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SUBJECT: Forwards response to NRC 980529 RAI re re-evaluation of RPV weld chemistry values that have previously been submitted as part of NMP licensing basis in light of info presented in CEOG, FTI & BWRVIP repts.

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September 4, 1998
NMP1L 1358

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

RE: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Subject: ***Request for Additional Information Regarding Reactor Pressure Vessel Structural Integrity at Nine Mile Point Nuclear Station Unit 1 (TAC No. MA1200)***

Gentlemen:

On May 19, 1995, the NRC issued Generic Letter (GL) 92-01, Revision 1, Supplement 1 (GL 92-01, Rev. 1, Supp. 1), "Reactor Vessel Structural Integrity." This GL requested licensees to perform a review of their reactor pressure vessel (RPV) structural integrity assessments in order to identify, collect, and report any new data pertinent to the analysis of the structural integrity of their RPVs and to assess the impact of those data. Niagara Mohawk Power Corporation (NMPC) responded to GL 92-01, Rev. 1, Supp. 1 by letters dated August 16, 1995 and November 20, 1995.

The NRC issued a letter dated August 26, 1996, which acknowledged receipt of our responses, noted that additional RPV information may become available as a result of Owners Group efforts and requested that we provide the results of the Owners Groups' programs relative to Nine Mile Point Unit 1 (NMP1). Following issuance of these letters, the BWR Vessel and Internals Project (BWRVIP) submitted the report "Update of Bounding Assessment of BWR/2-6 Reactor Pressure Vessel Integrity Issues (BWRVIP-46)." This report included bounding assessments of new data from the Combustion Engineering Owners Group's (CEOG) database, analyses from Framatome Technologies Incorporated (FTI) and Chicago Bridge and Iron's quality assurance records. New data for one vessel fabricated by Hitachi was also included in the BWRVIP report.

By letter dated May 29, 1998, the NRC issued a Request for Additional Information (RAI) requesting that NMPC re-evaluate the RPV weld chemistry values that have previously been submitted as part of our licensing basis in light of the information presented in the CEOG, FTI, and BWRVIP reports. The NRC indicated an assessment of this information is expected to determine whether any values of RPV weld chemistry need to be revised. The attachment to this letter provides our response to this RAI.

Sincerely,

Richard B. Abbott

Richard B. Abbott
Vice President Nuclear Engineering

RBA/JMT/kap
Attachment

xc: Mr. H. J. Miller, Regional Administrator, Region I
Mr. S. S. Bajwa, Director, Project Directorate I-1, NRR
Mr. B. S. Norris, Senior Resident Inspector
Mr. D. S. Hood, Senior Project Manager, NRR
Records Management

ATTACHMENT

REQUEST FOR ADDITIONAL INFORMATION

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION UNIT NO. 1

Request for Information

The NRC staff recently received the Boiling Water Reactors Vessel and Internals Project (BWRVIP) report, "Update of Bounding Assessment of BWR/2-6 Reactor Pressure Vessel Integrity Issues (BWRVIP-46)." In accordance with the provisions of Generic Letter 92-01, Revision 1, Supplement 1, the NRC requests an evaluation of the bounding assessment in BWRVIP-46 and its applicability to the determination of the best-estimate chemistry for all of your Unit 1 RPV beltline welds. Based upon this reevaluation, supply the information necessary to completely fill out the data requested in Table 1 for each Unit 1 RPV beltline weld material. If the limiting material for the Unit 1 vessel's P-T limits evaluation is not a weld, include the information requested in Table 1 for the limiting material also.

During a public meeting on November 12, 1997, between the NRC staff, Nuclear Energy Institute (NEI), and industry representatives, the NRC staff discussed some of the issues regarding the evaluation of the data. The summary of this meeting (see memorandum dated November 19, 1997, from Keith R. Wichman to Edmund J. Sullivan, "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") should be considered in your response.

In addition to the issues discussed in the public meeting, you should also consider the method used to group sets of chemistry data (in particular, those from weld qualification tests) as being from "one weld" or from multiple welds. This is an important consideration when a mean-of-the-means or coil-weighted average approach is determined to be the appropriate method for determining the best-estimate chemistry. If a weld (or welds) were fabricated as weld qualification specimens by the same manufacturer, within a short time span, using similar welding input parameters, and using the same coil (or coils in the case of tandem arc welds) of weld consumables, then it may be appropriate to consider all chemistry samples from that weld (or welds) as samples from "one weld" for the purposes of best-estimate chemistry determination. If information is not available to confirm these details, but sufficient evidence exists to reasonably assume the details are the same, then the best-estimate chemistry should be evaluated both by assuming the data came from "one weld" and by assuming that the data came from an appropriate number of "multiple welds." A justification should then be provided as to which assumption was chosen when the best-estimate chemistry was determined.

Required Response

The Nine Mile Point Unit 1 (NMP1) reactor pressure vessel was fabricated by Combustion Engineering (CE). The submerged arc weld heats in the reactor vessel beltline include heat numbers 1248 and 86054B. The limiting material for the NMP1 P-T limits is currently identified as plate G-307-4 (heat P2076). Table 1 provides the calculated surface adjusted reference temperature (ART) values for these weld and limiting plate materials. The fluence value of 2.7×10^{18} n/cm^2 corresponds to 28 EFPY which is expected to be the end-of-license fluence. The best-estimate weld chemistries were determined from the Combustion Engineering Owners Group (CEOG) data as described below. The revised chemistry factors in Table 1 are lower than the bounding values given in the BWRVIP-46 report. Also, the ART values for the welds are bounded by the ART value for the limiting plate. Therefore, it is apparent from the calculated ART values shown in Table 1 that plate G-307-4 (heat no. P2076) remains the limiting beltline material for the vessel P-T limits.

