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Georgia Power
the southern electric system

C. K. McCoy
Vice President, Nuclear
Vogtle Project

November 15, 1995

Docket Nos. 50-424
50-425

LCV-0648B

TAC Nos. M83522
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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Vogtle Electric Generating Plant
Response to Generic Letter 92-01, Revision 1, Supplement 1
Reactor Vessel Structural Integrity

Ladies and Gentlemen:

The NRC issued Generic Letter 92-01, Revision 1, Supplement 1 (GL92-01, R1, S1), Reactor Vessel Structural Integrity, on May 19, 1995. In the generic letter supplement, the NRC identified a concern that licensees may not have all of the relevant data pertinent to the evaluation of the structural integrity of their reactor pressure vessels. The generic letter supplement requested licensees to respond within 90 days describing those actions taken or planned to locate all data relevant to the determination of RPV integrity, or an explanation of why the existing data is considered complete as previously submitted.

Additionally, GL92-01, R1, S1 requested licensees to provide the following information within 6 months of the date of the generic letter supplement:

- an assessment of any change in best-estimate chemistry based on consideration of all relevant data;
- a determination regarding the need to use the ratio procedure described in Position 2.1 of Regulatory Guide 1.99, Revision 2; and
- a written report providing any newly acquired data and 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 50, and any potential impact on the LTOP or P-T limits or a certification that all information previously submitted remains valid.

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Georgia Power Company (GPC) letter LCV-0648 to the NRC, dated August 9, 1995, provided the 90 day response to GL92-01, R1, S1, for Vogtle 1 and 2. Attachments 1 and 2 to this letter provide the 6 month response to GL92-01, R1, S1, for Vogtle 1 and 2. Based on the specific NRC inquiries contained in GL92-01, R1, S1, GPC has focused the activities associated with this response to those necessary to address weld chemistry variability.

In summary, the Vogtle 1 and 2 reactor vessel beltline welds were not fabricated using copper coated weld wire and are not subject to the weld chemistry variability identified in GL92-01, R1, S1. Additional information obtained through participation in the Combustion Engineering Reactor Vessel Group (CE-RVG) resulted in slight changes to the best-estimate copper and nickel values for the Vogtle 1 and 2 beltline welds. However, the Vogtle 1 and 2 reactor vessels continue to be plate limited and the current reactor vessel integrity analyses remain valid.

As part of a long-term resolution of this issue, GPC is currently participating in the Combustion Engineering Owners Group - Reactor Vessel Working Group (CEOG-RVWG) weld chemistry variability task. The objective of this task is to determine best-estimate copper and nickel values for each weld material heat used in the beltline region of CE-fabricated reactor vessels. Completion of this task is currently projected to require a minimum of 18 months. Upon completion, the results of this task will be evaluated to determine the affect of any new information on the reactor vessel integrity analyses for Vogtle 1 and 2.

Should you have any questions, please advise.

GEORGIA POWER COMPANY

By: C.K. McCoy

C. K. McCoy

SWORN TO AND SUBSCRIBED BEFORE ME THIS 15th DAY OF November 1995

Mary N. Bentley

Notary Public

My Commission Expires: May 9, 1999

CKM/TWS

LCV-0648B

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Attachments

1. Response to Generic Letter 92-01, Revision 1, Supplement 1 - Requested Information
2. Best-Estimate Copper and Nickel Values for Reactor Vessel Beltline Welds

cc: Georgia Power Company
J. B. Beasley, Jr.
M. Sheibani
NORMS

U. S. Nuclear Regulatory Commission
S. D. Ebneter, Regional Administrator
L. L. Wheeler, Licensing Project Managet, NRR
C. R. Ogle, Senior Resident Inspector, Vogtle

LCV-0648B

ATTACHMENT 1

Vogtle Electric Generating Plant
Response to Generic Letter 92-01, Revision 1, Supplement 1

Requested Information

Requested Information

(1) Describe those actions taken or planned to locate all data relevant to the determination of reactor vessel integrity, or an explanation of why the existing data is considered complete as previously submitted.

The response to this item was provided in GPC letter LCV-0648, dated August 9, 1995.

