Consumers Energy

A CMS Energy Company

Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043

Tel: 616 764 2276
Fax: 616 764 2490

Nathan L. Haskell
Director, Licensing

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING REACTOR PRESSURE VESSEL INTEGRITY (TAC NO. MA0560)

By letter dated June 8, 1998, the NRC requested additional information regarding report CE NPSD-1039, Revision 02, "Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds," dated June 1997. That report, submitted to the NRC by the Combustion Engineering Owners' Group (CEOG), provided additional reactor pressure vessel (RPV) weld chemistry data for RPVs fabricated by CE. The attachment to this letter provides the requested information.

SUMMARY OF COMMITMENTS

This letter contains no new commitments and no revisions to existing commitments.

Nathan L. Haskell
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Director, Licensing

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CC Administrator, Region III, USNRC
Project Manager, NRR, USNRC
NRC Resident Inspector - Palisades

Attachment

ATTACHMENT

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

RESPONSE TO REQUEST FOR INFORMATION
BY NRC LETTER Dated June 8, 1998
REGARDING PRESSURE VESSEL INTEGRITY
(TAC No. MA0560)

12 Pages

ATTACHMENT

RESPONSE TO REQUEST FOR INFORMATION
BY NRC LETTER Dated June 8, 1998
REGARDING PRESSURE VESSEL INTEGRITY
(TAC No. MA0560)

Based on information provided to the NRC by the Combustion Engineering Owners' Group (CEOG) in report CE NPSD-1039, Revision 02, "Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds," dated June 1997, the NRC requested the following information:

NRC Request:

1. *An evaluation of the information in the reference above and an assessment of its applicability to the determination of the best-estimate chemistry for all of your RPV beltline welds. Based upon this reevaluation, supply the information necessary to completely fill out the data requested in Table 1 for each RPV beltline weld material. Also provide a discussion for the copper and nickel values chosen for each weld wire heat noting what heat-specific data were included and excluded from the analysis and the analysis method chosen for determining the best estimate. If the limiting material for your vessel's pressurized thermal shock/pressure-temperature (PTS/PT) limits evaluation is not a weld, include the information requested in Table 1 for the limiting material also. Furthermore, you should consider the information provided in Section 2.0 of this request for information (RAI) on the use of surveillance data when responding.*

Consumers Energy Response:

Consumers Energy has reviewed the information supplied to the NRC by the CEOG in report CE NPSD-1039, Revision 02, "Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds," dated June 1997. Consumers Energy did not participate in the development of this report, because (1) it was perceived that we had reached agreement with the NRC on an acceptable approach for defining the best estimate chemistry for the Palisades reactor vessel beltline welds, (2) there was very little additional information ABB (CE) could provide, and (3) Generic Letter 92-01, Revision 1, Supplement 1 had been issued as a result of information Consumers Energy had supplied. Therefore a request for additional information on this topic was not expected.

Weld Wire Heat Number 27204

CE NPSD-1039, Rev. 02 specifies best estimate values of 0.203% Cu and 1.018% Ni for welds fabricated with weld wire heat number 27204. The best estimate values reported June 5, 1992 for the Palisades reactor vessel beltline circumferential weld were 0.208% Cu and 1.00% Ni. In our July 3, 1992 response to Generic Letter 92-01 Rev. 1, the best estimate value for the circumferential weld was reported as 0.21% Cu and 1.00% Ni. In our December 20 and November 17, 1995 submittals, we acknowledged that additional chemistry information was available and calculated weighted values of 0.198% Cu and 1.02% Ni. Because this material is not the Palisades reactor vessel limiting material and because it resulted in a slightly higher chemistry factor, Consumers Energy chose to continue to report 0.21% Cu and 1.00% Ni as the best estimate value for the beltline circumferential weld. Given that the values reported in CE NPSD-1039, Rev. 02 are comparable to those calculated by Consumers Energy in 1995, Consumers Energy concludes the best estimate chemistry for the Palisades reactor vessel beltline welds fabricated with weld wire heat number 27204 is 0.203% Cu and 1.018% Ni as reported in CE NPSD-1039, Rev. 02.

