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New York Power Authority

James Knubel
Senior Vice President and
Chief Nuclear Officer

September 4, 1998
IPN-98-096

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

Subject: **Indian Point 3 Nuclear Power Plant**
Docket No. 50-286
Response to Request for Additional Information Regarding Response to Generic Letter 92-01: Reactor Vessel Structural Integrity (TAC No. M83473)

Reference: NRC letter, George F. Wunder to James Knubel, "Request for Additional Information Regarding Response to Generic Letter 92-01, 'Reactor Vessel Structural Integrity' – Indian Point Unit 3 (TAC No. M83473)," dated June 3, 1998.

This letter provides a response to the NRC's request for additional information (Reference) regarding Generic Letter 92-01. The NRC's questions followed by the Authority's responses are contained in Attachment I. Attachment II contains supporting documentation for the information provided in Attachment I.

The portions of the Combustion Engineering report which are included as Attachment II are copyright protected. Attachment II includes a letter from Combustion Engineering granting permission for the Authority and the NRC to make use of this document.

A028

This submittal contains no new commitments. If you have any questions, please contact Ms. C. D. Faison.

Very truly yours,

J. Knubel
Senior Vice President and
Chief Nuclear Officer

Attachments: I - Response to Request for Additional Information
II - Portions of the Combustion Engineering Report, CE-NPSD-1119, Revision 1, "Updated Analysis for Combustion Engineering Fabricated Reactor Vessel Welds Best Estimate Copper and Nickel Content," dated July 1998.

cc: Regional Administrator
U.S. Nuclear Regulatory Commission
475 Allendale Road
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Resident Inspector's Office
Indian Point Unit 3
U.S. Nuclear Regulatory Commission
P.O. Box 337
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Mr. George F. Wunder, Project Manager
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ATTACHMENT I TO IPN-98-096

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER 92-01: REACTOR VESSEL STRUCTURAL INTEGRITY

NEW YORK POWER AUTHORITY
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
DPR-64

Response to Request for Additional Information

Question 1:

Provide the following:

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 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 RAI on the use of surveillance data when responding.

Response:

Two weld wire heats (13253 and 34B009 with Ni-200) were used by Combustion Engineering for the IP3 reactor vessel to fabricate the beltline welds. These two weld wire heats were identified in Reference 1 and are now further updated in CEOG report, "Updated Analysis for Combustion Engineering Fabricated Reactor Vessel Welds Best Estimate Copper and Nickel Content," (Reference 2).

The additional information in Reference 2 has revised the copper and nickel values as follows:

Weld Wire Heat Number	Previously Submitted* Copper Value	New Submitted Copper Value	Previously Submitted* Nickel Value	New Submitted Nickel Value
13253	0.210%	0.221%	0.726%	0.732%
34B009 with Ni-200	0.184%	0.192%	0.926%	1.007%

* NYPA letter to NRC (IPN-95-121), "Generic Letter 92-01, Revision 1, Supplement 1: Reactor Vessel Structural Integrity – Six Month Response," dated November 20, 1995.

Table 1 has been completed, as requested, and is provided at the end of this attachment. As IP3 is still baseplate limited, information for both the welds and baseplate is included. It should be noted that the chemistry factor and the end of life (EOL) fluence values used for Baseplate B2803-3 in this table contain the conservative assumptions adopted during the licensing process for approval of the Indian Point 3 heatup and cooldown curves (Reference 5).

The best estimate techniques used to determine the chemistry values for the above new submitted values for the weld wire heats used in Indian Point Unit 3 reactor vessel are identified in Reference 2 and are provided below.

Weld Wire Heat Number	Copper Value Basis	Nickel Value Basis
13253	Weighted Mean	Weighted Mean
34B009 with Ni-200	Weighted Copper	Best Estimate

- The methodology used for determining best estimate chemistries are described in detail in Reference 1. One flow chart and process description is provided for the data pedigree process. This establishes the source information and validity of each weld deposit chemical analysis record. The second flow chart and process description is provided for the data analysis process. This establishes the mean values, identifies relevant supporting data, and enables selection of best estimate copper and nickel content.

- For each heat, observations concerning differences in mean chemistry obtained by each method are cited in Reference 1 in accordance with the data analysis process. The rationale used to select which mean value for the beat estimate is documented in the text of Reference 1.

- As noted, the consideration given for each heat is documented (Reference 1) as are the details of the process, such that a justification is provided or can be reconstructed for each and every heat.

- Best Estimate Nickel for Nickel Addition Welds (34B009 with Ni-200)

  Figure 5-4 and Table 5-4 of Reference 1 present the data used previously to develop a best estimate for the nickel content in welds fabricated using a combination of a Mn-Mo electrode and a Ni-200 cold wire feed. For this type of submerged arc weld process, there was insufficient nickel in the available wire heats, so pure nickel was added during welding to raise the nickel content of the weld deposit to approximately 1.0%. Combustion Engineering performed an analysis of chip samples from the weld groove during welding to ascertain that the Ni-200 wire feed rate was sufficient to yield the desired nickel content in the weld deposit. Additional analyses have been performed of the through-wall nickel content to determine the variation in the as-deposited nickel. In an evaluation cited in Reference 1, the nickel varied through-wall from 0.72% to 1.08% based on 20 separate analyses. It is assumed that the measurements were taken at the same interval through the thickness, but the available records are not conclusive with respect to sample location. However, other data in which the sample location was clearly documented gave similar results; that is, the nominal nickel content was 1% through the majority of the weld thickness but varied near the weld root and weld surfaces.

  The nickel addition welding process was used for a limited period of time for beltline welds and was employed with about five unique heats of Mn-Mo electrodes and several heats of Ni-200 wire. (Note: A sixth heat, 3277, was used for fabrication of a weld for a surveillance program but was not used with Ni-200 in a vessel beltline weld. The data for heat 3277 with Ni-200 are included in Table 4 of Reference 2.) There are weld deposit nickel measurements available for all five Mn-Mo heats. There are only two nickel measurements representing nickel addition welds available for two of the five heats, whereas there are 8, 362, and 435 measurements, respectively, representing nickel addition welds available for the other three heats.

