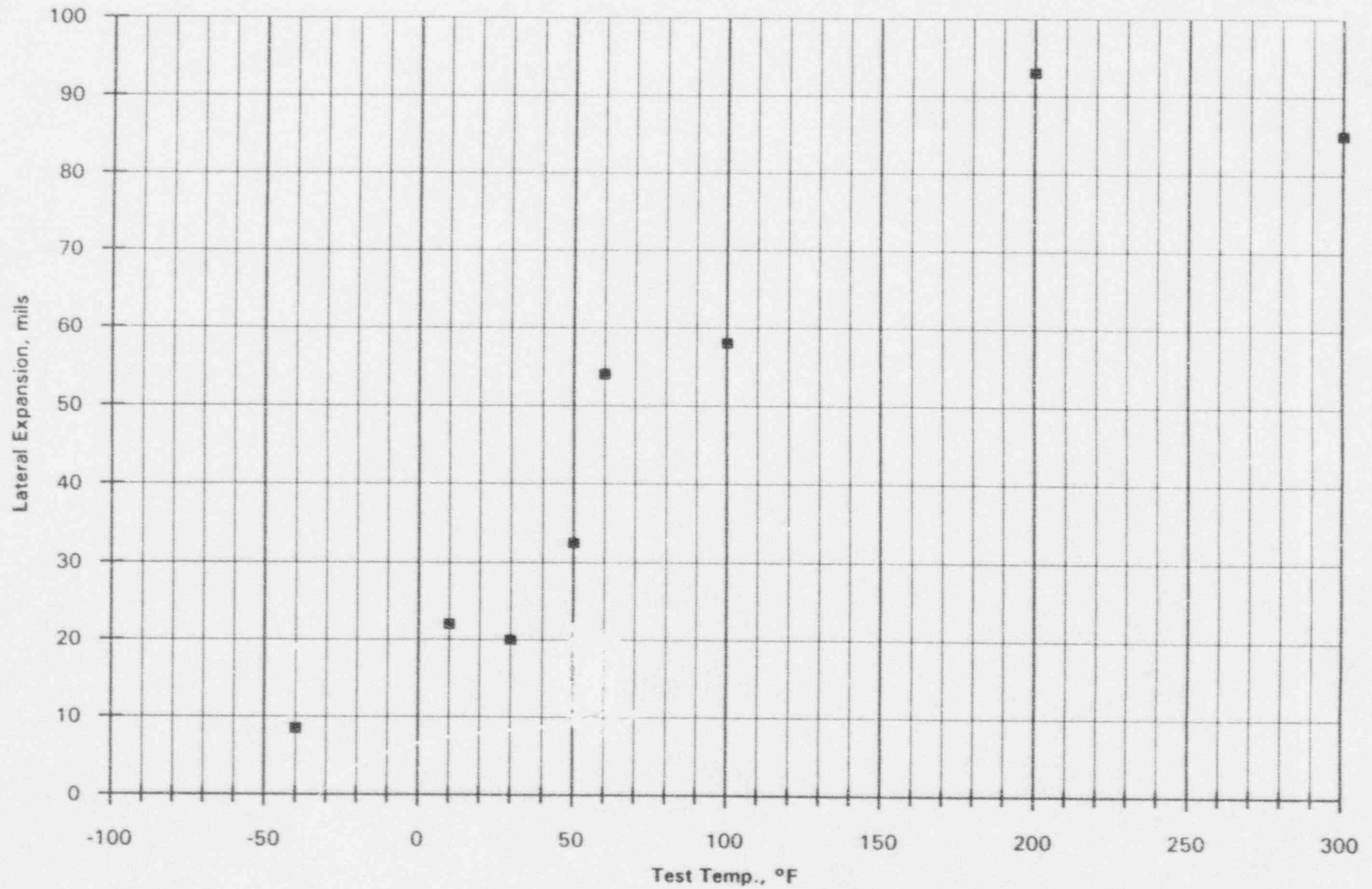


Figure 4-2: Brunswick 1 Irradiated Base Metal Lateral Expansion

Weld

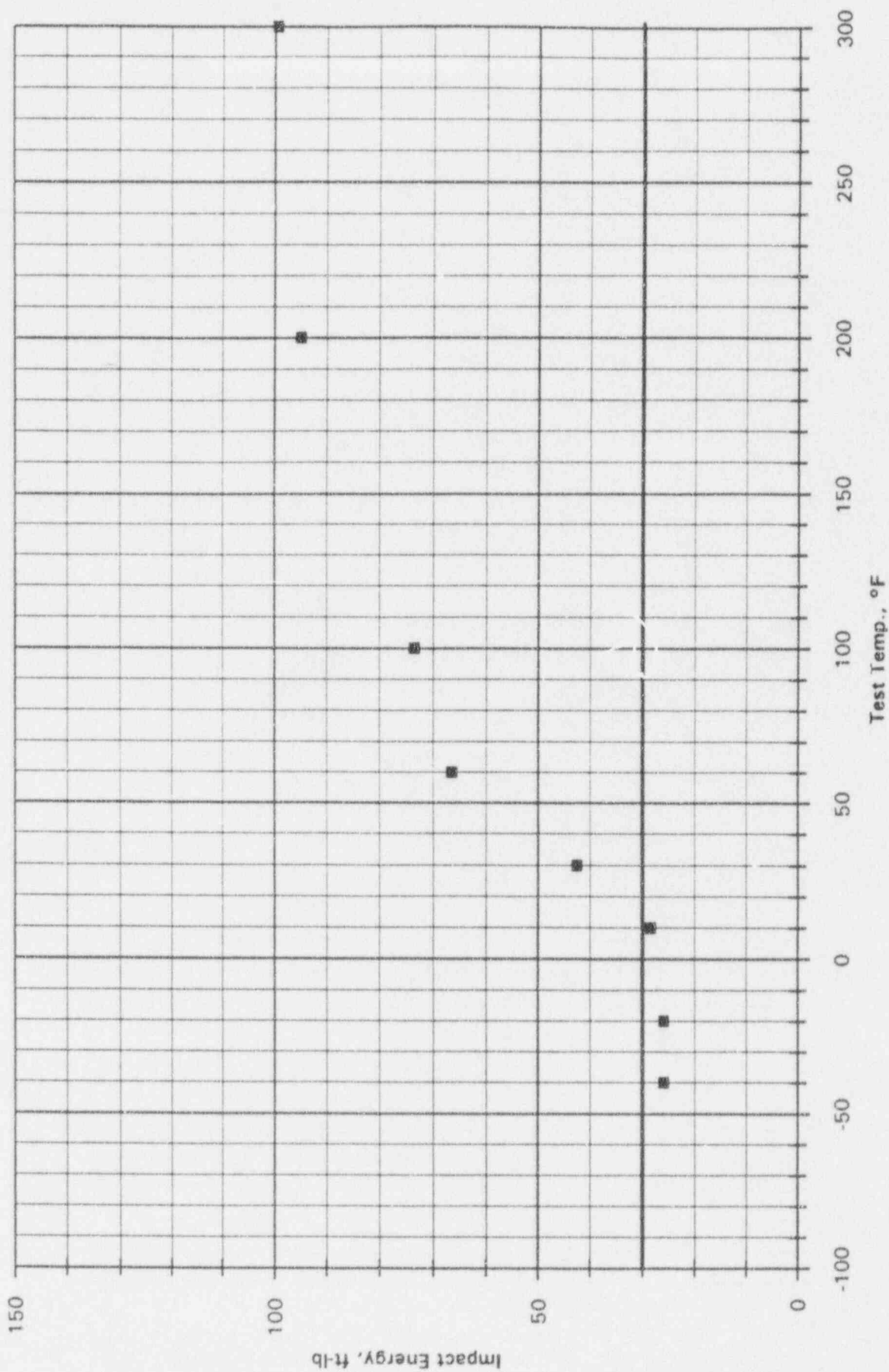