Weld Wire Heat Number 34B009

CE NPSD-1039, Rev. 02 specifies best estimate values of 0.192% Cu and 1.038% Ni for welds fabricated with weld wire heat number 34B009. The NRC has acknowledged in the Reactor Vessel Integrity Database that the best estimate values for welds fabricated with weld wire heat number 34B009 are 0.19% Cu and 0.99% Ni for the Palisades reactor vessel. In our December 20 and November 17, 1995 submittals, we acknowledged that additional chemistry information was available and calculated weighted values of 0.188% Cu and 0.98% Ni. Because this material is not the Palisades reactor vessel limiting material and because it resulted in a slightly higher chemistry factor, Consumers Energy chose to continue to report 0.19% Cu and 0.99% Ni as the best estimate value for welds fabricated with weld wire heat number 34B009. As can be seen, the copper value reported in CE NPSD-1039, Rev. 02 is comparable with the previously accepted number for welds fabricated with weld wire heat number 34B009. The best estimate copper value of 0.192% for welds fabricated with weld wire heat number 34B009 reported in the CE NPSD-1039, Rev. 02 is considered acceptable and is endorsed by Consumers Energy as a technically acceptable value for the Palisades welds fabricated with weld wire heat number 34B009.

Consumers Energy is unable to endorse the best estimate chemistry value for nickel recommended in CE NPSD-1039, Rev. 02 for nickel addition welds. The value of 1.038% was determined by finding the mean of 144 nickel measurements. It was noted in our review that at least 45 measurements are from the Palisades retired steam generators, therefore the mean is heavily dominated by just two welds. Consumers Energy recommended that the best estimate nickel value for nickel addition welds be redetermined taking into account the volume of material represented by each sample. CEOG has subsequently revised the method used to determine the best estimate nickel concentration for welds using the nickel addition process in "Updated Analysis for Combustion Engineering Fabricated Reactor Vessel Welds Best Estimate Copper and Nickel Content," CE NPSD-1119, Revision 01, July 1998. The best estimate value of 1.007% nickel derived using a sample weighted mean is considered a technically superior approach to that used in CE NPSD-1039, Rev. 02.

10CFR50.61(c)(1)(iv)(A) states "For a weld, the best estimate values will normally be the mean of the measured values for a weld deposit made using the same weld wire heat number as the critical vessel weld." The concept of determining the best estimate nickel from all nickel addition welds is a reasonable technical assumption. Determining the copper content for all welds fabricated with copper coated weld wires would also be a reasonable assumption. Unfortunately, it has been observed that welds fabricated with certain heats of weld wire have different copper concentrations than welds fabricated with other heats of weld wire even though the wires were coated in the same time frame under the same specification by the same manufacturer. Since we are unable to explain why the copper concentration varies in this manner, it is possible that the nickel addition could have been influenced by the fabrication technique in some other unexplained manner. Given this possibility, when measurements are available, it would seem prudent that the best estimate nickel content should be determined from measured values for weld deposits made using the same weld wire heat number. Therefore, the best estimate value of 0.98% Ni reported in our December 20 and November 17, 1995 submittals is considered more representative of the best estimate chemistry as defined in 10CFR50.61(c)(1)(iv)(A), than is the estimate provided in CE NPSD-1119, Rev. 01.

Consumers Energy concludes the best estimate chemistry for the Palisades reactor vessel beltline welds fabricated with weld wire heat number 34B009 with nickel addition is 0.192% Cu and 0.98% Ni.

Weld Wire Heat Number W5214

CE NPSD-1039, Rev. 02 specifies best estimate values of 0.213% Cu and 1.038% Ni for welds fabricated with weld wire heat number W5214. The NRC, in their April 12,1995 Safety Evaluation Report, accepted that the best estimate values for welds fabricated with weld wire heat number W5214 representing the Palisades reactor vessel beltline axial welds are 0.212% Cu and 1.02% Ni. In our November 17, 1995 submittal, we acknowledged that additional chemistry information was available and calculated weighted values of 0.208% Cu and 1.01% Ni. Because it resulted in a slightly higher chemistry factor, Consumers Energy chose to continue to report 0.212% Cu and 1.02% Ni as the best estimate value for welds fabricated with weld wire heat number W5214. As can be seen, the copper value reported in CE NPSD-1039, Rev.