Given the definitions of best estimate nickel in paragraph (c)(1)(iv)(A) of Reference 3, consideration was given to using the mean nickel based on heat specific measurements or the stipulated default value of 1% Ni. In the former case, two of the Mn-Mo heats would have to rely on only two measurements if Mn-Mo heat results were to be used, whereas the three other heats would have from 8 to 435 measurements to determine the best estimate nickel content. (Note: the definition of 'heat' in Reference 3 is interpreted to mean the heat of Mn-Mo weld wire and not the combination of Mn-Mo and pure nickel wire used in fabricating the weld. There were numerous combinations of Mn-Mo heats and Ni-200 wire heats use for various vessels. If both the Mn-Mo and Ni-200 heats are used to define unique combinations of heats, it would unnecessarily complicate the determination of the best estimate nickel content. This is considered unnecessary because the heat-to-heat variation of nickel contributed from the 99% pure nickel wire in a weld deposit comprised of approximately 99% Mn-Mo electrode wire would probably not be detectable. Furthermore, the observed nickel variation of 0.72% to 1.08% would mask any variability from the heat of nickel. The unique heat of Ni-200 used was, therefore, not considered when establishing the best estimate nickel content of the weld deposit.)

If the stipulated default value of 1% Ni from Reference 3 were used, it would provide a reasonable approximation of the nickel content given that it is the same as the specified target value of 1.0% for nickel addition welds. However, use of the default value would not properly account for the available measurements.

In Reference 1, the approach taken was to determine a best estimate specific to the nickel addition process using all of the data available on nickel addition welds from six specific Mn-Mo heats. The bulk of the nickel in the weld deposit came from the Ni-200 feed wire, not from the Mn-Mo electrode heat. (As discussed in Section 1 of Reference 2, nickel was not intentionally added to the Mn-Mo wire, and the nickel content of such wires averaged 0.09%). Therefore, the nickel content in the Ni-200 addition welds will be minimally sensitive to the heat of wire.

In Reference 1, a value of 1.038% was determined for the nickel content in Ni-200 addition welds fabricated by Combustion Engineering. This value was based on the simple mean of the data shown in Table 4 which consist of 148 weld deposit nickel measurements from welds known to have been fabricated using Ni-200. As part of the current evaluation, additional nickel measurements for two of the welds in Table 4 of Reference 2 were made available. Those nickel data were reported in Attachments 4 and 5 to Reference 4 and are reproduced in an enclosure to Reference 2. The evaluation that follows provides a reanalysis of the expanded set of nickel measurements to provide a best estimate for the Ni-200 addition process (as opposed to a Mn-Mo wire heat specific number).

The best estimate for nickel described below is specific to the process and not to the heat of Mn-Mo wire or the heat of Ni-200 wire. It is the mean of measured values for a weld deposit made using the Mn-Mo wire plus Ni-200 addition weld process. It is not 'generic' because it employs data including the specific heats of Mn-Mo wire used, and it specifically considers results from the various heats of Ni-200 wire used. It is the best estimate nickel for nickel addition welds made by Combustion Engineering using the following Mn-Mo wire heats:

1248;
1248 & 661H577;
34B009;
39B196;
34B009 & 39B196; and
W5214.

In Table 4 of Reference 2, there are 148 individual measurements listed. As indicated above, a large number of additional measurements were made available using Attachments 4 and 5 from Reference 4. With the added data, two of the heats now have over 360 individual measurements versus as few as two individual measurements for two heats, yielding a total of 815 individual measurements. Using all 815 measurements to obtain a simple mean, as was done in Reference 1, would give considerable weight to the two welds with over 360 measurements each. Therefore, the analysis proceeded using a sample weighted mean.

The sample weighting followed the same concept as in Reference 1 where each 'sample' was a unique weldment as defined by the 'group tag' and the heat number. The group tags from Reference 1 are included in Table 4 of Reference 2. (Note 1: In Reference 1 a sample was specific to a heat. In this case, the definition of sample was broadened to include all the nickel addition welds where heat number plus group tag defined a unique sample. Note 2: For records #9 and #10 in Table 4 of Reference 2, heat 1248 & 661H577, the two samples were assigned unique group tags in Reference 1. This was reconsidered given that the heat, flux lot and analysis data were identical and the log numbers were sequential. For purposes of this analysis the two records were treated as one sample with the same tag.)

For the measurements associated with each unique sample, a mean value was determined. An exception was made for records 38 through 49 and 93 through 125; the data and sample means from Attachments 4 and 5 of Reference 4 were used instead. (The data from Reference 4 are a much more complete set than that reported in Reference 1 and, therefore, the larger data sets were used to compute the sample means.)

Table 4A of Reference 2 presents a summary of the sample means and the calculation of sample weighted means for the nickel addition welds. There are 20 unique nickel addition welds which were fabricated using six different Mil B4 wire heats or combinations of heats. The individual sample means ranged from 0.585% Ni to 1.20% Ni. The number of measurements obtained for each sample ranged from 1 to 371 for a total of 815 measurements. The sample weighted mean was derived using the sum of the 20 sample means divided by the number of samples, which resulted in a value of 1.007% Ni for the nickel addition welds. This value is very close to the specified target value for nickel addition welds.

Two other approaches were used to assess the magnitude of the sample weighted mean. One approach was to take the mean of the nine samples for which four or more measurements were obtained. This resulted in a mean of 0.96% Ni. The other approach was to use volume weighting with the following scale:

1 to 5 measurements	Weight of 1;
6 to 10 measurements	Weight of 2;
11 to 20 measurements	Weight of 3;
21 to 50 measurements	Weight of 4; and
Over 50 measurements	Weight of 5.

The volume weighting approach yielded a mean of 1.007% nickel. The volume and measurement based approaches produced a mean equal to or less than the sample weighted mean. Therefore, it appears that the calculation given in Table 4A of Reference 2 is a reasonable representation of the mean nickel for a nickel addition weld. Furthermore, it is apparent from this table that the sample means vary within a heat such that basing nickel content on one set of measurements is less reliable than using the sample weighted mean for a nickel addition weld.