(2) an assessment of any change in best-estimate chemistry based on consideration of all relevant data;

Tables 1 and 2 below illustrate the best-estimate chemistry changes from that reported in the GPC response to GL92-01, R1, and GL92-01, R1, S1, based on the information contained in Attachment 2 for Vogtle 1 and 2, respectively. Table 1 indicates that there was no change to the best-estimate copper content and a slight increased nickel content for the Vogtle 1 reactor vessel beltline welds. In accordance with 10 CFR 50.61, this change results in a slight increase in the chemistry factor (CF) from 33.5 °F to 35.4 °F for the Vogtle 1 reactor vessel beltline welds. Due to the low copper content of the Vogtle 1 reactor vessel beltline welds, this shift is considered to be insignificant.

Table 2 indicates a slight decrease in the best-estimate copper content and a slight increase in the nickel content of the Vogtle 2 reactor vessel beltline axial welds. These changes result in a decreased CF from 46.95 °F to 44.4 °F for the Vogtle 2 reactor vessel axial beltline welds. Table 2 also indicates a slight decrease in the copper content and a slight increase in nickel content for the Vogtle 2 intermediate to lower shell circumferential weld. These changes result in an increased CF for the intermediate to lower shell circumferential weld from 42.8 °F to 44.4 °F. Due to the low copper content of the Vogtle 2 reactor vessel beltline welds, these changes are also considered to be insignificant.

Seam Number	Location	Heat No.	GL 92-01 Revision 1		GL 92-01, Revision 1, Supplement 1	
			Cu	Ni	Cu	Ni
101-124A	Intermediate Shell Axial Weld A	83653	0.04	0.10	0.04	0.12
101-124B	Intermediate Shell Axial Weld B	83653	0.04	0.10	0.04	0.12
101-124C	Intermediate Shell Axial Weld C	83653	0.04	0.10	0.04	0.12
101-142A	Lower Shell Axial Weld A	83653	0.04	0.10	0.04	0.12
101-142B	Lower Shell Axial Weld B	83653	0.04	0.10	0.04	0.12
101-142C	Lower Shell Axial Weld C	83653	0.04	0.10	0.04	0.12
101-171	Intermediate to Lower Circ. Weld	83653	0.04	0.10	0.04	0.12
101-194	C & D Test Plate (Surv. Weld)	83653	[1]	[1]	0.04	0.12

Table 1 - Best-Estimate Chemistry Changes for Vogtle 1

Note: [1] Best-estimate copper and nickel values not provided by GPC GL92-01, R1, response

Seam Number	Location	Heat No.	GL 92-01 Revision 1		GL 92-01, Revision 1, Supplement 1	
			Cu	Ni	Cu	Ni
101-124A	Intermediate Shell Axial Weld A	87005	0.07	0.13	C.05	0.16
101-124B	Intermediate Shell Axial Weld B	87005	0.07	0.13	0.05	0.16
101-124C	Intermediate Shell Axial Weld C	87005	0.07	0.13	0.05	0.16
101-142A	Lower Shell Axial Weld A	87005	0.07	0.13	0.05	0.16
101-142B	Lower Shell Axial Weld B	87005	0.07	0.13	0.05	0.16
101-142C	Lower Shell Axial Weld C	87005	0.07	0.13	0.05	0.16
101-171	Intermediate to Lower Circ. Weld	87005	0.06	0.12	0.05	0.16
101-194	C & D Test Plate (Surv. Weld)	87005	[1]	[1]	0.05	0.16

Table 2 - Best-Estimate Chemistry Changes for Vogtle 2

Note: [1] Best-estimate copper and nickel values not provided by GPC GL92-01, R1, response

(3) a determination regarding the need to use the ratio procedure described in Position 2.1 of Regulatory Guide 1.99, Revision 2; and

The surveillance program welds for Vogtle 1 and 2 were fabricated using the same heat of weld wire used to fabricate the reactor vessel beltline welds for the respective units. No copper coated weld wires were used in either the surveillance program welds or the reactor vessel beltline welds for Vogtle 1 and 2. Therefore, the best-estimate copper and nickel content for the Vogtle 1 and 2 surveillance program welds are considered representative of their respective beltline welds. Therefore, it is not necessary to adjust the surveillance weld results using the ratio procedure described in Position 2.1 of Regulatory Guide 1.99, Revision 2.