Figure 4-3: Brunswick 1 Irradiated Weld Metal Impact Energy

Weld

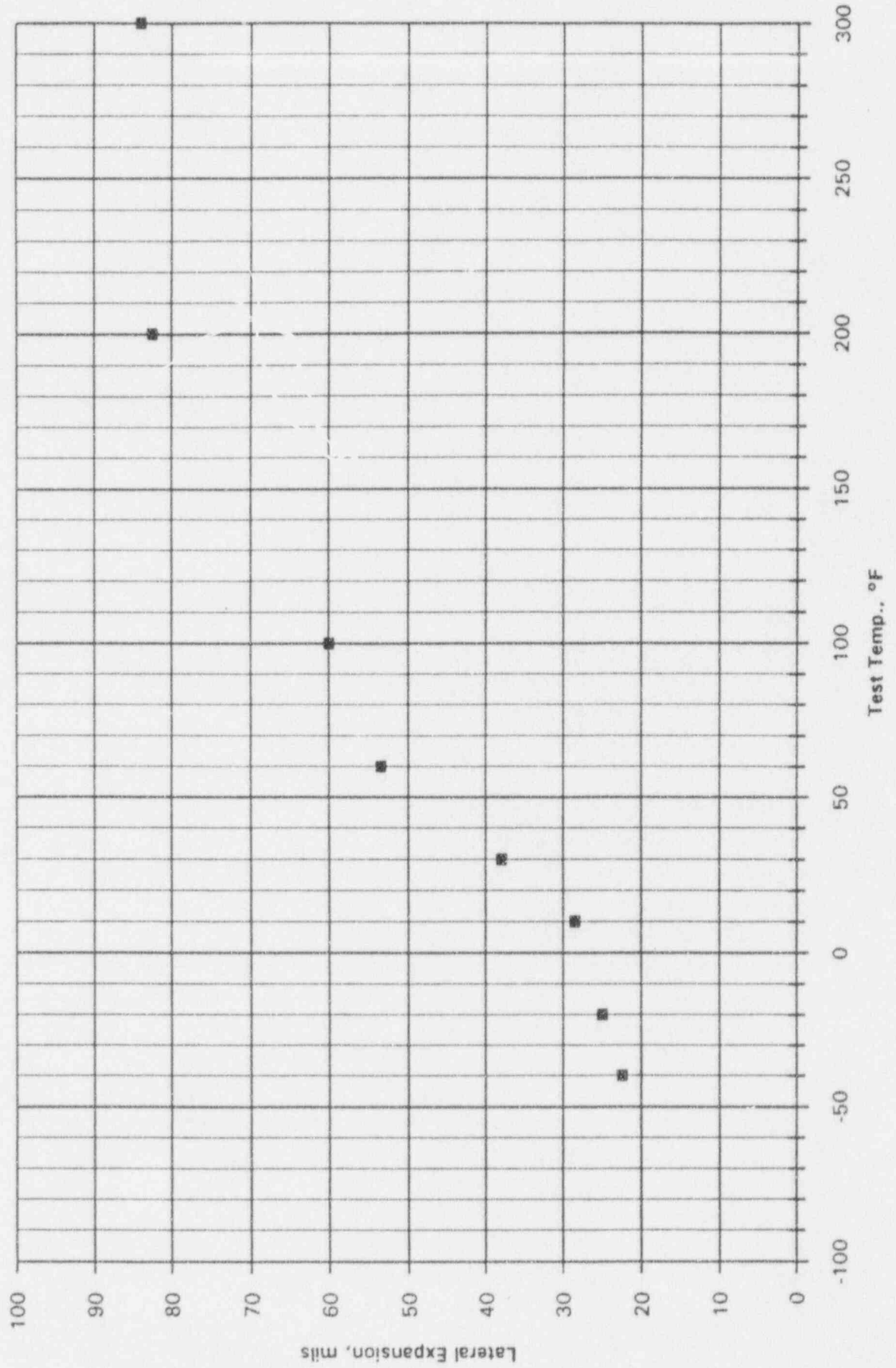