Therefore, for welds made by Combustion Engineering using the nickel addition process with weld wire heats listed above, the best estimate for the weld deposit nickel content is 1.007%.

Question 2:

(1) The information listed in Table 2, Table 3, and the chemistry factor from the surveillance data should be provided for each heat of material for which surveillance weld data are available and 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).

Response:

The Indian Point Unit 3 limiting beltline material has not changed nor is it affected by the data and information provided in References 1 and 2. No additional information has been found for the plate material. The limiting material remains the lower shell plate B2803-3. Therefore the current heatup and cooldown curves, approved by Reference 5, remain valid. Tables 2 and 3 have been completed, as requested, and are provided at the end of this attachment.

Question 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 50 Appendix G is maintained.

Response:

The limiting material for Indian Point 3 has not changed. Indian Point 3 is still base plate limited, rather than weld limited. Therefore, the current pressure-temperature and low temperature overpressure protection (LTOP) limits, approved by Reference 5, are not affected.

Question 4:

The initial RT_{NDT} that you reported for the heat No. 13253 weld may not be conservative. Please review the initial RT_{NDT} values for welds made of weld wire with heat No. 13253 from all plants, not just D.C. Cook 1, to determine the appropriate value for weld 9-042.

The initial USE that you reported for the heat No. 34B009 weld may not be conservative. Please review the initial USE for welds made with weld wire of heat No. 34B009 from all plants to determine the appropriate value for the axial welds. The revised EOL fluence should also be reported.

Response:

The Authority has reviewed the initial RT_{NDT} values for welds made of weld wire with heat number 13253, flux type 1092, and flux lot 3791 for determining if our reported value for Indian Point Unit 3 is conservative. The reported IP3 initial RT_{NDT} value (-54°F) is the WOG Data Base Mean Value (Reference 7). In addition, three other reactor vessels that match the Indian Point 3 heat number, flux type, and flux lot have identified the following initial RT_{NDT} values.

Plant	Initial RT_{NDT} Value	Source
Salem 1	-56°F	RVID
DC Cook 1	-56°F	RVID
Hatch 1	-50°F	Reference 6

Since the average from these plants' reported values is also -54°F, this value is considered by the Authority to be an appropriate initial RT_{NDT} value.

The initial USE of 120 ft/lb for heat No. 34B009 weld was incorrectly taken from the Indian Point No. 3 surveillance weld, heat W5214. The appropriate USE is 112 ft/lb based on Millstone Unit 1 surveillance weld heat No. 34B009 (Reference 8). The revised EOL fluence is 1.12×10^{19} n/cm^2. This is based on the assumptions for flux and fluence on which the current heatup/cooldown curves are based (Reference 5).

References:

1. Combustion Engineering Owners Groups Report, CE NPSD-1039, Revision 2, "Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds," June 1997.

2. Combustion Engineering Report, CE-NPSD-1119, Revision 1, "Updated Analysis for Combustion Engineering Fabricated Reactor Vessel Welds Best Estimate Copper and Nickel Content," dated July 1998.

3. "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," 10CFR 50.61, Federal Register, Vol. 60, No. 243, December 19, 1995.

4. Consumers Power Company Letter dated November 15, 1995, R. W. Smedley to Nuclear Regulatory Commission, "Response to NRC Generic Letter 92-01, Revision 1, Supplement 1: Reactor Vessel Structural Integrity."

5. NRC letter, G. F. Wunder to J. Knubel (Amendment 179), "Issuance of Amendment for Indian Point Nuclear Generating Unit No. 3 (TAC No. M99928)," dated April 10, 1998.

6. Southern Company letter to NRC, "Edwin I. Hatch Nuclear Plant – Unit 1: Response to Verbal Request for Information on Pressure/Temperature Technical Specification Revision Request," dated May 28, 1997.

7. Indian Point Unit 3 Reactor Vessel Fluence and RT_{PTS} Evaluation - WCAP-11045, Revision 1, June 1989.

8. Northeast Utilities Company letter to NRC, "Haddam Neck Plant, Millstone Nuclear Power Station, Unit No.s 1, 2, and 3 - Reactor Vessel Structural Integrity, 10 CFR 50.54(f), (Generic Letter 92-01, Revision 1)," dated July 6, 1992.

Table 1

Facility: Indian Point 3
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_1	σ_Δ	Margin	RT_{PTS} at EOL
A0512-2 (H) B2803-3 (B)	0.24	0.52	1.12096	168.12	Surveillance	74°F	0	8.5°F	17°F	264.36°F
34B009 (W)	0.192	1.007	1.12096	221.3	Tables	-56°F	0	28°F	56°F	228.36°F
13253 (W)	0.221	0.732	1.12096	189.1	Tables	-54°F	0	28°F	56°F	197.13°F
W5214 (W)	0.15	1.02	1.12096*	191.9	Tables	-56°F	0	28°F	56°F	224.02°F

*Fluence factor used is same as for beltline welds even though this weld, the surveillance weld, is not a beltline weld.

(1) H = Heat number B = Baseplate W = Weld Wire
(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
34B009	Intermediate and Lower Shell Longitudinal Seam Weld
13253	Intermediate to Lower Shell Girth Seam Weld
W5214	Surveillance Weld

Table 2: Heat A0512-2 (B2803-3 Baseplate)

Capsule ID (including source)	Cu (%)	Ni (%)	Irradiation Temperature (°F)	Fluence[1] ($x10^{19}$ n/cm^2) on capsule	Measured ΔRT_{NDT} (°F)	Data Used in Assessing Vessel (Y or N)
T	0.24	0.52	539.1	0.312	118	Y
Y	0.24	0.52	539.1	0.724	150	Y
Z	0.24	0.52	539.1	1.04	155	Y

Table 3: Heat A0512-2 (B2803-3 Baseplate)

Capsule ID (including source)	Cu (%)	Ni (%)	Irradiation Temperature (°F)	Fluence Factor[1] (on capsule)	Measured ΔRT_{NDT} (°F)	Adjusted ΔRT_{NDT} (°F)	Predicted ΔRT_{NDT} (°F)	(Adjusted-Predicted) ΔRT_{NDT} (°F)
T	0.24	0.52	539.1	0.6804	118	118	106	12
Y	0.24	0.52	539.1	0.9094	150	150	150	0
Z	0.24	0.52	539.1	1.0110	155	155	163	-8

(1) All capsule fluences re-evaluated under WCAP-14044, "Westinghouse Surveillance Capsule Neutron Fluence Re-evaluation," April 1994.