02 is comparable with the previously accepted number for welds fabricated with weld wire heat number W5214. The best estimate copper value of 0.213% reported in CE NPSD-1039, Rev. 02 is considered acceptable and is endorsed by Consumers Energy as a technically acceptable value for the Palisades welds fabricated with weld wire heat number W5214.

For the same reasons given in the discussion of weld wire number 34B009, Consumers Energy is unable to endorse the best estimate chemistry value for nickel recommended in CE NPSD-1039, Rev. 02 or CE NPSD-1119, Rev. 01 for nickel addition welds. Therefore, the best estimate value of 1.01% Ni reported in our November 17, 1995 submittal is considered more representative of the best estimate chemistry as defined in 10CFR50.61(c)(1)(iv)(A).

Consumers Energy concludes the best estimate chemistry for the Palisades reactor vessel beltline welds fabricated with weld wire heat number W5214 with nickel addition is 0.213% Cu and 1.01% Ni.

Re-evaluation of RT_{PTS}

Consumers Energy has assessed the information supplied by the CEOG in CE NPSD-1039, Rev. 02. This assessment has resulted in small changes in the best estimate copper and nickel concentrations for the reactor vessel beltline welds. These small changes result in small changes to the chemistry factor (CF) for each beltline weld. Based upon this revised assessment, Table 1 below is provided to show the effect the above changes have on the assessment of pressurized thermal shock to the Palisades Reactor Vessel.

TABLE 1

Facility: Palisades
Vessel Manufacturer: Combustion Engineering

Information Requested on RPV Weld and/or Limiting Materials

RPV Weld Wire Heat (1)	Best-Estimate Copper	Best-Estimate Nickel	EOL ID Fluence (x 10^{19})	Assigned Material Chemistry Factor (CF)	Method of Determining CF(2)	Initial RT_{NDT} ($RT_{NDT(U)}$)	σ_I	σ_Δ	Margin	ART or RT_{PTS} at EOL
27204	0.203	1.018	2.08	227	Table	-56	17	28	66	282
34B009	0.192	0.98	1.55	218	Table	-56	17	28	66	254
W5214	0.213	1.01	1.55	231	Table	-56	17	28	66	269

(1) or the material identification of the limiting material as requested in Section 1.0.
(2) determined from tables or from surveillance data.

Discussion of the Analysis Method and Data Used for Each Weld Wire Heat

Weld Wire Heat	Discussion
27204	The determination of the best-estimate copper and nickel values are described in CEOG report CE NPSD-1039, Revision 02, "Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds," dated June 1997. The chemistry factor (CF) is determined from Table 1 of 10CFR50.61.
34B009	The determination of the best-estimate copper value is described in CEOG report CE NPSD-1039, Revision 02, "Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds," dated June 1997. The determination of the best-estimate nickel value is described in Consumers Energy correspondence Smedley to NRC, "Docket 50-255 -License DPR-20 -Palisades Plant -Response to NRC Generic Letter 92-01, Revision 1, Supplement 1: Reactor Vessel Structural Integrity," November 17, 1995 and Smedley to NRC, "Docket 50-255 -License DPR-20 -Palisades Plant - Response to NRC Generic Letter 92-01, Revision 1, Supplement 1: Reactor Vessel Structural Integrity -Correction of Typographical Errors," December 20, 1995. CF is determined from Table 1 of 10CFR50.61.
W5214	The determination of the best-estimate copper value is described in CEOG report CE NPSD-1039, Revision 02, "Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds," dated June 1997. The determination of the best-estimate nickel value is described in Consumers Energy correspondence, Smedley to NRC, "Docket 50-255 -License DPR-20 -Palisades Plant-Response to NRC Generic Letter 92-01, Revision 1, Supplement 1: Reactor Vessel Structural Integrity," November 17, 1995. CF is determined from Table 1 of 10CFR50.61.