(4) a written report providing any newly acquired data and; (a) 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 50, and any potential impact on the LTOP or P-T limits or (b) a certification that all information previously submitted remains valid.

Attachment 2 provides the newly acquired data requested by GL92-01, R1, S1. Due to the low copper content of the Vogtle 1 and 2 reactor vessel beltline welds, the reactor vessel integrity analyses are limited by the beltline plate properties instead of the beltline welds. The slight increase in chemistry factors stated in response to NRC required information item 2 above, does not result in any of the Vogtle 1 and 2 beltline welds becoming the limiting material with regard to reactor vessel integrity. Therefore, the current reactor vessel integrity analyses for Vogtle 1 and 2 continues to remain valid.

ATTACHMENT 2

Best-Estimate Copper and Nickel Values for Reactor Vessel Beltline Welds

Vogtle Electric Generating Plant
Units 1 and 2

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Tables

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Purpose

This report provides the best-estimate copper and nickel values for the beltline materials contained in the Vogtle 1 and 2 reactor vessels to support the Georgia Power Company (GPC) response to Generic Letter 92-01, Revision 1, Supplement 1.

Scope

1. Collection of information impacting the best-estimate copper and nickel values for Vogtle 1 and 2 reactor vessel beltline welds; and
2. Determination of the best-estimate copper and nickel value for Vogtle 1 and 2 beltline welds.

Summary

Table 1 provides the best-estimate copper and nickel content for the primary weld filler material heat numbers contained in the beltline region of the Vogtle 1 and 2 reactor vessels.

Plant	Heat Number	Wt % Copper	Wt % Nickel	Reference
Vogtle 1	83653	0.04	0.12	Table A-1
Vogtle 2	87005	0.05	0.16	Table A-2

Table 1 - Best-Estimate Values for Weld Filler Material Heats Contained in Vogtle 1 and 2 Reactor Vessel Beltlines

Background

The Vogtle 1 and 2 reactor vessels were fabricated by Combustion Engineering's Nuclear Division in Chattanooga, Tennessee. GPC participated in the Combustion Engineering - Reactor Vessel Group (CE-RVG) Phase II activity, which included a review of the original fabrication records for the Vogtle 1 and 2 reactor vessels. As a result, pertinent information abstracted from the original fabrication records, along with copies of the original fabrication records, were provided to GPC. These records are the primary source of information incorporated into this report.

As part of the fabrication process, Combustion Engineering (C-E) completed a Weld Inspection Form (WIF) for each weld seam contained in a specific reactor vessel. The WIF identified the seam identification number, the consumables used to fabricate the weld (i.e., weld wire heat number, flux type, and flux lot), weld procedure, and heat treatment procedures. It should be noted that seam numbers were often assigned to, and

WIFs completed for, welds in surveillance test plates that were later provided for use in the reactor vessel surveillance program.

Combustion Engineering used two primary weld processes to fabricate welds for the Vogtle 1 and 2 reactor vessel beltline seams. These are shielded metal arc welds and submerged arc welds. Shielded metal arc welds were made using E8018 stick electrodes and were used primarily for (1) fit-up of the plates in preparation for submerged arc welding; (2) to fill in backgrooves following removal of backing rings; and (3) miscellaneous weld repairs. When used for fit-up purposes, the shielded metal arc weld material was typically removed and replaced by a submerged arc weld.

Submerged arc welds were fabricated using a machine process that involved a continuous feed of weld wire from large spools into the weld puddle, which was shielded by a blanket of powdered material called flux. Submerged arc welds were fabricated using either one or two continuous weld wires fed from spools containing approximately 120 pounds of weld wire each. Submerged arc welds fabricated using only one weld wire are called single arc welds and those fabricated by feeding two weld wires into the weld puddle are called tandem arc welds.