Table 2: Heat W5214 (Surveillance Weld)

Capsule ID (including source)	Cu[1] (%)	Ni[1] (%)	Irradiation Temperature (°F)	Fluence[2] ($x10^{19}$ n/cm^2) on capsule	Measured ΔRT_{NDT} (°F)	Data Used in Assessing Vessel (Y or N)
T	0.15	1.02	539.1	0.312	143	Y
Y	0.166	1.21	539.1	0.724	180	Y
Z	0.15	1.02	539.1	1.04	220	Y

Table 3: Heat W5214 (Surveillance Weld)

Capsule ID (including source)	Cu[1] (%)	Ni[1] (%)	Irradiation Temperature (°F)	Fluence Factor[2] on capsule	Measured ΔRT_{NDT} (°F)	Adjusted ΔRT_{NDT} (°F)	Predicted ΔRT_{NDT} (°F)	(Adjusted-Predicted) ΔRT_{NDT} (°F)
T	0.15	1.02	539.1	0.6804	143	143	137	6
Y	0.166	1.21	539.1	0.9094	180	180	193	-13
Z	0.15	1.02	539.1	1.0110	220	220	210	10

(1) The Capsule Y chemical analysis resulted in Cu and Ni values greater than Capsules T and Z. The Capsule Y results are not consistent with Capsule T and Z values. Pending analysis of the next surveillance capsule, the chemistry factor for the surveillance weld will be based on Capsules T and Z. This results in a higher adjusted ΔRT_{NDT} for the girth and longitudinal welds.

(2) All capsule fluences re-evaluated under WCAP-14044, "Westinghouse Surveillance Capsule Neutron Fluence Re-evaluation," April 1994.

Table 2: Heat 13253 (Girth Weld)

Capsule ID (including source)	Cu(1) (%)	Ni(1) (%)	Irradiation Temperature (°F)	Fluence(2) ($x10^{19}$ n/cm^2) on capsule	Measured ΔRT_{NDT} (°F)	Data Used in Assessing Vessel (Y or N)
T	0.221	0.732	539.1	0.312	143	Y
Y	0.221	0.732	539.1	0.724	180	Y
Z	0.221	0.732	539.1	1.04	220	Y

Table 3: Heat 13253 (Girth Weld)

Capsule ID (including source)	Cu(1) (%)	Ni(1) (%)	Irradiation Temperature (°F)	Fluence Factor(2) on capsule	Measured ΔRT_{NDT} (°F)	Adjusted ΔRT_{NDT}(3) (°F)	Predicted ΔRT_{NDT} (°F)	(Adjusted-Predicted) ΔRT_{NDT} (°F)
T	0.221	0.732	539.1	0.6804	143	140.9	137	3.9
Y	0.221	0.732	539.1	0.9094	180	177.4	193	-15.6
Z	0.221	0.732	539.1	1.0110	220	216.8	210	6.8

(1) Weld Cu and Ni data is not from the capsule analysis but has been taken from document CE-NPSD-1119, Revision 1, "Updated Analysis for Combustion Engineering Fabricated Reactor Vessel Welds Best Estimate Copper and Nickel Content," dated July 1998.

(2) All capsule fluences re-evaluated under WCAP-14044, "Westinghouse Surveillance Capsule Neutron Fluence Re-evaluation," April 1994.

(3) Adjusted ΔRT_{NDT} $= CF_{13253}/CF_{surv\ weld}$ x Measured ΔRT_{NDT}
$= 189.1°F/191.9°F$ x Measured ΔRT_{NDT}
$= 0.9854$ x Measured ΔRT_{NDT}

Table 2: Heat 34B009 (Longitudinal Weld)

Capsule ID (including source)	Cu[(1)] (%)	Ni[(1)] (%)	Irradiation Temperature (°F)	Fluence ($x10^{19}$ n/cm^2)[(2)] on capsule	Measured ΔRT_{NDT} (°F)	Data Used in Assessing Vessel (Y or N)
T	0.192	1.007	539.1	0.312	143	Y
Y	0.192	1.007	539.1	0.724	180	Y
Z	0.192	1.007	539.1	1.04	220	Y

Table 3: Heat 34B009 (Longitudinal Weld)

Capsule ID (including source)	Cu[(1)] (%)	Ni[(1)] (%)	Irradiation Temperature (°F)	Fluence Factor[(2)] on capsule	Measured ΔRT_{NDT} (°F)	Adjusted ΔRT_{NDT}[(3)] (°F)	Predicted ΔRT_{NDT} (°F)	(Adjusted-Predicted) ΔRT_{NDT} (°F)
T	0.192	1.007	539.1	0.6804	143	164.9	137	27.9
Y	0.192	1.007	539.1	0.9094	180	207.6	193	14.6
Z	0.192	1.007	539.1	1.0110	220	253.7	210	43.7

(1) Weld Cu and Ni data is not from the capsule analysis but has been taken from document CE-NPSD-1119, Revision 1, "Updated Analysis for Combustion Engineering Fabricated Reactor Vessel Welds Best Estimate Copper and Nickel Content," dated July 1998.

(2) All capsule fluences re-evaluated under WCAP-14044, "Westinghouse Surveillance Capsule Neutron Fluence Re-evaluation," April 1994.