Figure 4-4: Brunswick 1 Irradiated Weld Metal Lateral Expansion

HAZ

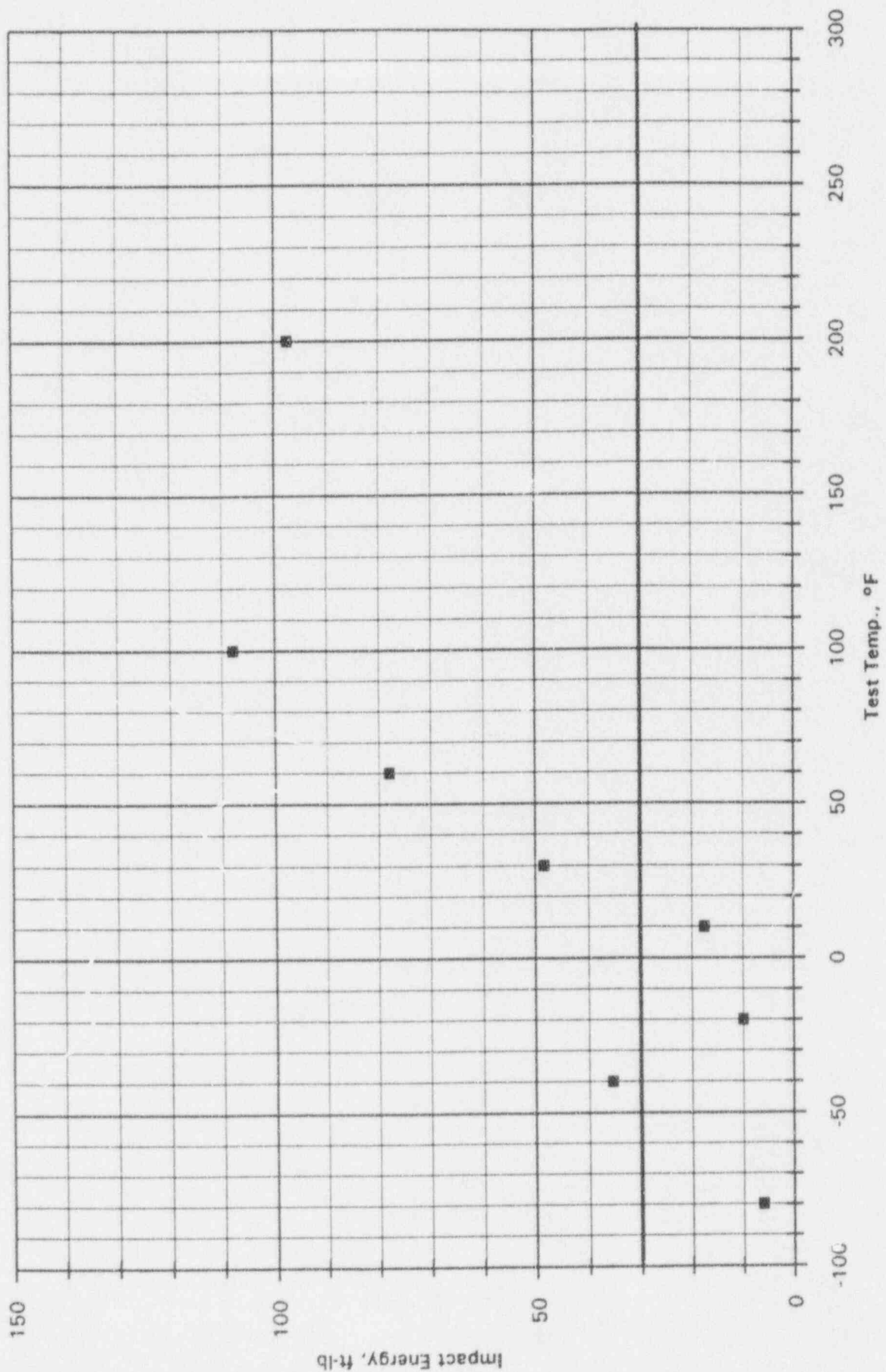


Figure 4-5: Brunswick 1 Irradiated