The weld wires that were used to fabricate submerged arc welds typically fall into two categories for the purpose of determining the best-estimate copper and nickel content. These are copper coated and non-copper coated wires. The copper coating was applied to the weld wire after the weld wire manufacturer performed the necessary chemical analyses to verify compliance with the applicable material specification. The purpose of the copper coating was to prevent corrosion of the wire prior to use. After copper was identified as the greatest contributor to radiation embrittlement damage, the practice of coating the weld wire with copper was discontinued. The Vogtle 1 and 2 reactor vessel beltline welds were fabricated using only non-copper coated weld wires.

There are typically five types of chemical analyses that were performed on weld filler material contained in reactor pressure vessels. These are described in Table 2.

ANALYSIS TYPE	DESCRIPTION
Bare Wire Chemical Analysis (BWCA)	Chemical analysis performed either prior to application of the copper-coating to the weld wire or following removal of the copper coating for the test specimen. This analysis does not account for the number of electrodes used in the weld process (i.e., single or tandem arc), the copper coating applied to the weld wire, or the flux type/lot used to fabricate a specific weld.
Coated Electrode Deposit Chemistry (CEDC)	Chemical analysis of welds fabricated using stick electrodes in the as-deposited condition (i.e., SMAW).
In-Process Weld Deposit Analysis (IPWDA)	Chemical analysis of chip samples taken directly from the vessel weld. IPWDA generally represents a weld/flux deposit chemistry or a coated electrode deposit chemistry for the specific weld seam.
Surveillance Welds	Chemical analysis of surveillance capsule weld specimen. Chemical analyses of surveillance welds are typically performed on irradiated specimens and are similar to other as-deposited chemical analyses in that they account for the consumables and number of electrodes used in the welding process.
Weld Flux Deposit Chemistry (WFDC)	Chemical analysis of weld material in an as-welded condition. WFDC include the effects of the consumables used in fabrication of the specific weld on which the analysis was performed.

Table 2: Types of Chemical Analyses Performed

Methodology

GPC reviewed the WIFs for the reactor vessel beltline seams for Vogtle 1 and 2, including welds in surveillance test plates, and identified the heat numbers of the weld filler material used to fabricate the beltline and surveillance welds. Tables 3 and 4 contain a list of all consumables used in the fabrication of the Vogtle 1 and 2 reactor vessel beltline welds, respectively.

SEAM NUMBER	WELD LOCATION	HEAT NUMBER(S)		FLUX TYPE	FLUX LOT	REFERENCE
101-124A	Intermediate Shell Axial Weld A	83653	[1]	0091	3536	RVG-0000004429
	Fit-up/Backgroove Weld	ABEA[2]	[3]	[4]	[4]	RVG-0000004429
	Fit-up/Backgroove Weld	IAGA[2]	[3]	[4]	[4]	RVG-0000004429
	Repair Weld	KOIB[2]	[3]	[4]	[4]	RVG-0000004428
101-124B	Intermediate Shell Axial Weld B	83653	[1]	0091	3536	RVG-0000004427
	Fit-up/Backgroove Weld	BOLA[2]	[3]	[4]	[4]	RVG-0000004427
	Repair Weld	JAHB[2]	[3]	[4]	[4]	RVG-0000004424
	Repair Weld	HABJC[2]	[3]	[4]	[4]	RVG-0000004424
101-124C	Intermediate Shell Axial Weld C	83653	[1]	0091	3536	RVG-0000004449
	Fit-up/Backgroove Weld	ABEA[2]	[3]	[4]	[4]	RVG-0000004449
	Fit-up/Backgroove Weld	BOLA[2]	[3]	[4]	[4]	RVG-0000004449
101-142A	Lower Shell Axial Weld A	83653	[1]	0091	3536	RVG-0000003769
	Repair Weld	HABJC[2]	[3]	[4]	[4]	RVG-0000003772
101-142B	Lower Shell Axial Weld B	83653	[1]	0091	3536	RVG-0000003768
	Fit-up/Backgroove Weld	HAAEC[2]	[3]	[4]	[4]	RVG-0000003768
101-142C	Lower Shell Axial Weld C	83653	[1]	0091	3536	RVG-0000003768
	Fit-up/Backgroove Weld	HAAEC[2]	[3]	[4]	[4]	RVG-0000003768
101-171	Intermediate to Lower Circ. Weld	83653	83653	0091	3536	RVG-0000003803
	Repair Weld	IAOCE[2]	[3]	[4]	[4]	RVG-0000003802
101-194	C & D Test Plate (Surv. Weld)	83653	83653	0091	3536	RVG-0000004366
	Fit-up/Backgroove Weld	FAAHF[2]	[3]	[4]	[4]	RVG-0000004366