(3) Adjusted ΔRT_{NDT} $= CF_{34B009}/CF_{surv\ weld} \times$ Measured ΔRT_{NDT}
$= 221.3°F/191.9°F \times$ Measured ΔRT_{NDT}
$= 1.1532 \times$ Measured ΔRT_{NDT}

ATTACHMENT II TO IPN-98-096

COMBUSTION ENGINEERING REPORT:
UPDATED ANALYSIS FOR COMBUSTION ENGINEERING FABRICATED REACTOR VESSEL WELDS BEST ESTIMATE COPPER AND NICKEL CONTENT
JULY 1998

NEW YORK POWER AUTHORITY
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
DPR-64

ATTACHMENT II TO IPN-98-096

EXCERPTS FROM THE COMBUSTION ENGINEERING REPORT: UPDATED ANALYSIS FOR COMBUSTION ENGINEERING FABRICATED REACTOR VESSEL WELDS BEST ESTIMATE COPPER AND NICKEL CONTENT JULY 1998

NEW YORK POWER AUTHORITY
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
DPR-64

ABB
ASEA BROWN BOVERI

PENG-98-198
September 1, 1998

Mr. Karl Jacobs
New York Power Authority
123 Main Street
White Plains, NY 10601

Subject: Release to Copy CE NPSD-1119, Revision 01

Dear Mr. Jacobs:

In response to your request, the New York Power Authority is released to copy the information from the following report for purposes of responding to questions raised by the Nuclear Regulatory Commission:

> "Updated Analysis for Combustion Engineering Fabricated Reactor Vessel Welds Best Estimate Copper and Nickel Content", CE NPSD-1119, Revision 1, dated July 1998.

CE NPSD-1119 was prepared on behalf of the C-E Owners Group to enable the participants in CEOG Task 1054 to address NRC questions and comments regarding reactor pressure vessel weld materials. As a participant in that task, the New York Power Authority is free to use the report in support of its submittals to the NRC. The Combustion Engineering, Inc. copyright was not intended to restrict use of CE NPSD-1119 in such applications. Furthermore, this letter shall serve as authorization from ABB Combustion Engineering to allow the NRC to make copies of the subject report for the purpose of displaying copies in the Public Documents Room, NRC File Center, and input into NUDOCS.

Thank you for bringing this matter to my attention. Thank you also for your continuing support of the CEOG Reactor Vessel Working Group activities.

Sincerely,
Combustion Engineering, Inc.
Stephen T. Byrne
Stephen T. Byrne
Project Manager

cc: W.H. Spatoro, NYPA
S. Lurie
A. Sowers

ABB Combustion Engineering Nuclear Power

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TABLE 4
WELD DEPOSIT NICKEL FOR NICKEL ADDITION WELDS

Rec #	Heat	Ni (%)	Analysis/ Report No.	Pedigree	Group Tag	Wgtd Ni	# Coils (Est)	Source ID
1	1248	.94	D4347	VALID	a	0.94	N/A	WDC-0361
2	1248, 1248	1.20	D4322	VALID	b	1.20		WDC-0390
3	1248, 1248	1.15	D3911	VALID	j			WDC-0391
4	1248, 1248	1.23	D3912	VALID	j	1.19		WDC-0392
5	1248, 1248	.93	D4050	VALID	k			WDC-0393
6	1248, 1248	.94	D4049	VALID	k			WDC-0394
7	1248, 1248	.95	D4048	VALID	k	0.96		WDC-0395
8	1248, 1248	1.02	D4051	VALID	k			WDC-0396
9	1248, 661H577	1.09	D3862	VALID	a			WDC-0397
10	1248, 661H577	1.12	D3861	VALID	b	1.105		WDC-0398
11	3277, 3277	.43	BCL-(8-25-77)	VALID	a			WDC-0654
12	3277, 3277	.63	WCAP-10637	VALID	a			WDC-0655
13	3277, 3277	1.27	BCL-(8-25-77)	VALID	a			WDC-0656
14	3277, 3277	1.28	BCL-(8-25-77)	VALID	a			WDC-0658
15	3277, 3277	1.38	WCAP-10637	VALID	a			WDC-0659
16	3277, 3277	1.60	WCAP-10637	VALID	a	1.098		WDC-0660
17	34B009	.32	CPL-84-070 4/84	VALID	d			WDC-1776
18	34B009	.43	CPL-84-070 4/84	VALID	d			WDC-1774
19	34B009	.75	CPL-84-070 4/84	VALID	d			WDC-1775
20	34B009	.84	CPL-84-070 4/84	VALID	d	0.585		WDC-1777
21	34B009, 34B009	.08	NEDC-30299	VALID	b			WDC-1790
22	34B009, 34B009	.11	NEDC-30299	VALID	b			WDC-1789
23	34B009, 34B009	.38	NEDC-30299	VALID	b			WDC-1791
24	34B009, 34B009	.59	GE (SEE MEMO)	VALID	b			WDC-1793
25	34B009, 34B009	.86	NEDC-30299	VALID	b			WDC-1781
26	34B009, 34B009	.94	NEDC-30299	VALID	b			WDC-1792
27	34B009, 34B009	.95	NEDC-30299	VALID	b			WDC-1782
28	34B009, 34B009	.96	NEDC-30299	VALID	b			WDC-1783
29	34B009, 34B009	.99	GE (SEE MEMO)	VALID	b			WDC-1795
30	34B009, 34B009	.99	NEDC-30299	VALID	b			WDC-1784
31	34B009, 34B009	1.06	NEDC-30299	VALID	b			WDC-1788
32	34B009, 34B009	1.06	NEDC-30299	VALID	b			WDC-1785
33	34B009, 34B009	1.09	NEDC-30299	VALID	b			WDC-1786
34	34B009, 34B009	1.09	GE (SEE MEMO)	VALID	b			WDC-1794
35	34B009, 34B009	1.30	NEDC-30299	VALID	b			WDC-1787
36	34B009, 34B009	1.78	GE (SEE MEMO)	VALID	b			WDC-1796
37	34B009, 34B009	1.03	NEDC-30833	VALID	b	0.898		WDC-0869
38	34B009, 34B009	1.14	D44856	VALID	c			WDC-0870
39	34B009, 34B009	1.22	ICP	VALID	c			WDC-0871
40	34B009, 34B009	1.29	D44854	VALID	c			WDC-0872
41	34B009, 34B009	1.33	D44855	VALID	c			WDC-0873
42	34B009, 34B009	1.14	D44858	VALID	c			WDC-0874
43	34B009, 34B009	1.21	D44857	VALID	c			WDC-0875
44	34B009, 34B009	1.26	ICP	VALID	c			WDC-0876
45	34B009, 34B009	1.38	D44859	VALID	c			WDC-0877
46	34B009, 34B009	.94	D44852	VALID	c			WDC-0878
47	34B009, 34B009	1.05	ICP	VALID	c			WDC-0879