NRC Request:

2. *That (1) the information listed in Table 2, Table 3, and the chemistry factor from the surveillance data be provided for each heat of material for which surveillance weld data are available <u>and</u> a revision in the RPV integrity analyses (i.e., current licensing basis) is needed or (2) a certification that previously submitted evaluations remain valid. Separate tables should be used for each heat of material addressed. If the limiting material for your vessel's PTS/PT limits*

evaluation is not a weld, include the information requested in the tables for the limiting material (if surveillance data are available for this material).

Consumers Energy Response:

Consumers Energy has never formally assessed surveillance results from other reactor vessel surveillance programs that contain welds fabricated with the same weld wire heat number as the Palisades reactor vessel beltline welds. Therefore, Consumers Energy will provide the information requested in Tables 2 and 3 for each weld material.

In order to use what is considered to be the most consistent source of information on surveillance program test results from the various surveillance programs potentially applicable to the Palisades reactor vessel, Consumers Energy has elected to use the information regarding irradiation temperature, fluence and measured ΔRT_{NDT} contained in the report by Eason, Wright and Odette, "Improved Embrittlement Correlations for Reactor Pressure Vessel Steels," NUREG/CR-6551, Draft Report, May 1997.

Copper and nickel concentrations reported for each of the surveillance welds are taken from chemistry measurements performed solely on Charpy specimens documented in the applicable surveillance capsule reports. In general, these chemistry results should not be substantially different from the mean estimated for all measurements performed on the surveillance weld as reported in CE NPSD-1039, Rev, 02. This proves to be the case for welds fabricated with weld wire heat number 27204. However, for welds fabricated with weld wire heat numbers 34B009 and W5214 using nickel addition, the chemistry may vary substantially within a weld. Given the guidance in Wichman to Sullivan (NRC), "Meeting Summary for November 12, 1997 Meeting with Owners Group Representatives and NEI Regarding Review of Responses to Generic Letter 92-01, Revision 1, Supplement 1 Responses," November 19, 1997, that the measured ΔRT_{NDT} be adjusted by the ratio of the vessel best estimate CF to the surveillance weld best estimate CF, it is crucial that an accurate estimate of the copper and nickel concentration of the *material tested* be obtained.

Weld Wire Heat Number 27204

The only surveillance program results known to be applicable to weld wire heat number 27204 in draft NUREG/CR-6551 are from the Diablo Canyon 1 reactor vessel. The following information is taken from the surveillance capsule reports WCAP-11567 and WCAP-13750, and draft NUREG/CR-6551.

Table 2: Heat 27204

Capsule ID (including source)	Cu	Ni	Irradiation Temperature (°F)	Fluence ($x10^{19}n/cm^2$)	Measured ΔRT_{NDT} (°F)	Data Used in Assessing Vessel (Y or N)
DC1 S	0.196	1.003	539	0.284	113	N
DC1 Y	0.196	1.003	540	0.941	233	N

The copper and nickel values listed above are averaged from the six Charpy weld specimens (W3, W4, W8, W17, W20, W34) tested and measured from the Diablo Canyon Unit 1 reactor vessel surveillance Capsule S and Capsule Y. The mean copper and nickel values for the Diablo Canyon 1 surveillance weld as determined in CE NPSD-1039, Rev. 02 are 0.198% and 0.9994% respectively. Each of these chemistry values (i.e., the measurements solely determined from the six identified Charpy specimens and the total of all measurements made on the Diablo Canyon 1 surveillance weld) result in an estimated CF = 222°F.

The measured results are adjusted in the following table to account for the irradiation temperature difference between the two surveillance capsules. Using the adjusted measurements, a least squares best estimate of CF is determined, in accordance with the guidance in 10CFR50.61, to be 217°F. The predicted ΔRT_{NDT} in this table is then determined using CF = 217°F.