TABLE 3 - VOGTLE UNIT 1 BELTLINE WELD CONSUMABLES

NOTES: [1] Listing of a single heat number indicates single arc weld. Therefore, second heat number is not applicable.
[2] E8018 filler material
[3] Multiple electrodes are not applicable to Shielded Metal Arc Welds.
[4] Powdered flux is not applicable to Shielded Metal Arc Welds.

SEAM NUMBER	WELD LOCATION	HEAT NUMBER(S)		FLUX		REFERENCE
				TYPE	LOT	
101-124A	Intermediate Shell Axial Weld A	87005	[1]	0091	0145	RVG-0000006562
	Repair Weld	BAOED[2]	[3]	[4]	[4]	RVG-0000006563
101-124B	Intermediate Shell Axial Weld B	87005	[1]	0091	0145	RVG-0000006562
	Repair Weld	BAOED[2]	[3]	[4]	[4]	RVG-0000006563
101-124C	Intermediate Shell Axial Weld C	87005	[1]	0091	0145	RVG-0000006562
	Repair Weld	BAOED[2]	[3]	[4]	[4]	RVG-0000006563
	Repair Weld	ABCAH[2]	[3]	[4]	[4]	RVG-0000006565
101-142A	Lower Shell Axial Weld A	87005	[1]	0091	0145	RVG-0000006699
	Fit-up/Backgroove Weld	HAOEE[2]	[3]	[4]	[4]	RVG-0000006699
	Repair Weld	HABJF[2]	[3]	[4]	[4]	RVG-0000006817
101-142B	Lower Shell Axial Weld B	87005	[1]	0091	0145	RVG-0000006815
	Fit-up/Backgroove Weld	HAOEE[2]	[3]	[4]	[4]	RVG-0000006815
	Fit-up/Backgroove Weld	FAOJE[2]	[3]	[4]	[4]	RVG-0000006815
	Repair Weld	HABJF[2]	[3]	[4]	[4]	RVG-0000006817
	Repair Weld	IAOCE[2]	[3]	[4]	[4]	RVG-0000006818 RVG-0000006819
101-142C	Lower Shell Axial Weld C	87005	[1]	0091	0145	RVG-0000006816
	Fit-up/Backgroove Weld	HAAEC[2]	[3]	[4]	[4]	RVG-0000006816
	Fit-up/Backgroove Weld	HAOEE[2]	[3]	[4]	[4]	RVG-0000006816
	Repair Weld	HABJF[2]	[3]	[4]	[4]	RVG-0000006817
	Repair Weld	IAOCE[2]	[3]	[4]	[4]	RVG-0000006819
101-171	Intermediate to Lower Circ. Weld	87005	87005	0124	1061	RVG-0000006827
	Fit-up/Backgroove Weld	CAAEI[2]	[3]	[4]	[4]	RVG-0000006827
	Fit-up/Backgroove Weld	FAODI[2]	[3]	[4]	[4]	RVG-0000006827
101-194	C & D Test Plate (Surv Weld)	87005	87005	0124	1061	RVG-0000006736
	Fit-up/Backgroove Weld	FABGI[2]	[3]	[4]	[4]	RVG-0000006736

TABLE 4 - VOGTLE UNIT 2 BELTLINE WELD CONSUMABLES

NOTES: [1] Listing of a single heat number indicates single arc weld. Therefore, second heat number is not applicable.
[2] E8018 filler material
[3] Multiple electrodes are not applicable to Shielded Metal Arc Welds.
[4] Powdered flux is not applicable to Shielded Metal Arc Welds.