TABLE 4 (Cont'd)

Rec #	Heat	Ni (%)	Analysis/ Report No.	Pedigree	Group Tag	Wgtd Ni	# Coils (Est)	Source ID
48	34B009, 34B009	1.05	D14853	VALID	c		N/A	WDC-0880
49	34B009, 34B009	1.18	D14851	VALID	c	1.09 from Ref. 4		WDC-0881
50	39B196, 39B196	1.14	WCAP-10694	VALID	b			WDC-0883
51	39B196, 39B196	1.26	WCAP-10694	VALID	b	1.20		WDC-0884
52	W5214	.99	D4688	VALID	c	0.99		WDC-1650
53	W5214	.63	WCAP-10304	VALID	j			WDC-1654
54	W5214	.66	WCAP-10304	VALID	j			WDC-1655
55	W5214	.69	WCAP-10304	VALID	j	0.66		WDC-1656
56	W5214	.90	T.R.Mager, 5/83	VALID	u			WDC-1771
57	W5214	.99	T.R.Mager, 5/83	VALID	u			WDC-1770
58	W5214	1.00	T.R.Mager, 5/83	VALID	u			WDC-1773
59	W5214	1.08	T.R.Mager, 5/83	VALID	u	0.9925		WDC-1772
60	W5214, W5214	.96	D4660	VALID	d			WDC-1675
61	W5214, W5214	.92	D4687	VALID	d			WDC-1676
62	W5214, W5214	1.12	D4674	VALID	d	1.00		WDC-1677
63	W5214, W5214	.97	D4686	VALID	e			WDC-1678
64	W5214, W5214	1.05	D4673	VALID	e	1.01		WDC-1679
65	W5214, W5214	.72	D4494	VALID	h			WDC-1688
66	W5214, W5214	.76	D4494	VALID	h			WDC-1689
67	W5214, W5214	.77	D4494	VALID	h			WDC-1690
68	W5214, W5214	.81	D4494	VALID	h			WDC-1691
69	W5214, W5214	.81	D4494	VALID	h			WDC-1692
70	W5214, W5214	.81	D4494	VALID	h			WDC-1693
71	W5214, W5214	.96	D4494	VALID	h			WDC-1694
72	W5214, W5214	.96	D4494	VALID	h			WDC-1695
73	W5214, W5214	.97	D4494	VALID	h			WDC-1696
74	W5214, W5214	.98	D4494	VALID	h			WDC-1697
75	W5214, W5214	.98	D4494	VALID	h			WDC-1698
76	W5214, W5214	.99	D4494	VALID	h			WDC-1699
77	W5214, W5214	1.00	D4494	VALID	h			WDC-1700
78	W5214, W5214	1.01	D4494	VALID	h			WDC-1701
79	W5214, W5214	1.01	D4494	VALID	h			WDC-1702
80	W5214, W5214	1.03	D4494	VALID	h			WDC-1703
81	W5214, W5214	1.03	D4494	VALID	h			WDC-1704
82	W5214, W5214	1.05	D4494	VALID	h			WDC-1705
83	W5214, W5214	1.06	D4494	VALID	h			WDC-1706
84	W5214, W5214	1.08	D4494	VALID	h			WDC-1707
85	W5214, W5214	.69	SWRI-17-2108	VALID	h			WDC-1684
86	W5214, W5214	1.00	SWRI-17-2108	VALID	h			WDC-1685
87	W5214, W5214	1.02	SWRI-17-2108	VALID	h			WDC-1686
88	W5214, W5214	1.06	SWRI-17-2108	VALID	h			WDC-1687
89	W5214, W5214	1.15	WCAP-7323	INDETERMINATE	h			WDC-1836
90	W5214, W5214	.87	D4577	VALID	h			WDC-1710
91	W5214, W5214	.99	D4577	VALID	h			WDC-1711
92	W5214, W5214	1.07	D4604	VALID	h	0.951		WDC-1712
93	W5214, W5214	1.059	AEA-1	VALID	k			WDC-1713
94	W5214, W5214	1.066	AEA-2	VALID	k			WDC-1714

TABLE 4 (Cont'd)