HAZ Metal Impact Energy

HAZ

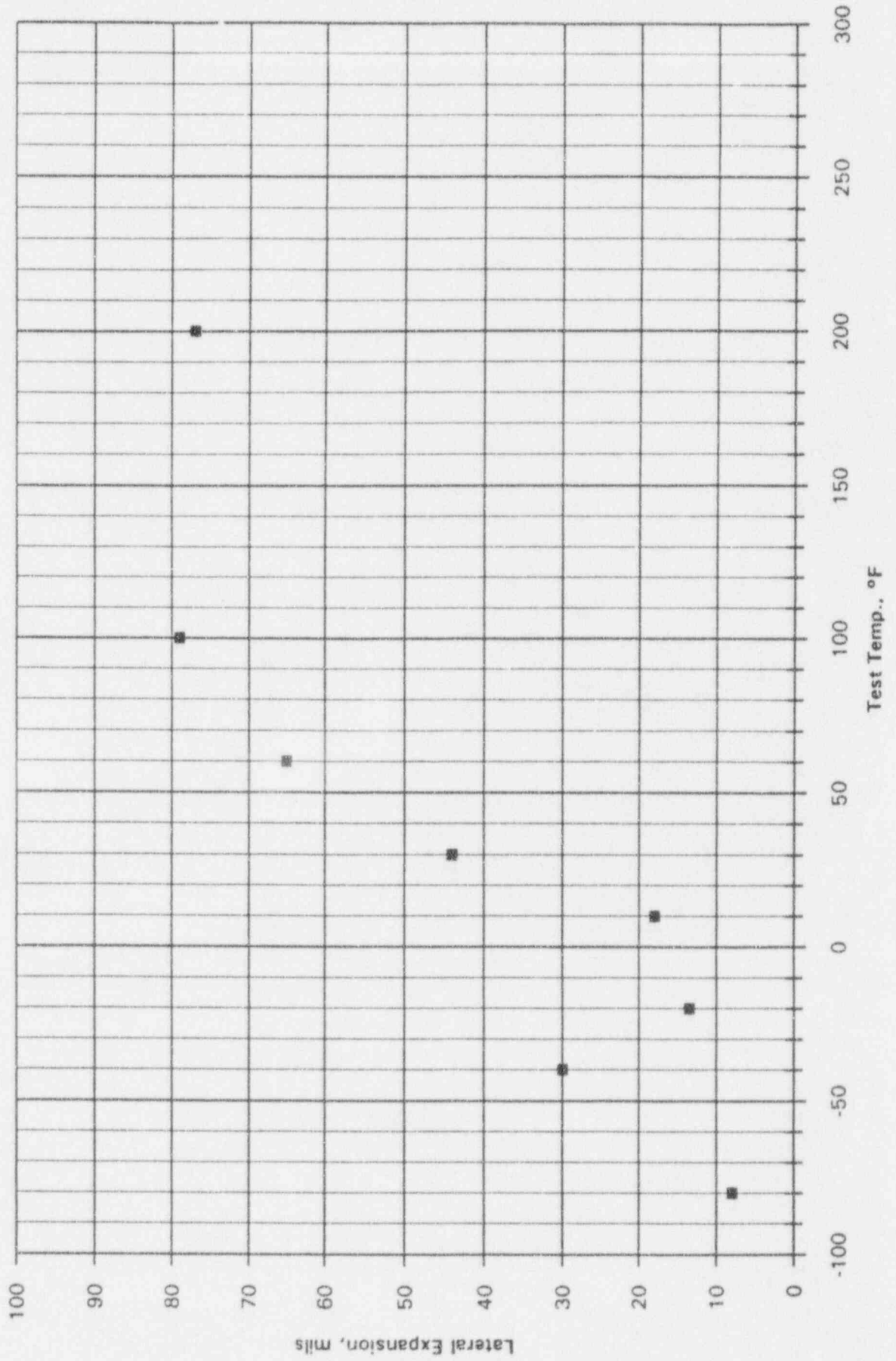


Figure 4-6: Brunswick 1 Irradiated HAZ Metal Lateral Expansion

AMENDED TABLE 5
OF
NEDO-32205, REVISION 1

TABLE 5

Predicted EOL USE drops for the limiting plates and welds
for the 29 participating plants