As stated previously, shielded metal arc welds using E8018 weld rods were used for fit-up and repair welds and are included on the WIF where applicable for a specific seam. In the case of fit-up welds, the E8018 filler material was typically removed prior to completion of the submerged arc welding process and therefore, does not contribute significantly to the copper and nickel content of the final weld. For weld repairs containing E8018 filler material, the repair typically represents a small volume of the final weld. Additionally, E8018 filler material typically contained a very small amount of copper, in the range of 0.02 to 0.03 weight percent, and approximately 1.0 weight percent nickel. Due to the relatively limited volume of filler material contained in the weld repairs and the low copper content associated with E8018 filler material, the contribution of copper and nickel associated with the weld repair is not considered to have a significant impact on the best-estimate copper and nickel content of a particular weld seam. Tables 5 and 6 provide a list of primary weld filler material heat numbers used in the Vogtle 1 and 2 reactor vessels, respectively.

SEAM NUMBER	WELD LOCATION	HEAT NUMBER(S)		FLUX TYPE	FLUX LOT	REFERENCE
101-124A	Intermediate Shell Axial Weld A	83653	[1]	0091	3536	RVG-0000004429
101-124B	Intermediate Shell Axial Weld B	83653	[1]	0091	3536	RVG-0000004427
101-124C	Intermediate Shell Axial Weld C	83653	[1]	0091	3536	RVG-0000004449
101-142A	Lower Shell Axial Weld A	83653	[1]	0091	3536	RVG-0000003769
101-142B	Lower Shell Axial Weld B	83653	[1]	0091	3536	RVG-0000003768
101-142C	Lower Shell Axial Weld C	83653	[1]	0091	3536	RVG-0000003768
101-171	Intermediate to Lower Circ. Weld	83653	83653	0091	3536	RVG-0000003803
101-194	C & D Test Plate (Surv. Weld)	83653	83653	0091	3536	RVG-0000004366

TABLE 5 - VOGTLE UNIT 1 PRIMARY BELTLINE WELD CONSUMABLES

NOTES: [1] Listing of a single heat number indicates single arc weld. Therefore, second heat number is not applicable.

SEAM NUMBER	WELD LOCATION	HEAT NUMBER(S)		FLUX TYPE	FLUX LOT	REFERENCE
101-124A	Intermediate Shell Axial Weld A	87005	[1]	0091	0145	RVG-0000006562
101-124B	Intermediate Shell Axial Weld B	87005	[1]	0091	0145	RVG-0000006562
101-124C	Intermediate Shell Axial Weld C	87005	[1]	0091	0145	RVG-0000006562
101-142A	Lower Shell Axial Weld A	87005	[1]	0091	0145	RVG-0000006699
101-142B	Lower Shell Axial Weld B	87005	[1]	0091	0145	RVG-0000006815
101-142C	Lower Shell Axial Weld C	87005	[1]	0091	0145	RVG-0000006816
101-171	Intermediate to Lower Circ. Weld	87005	87005	0124	1061	RVG-0000006827
101-194	C & D Test Plate (Surv. Weld)	87005	87005	0124	1061	RVG-0000006736

TABLE 6 - VOGTLE UNIT 2 PRIMARY BELTLINE WELD CONSUMABLES

NOTES: [1] Listing of a single heat number indicates single arc weld. Therefore, second heat number is not applicable.

The following databases were searched to identify the existence of chemical analyses for those weld material heats listed in Tables 5 and 6:

- Draft CE-RVG Phase II Reports (including PR-EDB)
- NRC Reactor Vessel Integrity Database (RVID)
- EPRI RMATCH
- EPRI PREP3
- Draft ATI/WOG RPVDATA

Individual discussions were held with plants containing the same weld filler material heats (i.e., sister plants) to share information and determine the existence of supplemental chemical testing that might have been performed. In instances where the chemical analysis for a particular weld filler material heat exactly matched the analysis reported by another source for all elements, they were considered to be duplicates of the same chemical analysis to avoid "double counting" a particular analysis. The information contained in the NRC-RVID was considered to be best-estimate licensing values reported by other utilities and use of this information was limited to identification of sister plants. For the same reason, information contained in PREP3, RMATCH, and RPVDATA that did not reference a specific analysis number or a specific test report was not included in the determination of the beltline weld best-estimate copper and nickel values.