Rec #	Heat	Ni (%)	Analysis/ Report No.	Pedigree	Group Tag	Wgtd Ni	# Coils (Est)	Source ID
95	W5214, W5214	1.127	AEA-2	VALID	k		N/A	WDC-1715
96	W5214, W5214	1.154	AEA-1	VALID	k			WDC-1716
97	W5214, W5214	1.156	AEA-1	VALID	k			WDC-1717
98	W5214, W5214	1.16	D44847	VALID	k			WDC-1718
99	W5214, W5214	1.18	D44846	VALID	k			WDC-1719
100	W5214, W5214	1.193	AEA-2	VALID	k			WDC-1720
101	W5214, W5214	1.23	ICP	VALID	k			WDC-1721
102	W5214, W5214	1.23	D44845	VALID	k			WDC-1722
103	W5214, W5214	1.29	D44845	VALID	k			WDC-1723
104	W5214, W5214	.96	ICP	VALID	k			WDC-1724
105	W5214, W5214	.96	AEA-2	VALID	k			WDC-1725
106	W5214, W5214	1.024	AEA-1	VALID	k			WDC-1726
107	W5214, W5214	1.107	AEA-2	VALID	k			WDC-1727
108	W5214, W5214	1.11	D44850	VALID	k			WDC-1728
109	W5214, W5214	1.149	AEA-1	VALID	k			WDC-1729
110	W5214, W5214	1.15	D44848	VALID	k			WDC-1730
111	W5214, W5214	1.18	D44850	VALID	k			WDC-1731
112	W5214, W5214	1.203	AEA-1	VALID	k			WDC-1732
113	W5214, W5214	1.204	AEA-2	VALID	k			WDC-1733
114	W5214, W5214	1.22	D44849	VALID	k			WDC-1734
115	W5214, W5214	1.29	D44848	VALID	k			WDC-1735
116	W5214, W5214	.78	ICP	VALID	k			WDC-1736
117	W5214, W5214	1.003	AEA-1	VALID	k			WDC-1737
118	W5214, W5214	1.006	AEA-2	VALID	k			WDC-1738
119	W5214, W5214	1.05	D44843	VALID	k			WDC-1739
120	W5214, W5214	1.09	D44842	VALID	k			WDC-1740
121	W5214, W5214	1.090	AEA-1	VALID	k			WDC-1741
122	W5214, W5214	1.093	AEA-1	VALID	k			WDC-1742
123	W5214, W5214	1.10	D44844	VALID	k			WDC-1743
124	W5214, W5214	1.104	AEA-2	VALID	k			WDC-1744
125	W5214, W5214	1.116	AEA-2	VALID	k	0.989 from Ref. 4		WDC-1745
126	W5214, W5214	1.02	WCAP-11815	VALID	l			WDC-1746
127	W5214, W5214	1.21	WCAP-11815	VALID	l	1.115		WDC-1747
128	W5214, W5214	1.06	T.R.Mager, 5/83	VALID	v			WDC-1767
129	W5214, W5214	1.09	T.R.Mager, 5/83	VALID	v			WDC-1769
130	W5214, W5214	1.11	T.R.Mager, 5/83	VALID	v	1.087		WDC-1768
131	W5214, W5214	1.01	D4295	INDETERMINATE	t			WDC-1749
132	W5214, W5214	1.03	D4278	INDETERMINATE	t			WDC-1750
133	W5214, W5214	1.03	D4283	INDETERMINATE	t			WDC-1751
134	W5214, W5214	1.04	D4293	INDETERMINATE	t			WDC-1752
135	W5214, W5214	1.04	D4296	INDETERMINATE	t			WDC-1753
136	W5214, W5214	1.04	D4311	INDETERMINATE	t			WDC-1754
137	W5214, W5214	1.06	D4277	INDETERMINATE	t			WDC-1755
138	W5214, W5214	1.06	D4284	INDETERMINATE	t			WDC-1756
139	W5214, W5214	1.06	D4286	INDETERMINATE	t			WDC-1757
140	W5214, W5214	1.06	D4292	INDETERMINATE	t			WDC-1758
141	W5214, W5214	1.07	D4345	INDETERMINATE	t			WDC-1759

TABLE 4 (Cont'd)

Rec #	Heat	Ni (%)	Analysis/ Report No.	Pedigree	Group Tag	Wgtd Ni	# Coils (Est)	Source ID
142	W5214, W5214	1.08	D4282	INDETERMINATE	t		N/A	WDC-1760
143	W5214, W5214	1.10	D4294	INDETERMINATE	t			WDC-1761
144	W5214, W5214	1.15	D4279	INDETERMINATE	t			WDC-1762
145	W5214, W5214	1.15	D4281	INDETERMINATE	t			WDC-1763
146	W5214, W5214	1.15	D4298	INDETERMINATE	t			WDC-1764
147	W5214, W5214	1.15	D4312	INDETERMINATE	t			WDC-1765
148	W5214, W5214	1.16	D4280	INDETERMINATE	t	1.08		WDC-1766

Weighted Mean Ni 1.007 % (See Table 4A)

TABLE 4A
Weld Deposit Nickel for Nickel Addition Welds

Heat No.	Group Tag	Sample Mean	Number of Samples
1248	a	0.94	1
1248	b	1.20	1
1248	j	1.19	2
1248	k	0.96	4
1248,661H577	a,b	1.105	2
3277	a	1.098	6
34B009	d	0.585	4
34B009	b	0.898	17
34B009	c	1.09	341
39B196	b	1.20	2
W5214	c	0.99	1
W5214	j	0.66	3
W5214	u	0.9925	4
W5214	d	1.00	3
W5214	e	1.01	2
W5214	h	0.951	28
W5214	k	0.989	371
W5214	l	1.115	2
W5214	v	1.087	3
W5214	t	1.08	18

Sum of Sample Means = 20.1405

Number of Samples = 20

Sample Weighted Mean = 20.1405 / 20 = 1.007 % Nickel

Table 5
Best Estimate Copper and Nickel by Heat Number

Heat Number	Copper, %	Nickel, %	Basis
10120	0.046	0.082	simple mean
10137	0.216	0.043	weighted mean
12008, 13253	0.210	0.873	simple mean
12008, 20291	0.199	0.846	weighted mean
12008, 21935	0.213	0.867	weighted mean
12008, 27204	0.219	0.996	*
12008, 305414	0.286	0.792	*
12008, 305424	0.254	.802	*
12420	0.27	1.035	generic Cu, simple mean Ni
1248	0.206	0.072	weighted Cu, avg. Ni
1248 w/Ni200	0.206	1.007	weighted Cu, Ni200 BE
1248, 661H577 w/Ni200	0.27	1.007	generic Cu, Ni200 BE
13253	0.221	0.732	weighted mean
1P2809	0.27	0.735	generic Cu, bare wire Ni
1P2815	0.316	0.724	simple mean
1P3571	0.283	0.755	coil wgt'd Cu, wgt'd Ni
20291	0.216	0.737	simple mean
21935	0.183	0.704	weighted mean
27204	0.203	1.018	weighted mean
2P5755	0.210	0.058	weighted mean
305414	0.337	0.609	weighted mean
305424	0.273	0.629	coil wgt'd Cu, wgt'd Ni
3277 w/Ni200	0.247	1.007	simple Cu, Ni200 BE
33A277	0.258	0.165	weighted mean
34B009	0.192	0.13	wgt'd Cu, generic Ni
34B009 w/Ni200	0.192	1.007	wgt'd Cu, Ni200 BE
39B196 w/Ni200	0.160	1.007	simple Cu, Ni200 BE
3P7317	0.074	0.067	weighted mean
4P6052	0.047	0.049	weighted mean
4P6519	0.131	0.060	simple mean
4P7869	0.031	0.096	simple mean
51874	0.147	0.037	weighted mean