Table 3: Heat 27204

Capsule ID (including source)	Cu	Ni	Irradiation Temperature (°F)	Fluence Factor	Measured ΔRT_{NDT} (°F)	Adjusted ΔRT_{NDT} (°F)	Predicted ΔRT_{NDT} (°F)	(Adjusted -Predicted) ΔRT_{NDT} (°F)
DC1 S	0.196	1.003	539	0.656	113	113	142	-30
DC1 Y	0.196	1.003	540	0.983	233	234	213	20

In accordance with NRC guidance, the above surveillance results are considered non-credible because the absolute value of -30°F exceeds the allowed deviation for welds of 28°F. Because the above surveillance results do not meet the specified criteria, the chemistry factor for Palisades reactor vessel welds fabricated with weld wire heat number 27204 will be determined from Table 1 in 10CFR50.61.

Weld Wire Heat Number 34B009

The only surveillance program results known to be applicable to weld wire heat 34B009 in draft NUREG/CR6551 are from the Millstone 1 reactor vessel. The following information is taken from surveillance capsule report GE-NE-523-165-1292 and draft NUREG/CR-6551.

Table 2: Heat 34B009

Capsule ID (including source)	Cu	Ni	Irradiation Temperature (°F)	Fluence ($x10^{19}n/cm^2$)	Measured ΔRT_{NDT} (°F)	Data Used in Assessing Vessel (Y or N)
ML1 210°	0.19	0.99	531	0.033	22	N
ML1 300°	0.19	0.99	531	0.066	68	N

The copper and nickel concentrations measured for the Millstone Unit 1 surveillance weld listed above come solely from Charpy specimen C4A and result in an estimated CF = 219°F. The other measurements taken for this surveillance weld come from tensile specimens or from other locations within the weld. The mean copper and nickel values for the Millstone 1 surveillance weld as determined in CE NPSD-1039, Rev. 02 are 0.1859% and 0.8976% respectively. These chemistry values result in an estimated CF = 203°F for the surveillance weld. However, the copper values range from 0.12% to 0.21% and the nickel values range from 0.08% to 1.78%. Because the chemistry of this weld varies substantially, the chemistry concentrations of the Charpy specimen is considered more representative of the material tested for mechanical properties. Using the measured values, a least squares best estimate of CF is determined to be 167°F. The predicted ΔRT_{NDT} in the following table is then determined using CF = 167°F.

Table 3: Heat 34B009

Capsule ID (including source)	Cu	Ni	Irradiation Temperature (°F)	Fluence Factor	Measured ΔRT_{NDT} (°F)	Adjusted ΔRT_{NDT} (°F)	Predicted ΔRT_{NDT} (°F)	(Adjusted -Predicted) ΔRT_{NDT} (°F)
ML1 210°	0.19	0.99	531	0.232	22	22	39	-17
ML1 300°	0.19	0.99	531	0.339	68	68	57	11

The above surveillance results are considered credible because all of the measurements fall within the allowed deviation for welds of 28°F. Because the results meet the credibility criteria, NRC guidance states that the measurements should be adjusted to the Palisades reactor vessel estimates for irradiation temperature and chemistry factor. The measurements are adjusted to the Palisades estimated T_{irr} = 533°F and CF = 218°F in the following table. Using the adjusted values, a least squares best estimate of CF is determined to be 159°F. The predicted ΔRT_{NDT} in the following table is then determined using CF = 159°F.

Table 3: Heat 34B009

Capsule ID (including source)	Cu	Ni	Irradiation Temperature (°F)	Fluence Factor	Measured ΔRT_{NDT} (°F)	Adjusted ΔRT_{NDT} (°F)	Predicted ΔRT_{NDT} (°F)	(Adjusted -Predicted) ΔRT_{NDT} (°F)
ML1 210°	0.19	0.99	531	0.232	22	20	37	-17
ML1 300°	0.19	0.99	531	0.339	68	66	54	12

The above surveillance results comply with the 28°F credibility criteria. However, the above adjusted results (CF=159°F) are substantially different from the value expected from the best estimate chemical concentrations (CF=219°F). Given that the results are acquired from the surveillance program of a boiling water reactor vessel, the Millstone 1 surveillance results may not represent the Palisades reactor vessel weld material. Because it is conservative, the chemistry factor for Palisades reactor vessel welds fabricated with weld wire heat number 34B009 will be determined from Table 1 in 10CFR50.61.