Following collection of weld chemistry data, a weighted average methodology was used to determine the best-estimate copper and nickel content for the weld filler material heat numbers listed in Tables 5 and 6. The weighted average approach appropriately accounts for chemical analyses that were performed on tandem arc welds in the as-deposited condition. Chemical analyses of tandem arc welds are considered to represent an average chemistry of the two weld wires used to fabricate the weld. Accordingly, chemical analyses performed on tandem arc welds are counted twice in determination of the best-estimate copper and nickel values while chemical analyses performed on single arc welds are counted only once. This methodology is applicable to WFDC, IPWDA, and chemical analyses performed on surveillance welds. Although BWCA are sometimes listed as being applicable to tandem arc welds, they represent an analysis that was performed on only a single wire or stick electrode and therefore, are only counted once in the best estimate copper and nickel determination.

BWCA performed on non-copper coated or shielded metal arc electrodes are representative of reactor vessel welds with regard to copper and nickel content. For this reason, BWCA are incorporated into the determination of best-estimate copper and nickel for welds fabricated using non-copper coated weld wire and shielded metal arc electrodes.

Chemical analyses performed on surveillance welds fabricated using non-copper coated weld wires or shielded metal arc electrodes are not expected to demonstrate the copper variability exhibited by those fabricated using copper coated wire. Therefore, multiple chemical analyses performed on a single surveillance weld fabricated using non-copper coated weld wire or shielded metal arc electrodes are considered to be unique analyses instead of duplicates of the same analysis. In determination of the best-estimate copper and nickel value for a non-copper coated weld wire, chemical analyses performed on surveillance weld filler material are weighted as indicated in Table 7 based on whether the surveillance weld was fabricated using tandem or single submerged arc welding process.

Table 7 illustrates the weighting factors used to determine the best-estimate copper and nickel content of the beltline welds.

ANALYSIS TYPE	WIRE TYPE/WELD CONFIGURATION			
	Non-Copper Coated			
	Single Arc		Tandem Arc	
	Cu	Ni	Cu	Ni
BWCA	1	1	N/A	N/A
CEDC	1	1	N/A	N/A
WFDC	1	1	2	2
IPWDA	1	1	2	2
Surv. Welds	1	1	2	2

Table 7 - Weighting Factors used to Determine Best-Estimate Copper and Nickel

Based on the above methodology, best-estimate copper and nickel values were determined for each of the primary weld filler material heat numbers listed in Tables 5 and 6 for Vogtle 1 and 2, respectively. The resulting best-estimate copper and nickel values for the weld filler materials are found in Table 1. Appendix A contains the detailed calculation of the best-estimate values for the Vogtle 1 and 2 primary beltline weld filler material heats.

The above described methodology is consistent with that described by NEI letter dated October 20, 1995.