PLANT NAME	BWR TYPE	PLATE CU% ΔUSE%	WELD CU% ΔUSE%	1/4T FLUENCE 10 ¹⁸ (n/cm ²)
Browns Ferry 1	4	0.15 13.5	0.31 23	0.86
Browns Ferry 2	4	0.17 14.5	0.25ES 22	0.73
Browns Ferry 3	4	0.15 13	0.25ES 22	0.72
* Brunswick X 2	4	0.15 15.2 14.5	0.05 12.0 11.3	1.42* 1.13
Brunswick Z 1	4*	0.19 17.7 16.7	0.06 12.5 11.9	1.42* 1.09
Cooper	4	0.21 18	0.22 30.5**	1.10
Dresden 2	3	0.23 13.9	0.25 16.8	0.25
Dresden 3	3	0.24 15.4	0.30ES 21.0	0.37
Duane Arnold	4	0.15 18.3	0.03 14.9	3.60
FitzPatrick	4	0.18 17.8	0.26 26.6	1.70
Grand Gulf 1	6	0.04 11.9	0.06 12.5	1.42*
Hatch 1	4	0.17 17.3	0.28 29.0	1.8
Hatch 2	4	0.11 12.0	0.23 22.0	1.0
Hope Creek	4	0.15 14.0	0.10 14.0**	1.1
LaSalle 1	5	0.15 10.2	0.33 19.0	0.25*
LaSalle 2	5	0.12 9.0	0.04 8.1	0.28*
Limerick 1	4	0.12 12.6	0.09 13.9	1.20
Limerick 2	4	0.15 14.6	0.09 13.9	1.20
Millstone 1	3	0.23 18.3	0.21 29.0**	0.90
Monticello	3	0.17 20.6	0.10 19.0	3.80
Oyster Creek	2	0.27 25.7	0.35 34.0	2.36
Peach Bottom 2	4	0.13 11.1	0.21 17.9	0.55
Peach Bottom 3	4	0.15 11.9	0.21 17.6	0.50
Quad Cities 1	3	0.27 15.9	0.30ES 19.0	0.25
Quad Cities 2	3	0.18 12.3	0.30ES 20.5	0.35
Susquehanna 1	4	0.14 11.5	0.04 9.5	0.53
Susquehanna 2	4	0.13 11.0	0.06 9.9	0.53
Vermont Yankee	4	0.13 8.4	0.03 7.2	0.17
WNP 2	4	0.15 13.8	0.09 13.2	0.94

BASED on
EOL fluence
projections.
24.4 EFPY for
Unit 1 AND
24.8 EFPY
for Unit 2

29

* The fluence is from the most recent submittal since it was not reported in
the response to GL 92-01

** Reported by the licensee from surveillance data

ENCLOSURE 2
BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKET NOS. 50-325 & 50-324
OPERATING LICENSE NOS. DPR-71 & DPR-62
BSEP 94-0179

SUMMARY OF COMMITMENTS

The following table identifies those actions committed to by Carolina Power & Light Company in this submittal. Any other actions discussed in the submittal represent intended or planned actions by Carolina Power & Light Company. These actions are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the Manager-Regulatory Affairs at the Brunswick Nuclear Plant of any questions regarding this document or any associated regulatory commitments.

Commitment	Committed date or outage
1. Unless more accurate RT_{NDT} data are derived in the future from either surveillance testing or the testing of unirradiated archive reactor vessel materials, CP&L will use the GE methodology (once approved) for determining initial RT_{NDT} values in future submittals.	NA
2. Significance of the change for those initial RT_{NDT} values which are increased by the GE approach will be addressed. This comparison will be completed and differences included in the submittal of the Unit 1 reactor vessel surveillance test report.	8/17/94
3. This verification process and reissuance of the revised NEDOs will be completed by the end of the current Unit 2 refuel outage, as indicated in LER 1-94-005, Supplement 1.	B211R1
4. If additional changes to the Enclosure information are warranted, CP&L will notify the NRC.	8/17/94