Table 5 (continued)
Best Estimate Copper and Nickel by Heat Number

Heat Number	Copper, %	Nickel, %	Basis
51912	0.156	0.059	weighted mean
51989	0.170	0.165	simple mean
5P5622	0.153	0.077	simple mean
6329637	0.205	0.105	simple Cu, bare wire Ni
83637	0.048	0.066	weighted mean
83640	0.051	0.096	simple mean
83642	0.046	0.086	simple mean
83648	0.042	0.136	simple mean
83650	0.045	0.087	weighted mean
83653	0.042	0.102	weighted mean *
86054B	0.214	0.046	simple mean
86054B, 9565	0.213	0.052	mean of indeterminate data
87005	0.054	0.151	weighted mean
88112	0.045	0.200	simple mean
88114	0.043	0.189	simple mean
89476	0.022	0.071	simple mean
89833	0.046	0.059	simple mean
90069	0.040	0.076	weighted mean
90071	0.035	0.079	simple mean
90077	0.036	0.057	simple mean
90099	0.197	0.060	simple Cu, bare wire Ni
90130	0.044	0.133	simple mean
90136	0.269	0.070	weighted mean
90144	0.042	0.075	simple mean
90146	0.039	0.082	weighted mean
90209	0.044	0.126	simple mean
9565	0.213	0.052	Ht. 86045B/9565 data
A8746	0.150	0.13	Avg. Cu with bare wire data; generic Ni
BOLA	0.027	0.913	simple mean
HODA	0.027	0.947	simple mean
W5214 w/Ni200	0.213	1.007	coil wgt'd Cu, Ni200 BE

* See Report CE NPSD-1039, Rev. 02 for method of determination.

Attachment A

Supplemental Weld Deposit

Chemical Analysis Results

Source:
Attachments 4 and 5 to Consumers Power Company Letter dated November 15, 1995, R.W. Smedley to Nuclear Regulatory Commission, "Response to NRC Generic Letter 92-01, Revision 1, Supplement 1: Reactor Vessel Structural Integrity."

Attachment A consists of three pages including Title Page, Attachment 4 page 2 of 2, and Attachment 5 page 2 of 2.

Total Chemistry Results
Palisades Steam Generator - 34B009
Nickel Weight %

Ave: 1.090

SER	BR1	BR1	BAA	BX	2BB	2BM	B-A	B-B	B-C	B-D	2B-A	2B-B	2B-C	2B-D
1.215	0.91	1.01	0.81	0.72	0.98	0.67	1.12	1.1	1.14	1.15	1.21	1.14	1.05	1.14
1.092	1.36	1.2	0.78	0.99	1.09	0.89	0.99	1.01	1.06	1.17	1.1	1.18	1.08	1.07
1.106	1.18	0.89	1.01	0.91	1.36	1.09	1.03	1.13	1.17	1.26	1.04	1.04	1.1	1.08
1.18	1.13	0.73	1.12	0.97	1.08	1.09	1.24	1.15	1.11	1.1	1.06	1.01	1.11	1.03
1.01	0.73	0.66	1.02	1.02	1.17	1.25	1.15	1.15	1.13	1.19	1.08	1.03	1.12	1.11
0.906	1.19	0.5	1.15	1.13	1.12	1.38	1.11	1.13	1.08	1.12	1.17	1.06	1.05	1.22
1.218	1.25	0.81	1.24	1.15	1.13	1.12	1.06	1.07	1.15	1.03	1.15	1.08	1.13	1.15
0.94	1.12	1.06	0.7	0.41	1.46	0.58	1.11	1.07	1.34	1.03	1.15	1.08	1.22	1.11
1.098	0.8	1.05	1.06	0.88	0.85	1.01	1.13	1.03	1.01	0.96	1.08	1.13	1.1	1.27
1.057	1	1.09	1.2	0.56	1.12	1.13	1.13	1.05	1.1	1.32	1.08	1.13	1.1	1.01
1.148	1.06	1.09	1.26	1.12	1.1	1.18	1.12	1.07	1.08	1.05	1.06	1.1	1.04	1.25
1.05	1.01	1.28	1.04	1.13	1.2	1.16	1.18	1.24	1.04	1.05	1.12	0.97	1.14	0.99
1.272	0.89		1.16	1.18	1.17	1.13	1.28	1.15	1.06	1.17	1.08	1.03	1.21	1.15
1.256	0.68		1.12	1.46	1.13	1.2	1.15	1.28	1.1	1.28	0.93	1.01	1.12	1.19
1.234	1.1		0.74	0.84	0.49	0.71	1.42	1.19	1.07	1.07	1.08	1.11	1.13	1.18
1.29	1.33		0.79	1.05	1.02	1.1	1.21	1.1	1.12	1.1	0.98	1.11	1.1	1.14
1.331	1.04		1.04	1.26	1.15	1.13	1.19	1.22	1.08	1.07	1.18	1.07	1.14	1.12
1.292	0.97		1.11	1.11	1.17	1.15	1.18	1.24	1.11	1.07	0.98	1.29	1.14	1.22
1.18	1.16		1.1	1.04	1.75	1.13	1.15	1.08	1.11	1.05	1.07	1.13	1.17	1.2
1.33	1.08		1.05	1.17	1.06	1.23	1.35	1.13	1.06	1.06	1.04	1.12	1.24	1.18
1.138	1.19		1.2	1.18										
0.998	1.13													
1.15	1.56													
1.14	1.34													
1.126	0.96													
1.117	1.23													
1.119	1.2													
1.21	1.18													
1.136	1.11													
1.088	0.95													
0.981	0.91													
1.14	1.04													
1.307	1													
1.292	0.69													
1.2	0.57													
1.38	0.36													
	0.97													
	0.56													
	1.34													
	1.24													
	1.17													
	1.3													
	1.02													
	1.01													
	1.23													
	0.97													
	1.11													
	1.2													
	0.12													
	0.99													
	1.06													