Weld Wire Heat Number W5214

The only surveillance program results known to be applicable to weld wire heat W5214 in draft NUREG/CR-6551 are available from the H. B. Robinson 2, the Indian Point 2 and the Indian Point 3 reactor vessels. The following information is based on information obtained from Consumers' Energy December 28, 1994 submittal and draft NUREG/CR-6551.

Table 2: Heat W5214

Capsule ID (including source)	Cu	Ni	Irradiation Temperature (°F)	Fluence ($x10^{19} n/cm^2$)	Measured ΔRT_{NDT} (°F)	Data Used in Assessing Vessel (Y or N)
HB2 T	0.34	0.66	546	4.42	298	N
HB2 V	0.34	0.66	546	0.601	211	N
IP2 V	0.21	1.04	524	0.506	196	N
IP2 Y	0.21	1.04	529	0.453	196	N
IP3 T	0.166	1.21	540	0.312	155	N
IP3 Y	0.166	1.21	540	0.724	176	N
IP3 Z	0.166	1.21	540	1.04	235	N

The copper and nickel concentrations measured for the H. B. Robinson Unit 2, and the Indian Point Units 2 and 3 surveillance welds Charpy specimens results in estimated CF's of 218°F, 234°F, and 217°F respectively. Specific specimens were W1 and W20 for H. B. Robinson 2, W12, W13, W17 and W19 for Indian Point 2, and W15 for Indian Point 3. The other measurements taken for these surveillance welds come from tensile specimens or from other locations within the welds. The mean chemistry values for the above surveillance welds as determined in CE NPSD-1039, Rev. 02 are 0.32% Cu and 0.66% Ni for H. B. Robinson 2, 0.1933% Cu and 0.9441% Ni for Indian Point 2, and 0.158% Cu and 1.115% Ni for Indian Point 3. These chemistry values result in estimated chemistry factors of 211°F, 213°F and 204°F respectively for the surveillance welds. The copper values range from 0.26% to 0.35% and the nickel values range from 0.63% to 0.69% for the H. B. Robinson 2 surveillance weld. The copper values range from 0.12% to 0.23% and the nickel values range from 0.69% to 1.15% for the Indian Point 2 surveillance weld. The copper values range from 0.15% to 0.166% and the nickel values range from 1.02% to 1.21% for the Indian Point 3 surveillance weld. Because the chemistry of these welds vary substantially, particularly in the case of the Indian Point 2 surveillance weld, the chemistry concentrations of the Charpy specimens alone are considered more representative of the materials tested for mechanical properties. Comparison of the measured and predicted results are detailed in the following table.

In the following table, the measured values from the seven surveillance capsules are adjusted to a normalized chemistry (0.228% Cu and 1.004% Ni, CF = 236°F) and normalized T_{irr} (538°F). Using the adjusted values, a least squares best estimate of CF is determined to be 243°F. The predicted ΔRT_{NDT} in the following table is then determined using CF = 243°F.

Table 3: Heat W5214

Capsule ID (including source)	Cu	Ni	Irradiation Temperature (°F)	Fluence Factor	Measured ΔRT_{NDT} (°F)	Adjusted ΔRT_{NDT} (°F)	Predicted ΔRT_{NDT} (°F)	(Adjusted -Predicted) ΔRT_{NDT} (°F)
HB2 T	0.34	0.66	546	1.377	298	331	335	-3
HB2 V	0.34	0.66	546	0.857	211	237	208	29
IP2 V	0.21	1.04	524	0.81	196	184	197	-13
IP2 Y	0.21	1.04	529	0.78	196	189	190	-1
IP3 T	0.166	1.21	540	0.68	155	171	165	6
IP3 Y	0.166	1.21	540	0.909	176	194	221	-27
IP3 Z	0.166	1.21	540	1.011	235	258	246	12

The above set of surveillance results are considered non-credible because 29°F exceeds the allowed deviation for welds of 28°F. The H. B. Robinson 2 surveillance weld differs substantially from the best estimate for the Palisades reactor vessel limiting weld. The HBR2 surveillance weld was fabricated using a different procedure (single versus tandem arc), has substantially different chemistry (0.34% Cu versus 0.213% Cu, 0.66% Ni versus 1.01% Ni) and was exposed to a different irradiation temperature (546°F versus 533°F). Removing the HBR2 results from the above information results in the following table. The measured values are adjusted to the normalized chemistry (0.184% Cu and 1.142% Ni, CF = 228°F) and normalized T_{irr} (535°F). Using the adjusted values, a least squares best estimate of CF is determined to be 233°F. The predicted ΔRT_{NDT} in the following table is then determined using CF = 233°F.