APPENDIX A

Determination of Best-Estimate
Copper and Nickel

Heat Number:	83653 (NON-COPPER COATED ELECTRODE)									
Analysis Source	Analysis Type	Wt% Cu	Wt% Ni	Weld Type	Weighting Factor Cu	Weighting Factor Ni	Contribution to Best Estimate Cu	Contribution to Best Estimate Ni	Reference
D13309	WFDC	0.03		Single Arc	1	0	0.03	0	RVG-0000000189
D14129	IPWDA	0.03	0.09	Single Arc	1	1	0.03	0.09	RVG-0000004457
D14040	IPWDA	0.03	0.1	Single Arc	1	1	0.03	0.1	SIS-0028228015
D16742	IPWDA	0.03	0.1	Single Arc	1	1	0.03	0.1	RVG-0000004462
D14130	IPWDA	0.03	0.11	Single Arc	1	1	0.03	0.11	RVG-0000004457
Vogtle 1 Surv Capsule	WFDC	0.035	0.091	Tandem Arc	2	2	0.07	0.182	WCAP-12256
Vogtle 1 Surv Capsule	WFDC	0.037	0.1	Tandem Arc	2	[illegible]	0.074	0.2	WCAP-11011
D14131	IPWDA	0.04	0.09	Single Arc	1	[illegible]	0.04	0.09	RVG-0000004457
D22736	IPWDA	0.04	0.1	Tandem Arc	2	2	0.08	0.2	RVG-0000004455
Vogtle 1 Surv Capsule	WFDC	0.04	0.117	Tandem Arc	2	2	0.08	0.234	WCAP-13931
D16745	IPWDA	0.04	0.12	Single Arc	1	1	0.04	0.12	RVG-0000004464
D23897	IPWDA	0.04	0.17	Single Arc	1	1	0.04	0.17	SIS-0028451602
D16741	IPWDA	0.04	0.18	Single Arc	1	1	0.04	0.18	RVG-0000004463
D16744	IPWDA	0.04	0.2	Single Arc	1	1	0.04	0.2	RVG-0000004464
D16743	IPWDA	0.04	0.21	Single Arc	1	1	0.04	0.21	RVG-0000004462
D16740	IPWDA	0.04	0.22	Single Arc	1	1	0.04	0.22	RVG-0000004463
Vogtle 1 Surv Capsule	WFDA	0.041	0.105	Tandem Arc	2	2	0.082	0.21	WCAP-13931
Vogtle 1 Surv Capsule	WFDC	0.048	0.101	Tandem Arc	2	2	0.096	0.202	WCAP-13931
D14214	IPWDA	0.05	0.08	Single Arc	1	1	0.05	0.08	SIS-0028228015
D26772	IPWDA	0.05	0.11	Tandem Arc	2	2	0.1	0.22	RVG-0000[illegible]4454
R3075	BWCA	0.06		NA	1	0	0.06	0	RVG-0000[illegible]4553
					28	26	1.122	3.118	

Best Estimate Copper = 1.122/28 = 0.04
Best Estimate Nickel = 3.118/26 = 0.12

TABLE A-1 - CALCULATION OF BEST-ESTIMATE COPPER AND NICKEL VALUES FOR WELD WIRE HEAT 83653

Heat Number:	87005 (NON-COPPER COATED ELECTRODE)								
Analysis Source	Analysis Type	Wt% Cu	Wt% Ni	Weld Type	Weighting Factor Cu	Weighting Factor Ni	Contribution to Best Estimate Cu	Contribution to Best Estimate Ni	Reference
R3493	BWCA	0.03		NA	1	0	0.03	0	RVG-0000001389
Supplier Analysis	BWCA	0.04		NA	1	0	0.04	0	RVG-0000001389
D18140	IPWDA	0.04	0.15	Single Arc	1	1	0.04	0.15	RVG-0000009433
D18142	IPWDA	0.04	0.16	Single Arc	1	1	0.04	0.16	RVG-0000009434
D18138	IPWDA	0.04	0.17	Single Arc	1	1	0.04	0.17	RVG-0000009432
D18139	IPWDA	0.04	0.17	Single Arc	1	1	0.04	0.17	RVG-0000009432
Vogtle [illegible] Capsule	WFDC	0.04	0.17	Tandem Arc	2	2	0.08	0.34	WCAP-11381
Vogtle [illegible] Capsule	WFDC	0.045	0.091	Tandem Arc	2	2	0.09	0.182	WCAP-13007
D21867	IPWDA	0.05	0.15	Single Arc	1	1	0.05	0.15	RVG-0000009452
D18143	IPWDA	0.05	0.19	Single Arc	1	1	0.05	0.19	RVG-0000009434
D21865	IPWDA	0.05	0.2	Single Arc	1	1	0.05	0.2	RVG-0000009450
D21866	IPWDA	0.05	0.21	Single Arc	1	1	0.05	0.21	RVG-0000009451
D28505	WFDC	0.06	0.12	Single Arc	1	1	0.06	0.12	RVG-0000001389
D18141	IPWDA	0.06	0.27	Single Arc	1	1	0.06	0.27	RVG-0000009433
D17217	WFDC	0.07	0.13	Single Arc	1	1	0.07	0.13	RVG-0000007109
					17	15	0.79	2.442	

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Best Estimate Copper = 0.79/17  = 0.05
Best Estimate Nickel = 2.442/15 = 0.16
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TABLE A-2- CALCULATION OF BEST-ESTIMATE COPPER AND NICKEL VALUES FOR WELD WIRE HEAT 87005