Table 3: Heat W5214

Capsule ID (including source)	Cu	Ni	Irradiation Temperature (°F)	Fluence Factor	Measured ΔRT_{NDT} (°F)	Adjusted ΔRT_{NDT} (°F)	Predicted ΔRT_{NDT} (°F)	(Adjusted -Predicted) ΔRT_{NDT} (°F)
IP2 V	0.21	1.04	524	0.81	196	181	189	-8
IP2 Y	0.21	1.04	529	0.78	196	186	182	4
IP3 T	0.166	1.21	540	0.68	155	169	159	10
IP3 Y	0.166	1.21	540	0.909	176	191	212	-21
IP3 Z	0.166	1.21	540	1.011	235	253	236	17

The above set of surveillance results are considered credible because all of the measurements fall within the allowed deviation for welds of 28°F. Adjusting the results to the Palisades estimates of T_{irr} = 533°F and CF = 231°F, results in the following table. Using the adjusted values, a least squares best estimate of CF is determined to be 238°F. The predicted ΔRT_{NDT} in the following table is then determined using CF = 238°F.

Table 3: Heat W5214

Capsule ID (including source)	Cu	Ni	Irradiation Temperature (°F)	Fluence Factor	Measured ΔRT_{NDT} (°F)	Adjusted ΔRT_{NDT} (°F)	Predicted ΔRT_{NDT} (°F)	(Adjusted -Predicted) ΔRT_{NDT} (°F)
IP2 V	0.21	1.04	524	0.81	196	185	193	-8
IP2 Y	0.21	1.04	529	0.78	196	190	186	4
IP3 T	0.166	1.21	540	0.68	155	172	162	10
IP3 Y	0.166	1.21	540	0.909	176	195	217	-22
IP3 Z	0.166	1.21	540	1.011	235	258	241	17

Although the surveillance results meet the credibility criterion and the Indian Point 2 and 3 reactor vessels experience similar operating conditions as the Palisades reactor vessel, the chemistry factor for Palisades reactor vessel welds fabricated with weld wire heat number W5214 will be determined from the best estimate copper and nickel measurements using Table 1 of 10CFR50.61. The results derived from surveillance data is sensitive to subjective arguments and assumptions, and as a result, different evaluators may arrive at substantially different conclusions. Because these conclusions may vary, Consumers Energy is of the opinion that it is prudent to continue to base evaluations of PTS on the best estimate copper and nickel concentrations for the reactor vessel beltline materials.

NRC Request:

3. *If the limiting material for your plant changes or if the adjusted reference temperature for the limiting material increases as a result of the above evaluations, provide the revised RT_{PTS} value for the limiting material in accordance with 10 CFR 50.61. In addition, if the adjusted RT_{NDT} value increased, provide a schedule for revising the PT and LTOP limits. The schedule should ensure that compliance with 10 CFR Part 50 Appendix G is maintained.*

Consumers Energy Response:

The Palisades reactor vessel remains limited by the beltline axial welds fabricated with weld wire heat number W5214. At this time, Consumers Energy continues to discuss the rate of fluence accumulation to the Palisades reactor vessel with the NRC. The estimated fluence for when the limiting material will reach the PTS screening criteria is revised to 1.58×10^{19} n/cm². Based on projections supplied in our April 4, 1996, fluence submittal, Consumers Energy estimates this fluence level will be reached around the year 2012. Given that the NRC has not yet accepted the bias measured in our fluence calculations, it is projected that the limiting material will reach the screening criteria around the year 2004. These dates are slightly beyond previously projected PTS screening criteria dates.