Measured chemistry data for CE fabricated weld heat numbers 1248 and 86054B were obtained from the CEOG database. For each of the test data records, a Group Tag was assigned in the CEOG report identifying measurements from unique welds. The estimated number of coils used to fabricate the welds in each group was identified in the CEOG report. The source of each data measurement was obtained from the CEOG database. Additional screening of the original data sources was performed to verify the accuracy and pedigree of the individual data measurements. These specific details provided the necessary data to evaluate revised best-estimate chemistries using either a mean or coil-weighted average approach.

The measured chemistry data and best-estimate chemistry evaluations for weld heat number 1248 are shown in Table 2. Thirty-four test measurements were noted from eleven different weld groups. Of the various weld groups, one group had no measured copper or nickel data (Group h), another group was invalid or indeterminate because of uncertainties in the actual weld heat number (Group g), and four groups contained data for welds made with separate nickel wire addition (Groups a, b, j, and k). As noted in Table 2, a best-estimate value of 0.214 wt% Cu was obtained from the weighted average of the five weld groups containing valid copper data for this weld heat. Since there was no nickel wire addition to the NMP1 vessel beltline welds, a best-estimate nickel value of 0.076 wt% was calculated from the simple average of all the valid measured data excluding those data with nickel wire addition. The evaluation methods for Cu and Ni follow the recommended approach in the CEOG report. Although this evaluation excluded some data as being invalid or indeterminate, the results in Table 2 are still consistent with the best-estimate chemistry values for weld heat 1248 from the CEOG report. Furthermore, the revised best-estimate values are less than the previously assumed licensing values of 0.22 wt% Cu, and 0.20 wt% Ni for the NMP1 beltline welds made from heat number 1248.

The measured chemistry data and best-estimate chemistry evaluations for weld heat number 86054B are shown in Table 3. Six separate chemistry measurements were available from six groups of welds for this weld heat; thus, the simple average chemistries and the weighted average chemistries are identical. All of the data were determined to be valid. A best-estimate value of 0.214 wt% Cu, and 0.046 wt% Ni was obtained from the mean of the

measured data for weld heat number 86054B. This is identical to the recommended best-estimate chemistries from the CEOG report. The revised best-estimates are less than the previously assumed licensing values of 0.22 wt% Cu, and 0.20 wt% Ni for the NMP1 beltline welds made from heat number 86054B.

TABLE 1

Facility: Nine Mile Point 1

Vessel Manufacturer: Combustion Engineering

Information Requested on RPV Weld and/or Limiting Materials

RPV Weld Wire or Plate Heat (1)	Best-Estimate Copper (wt%)	Best-Estimate Nickel (wt%)	EOL ID Fluence ($\times 10^{19}$) (n/cm^2)	Assigned Material Chemistry Factor (CF) (°F)	Method of Determining CF (2) (°F)	Initial RT_{NDT} ($RT_{NDT(U)}$) (°F)	σ_i (°F)	σ_Δ (°F)	Margin (°F)	Surface ART at EOL (°F)
1248	0.214	0.076	0.27	99.9	Tables	-50	17	28	65.5	79.8
86054B	0.214	0.046	0.27	97.6	Tables	-50	17	28	65.5	78.3
P2076	0.27	0.53	0.27	173.9	Tables	40	0	17	34	185.8

(1) material identification (i.e., heat number) of the beltline weld or limiting plate material
(2) CF determined from tables or from surveillance data

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

Weld Wire Heat	Discussion
1248	Weighted Avg. Cu of valid data, Mean Ni of data without nickel wire addition (see Table 2)
86054B	Mean Cu, Mean Ni (see Table 3)

Table 2. Evaluation of Best-Estimate Chemistry for Weld Wire Heat No. 1248

Weld Wire Heat No. 1248							Group Average Chemistry		
Cu wt%	Ni wt%	Ni 200 Addition	PEDIGREE	FLUX TYPE	SOURCE	Group Tag	Avg. Cu wt%	Avg. Ni wt%	Est. # of Coils
				Group a				0.940	1
	0.94	Yes	VALID	Linde 1092	D4347	a			
				Group b				1.200	1
	1.2	Yes	VALID	Linde 1092	D4322	b			
				Group c			0.225	0.087	1
0.23	0.063	No	VALID	ARCOS B5	WCAP-10185	c			
0.22	0.11	No	VALID	ARCOS B5	WCAP-10185	c			
				Group d			0.170		1
0.17		?	VALID	ARCOS B5	D4019	d			
				Group e			0.210	0.082	1
0.22	0.07	No	VALID	ARCOS B5	D4260	e			
0.23	0.07	No	VALID	ARCOS B5	D4262	e			
0.2	0.1	No	VALID	ARCOS B5	D4261	e			
0.2	0.08	No	VALID	ARCOS B5	D4218	e			
0.2	0.09	No	VALID	ARCOS B5	D4217	e			
				Group f			0.205	0.050	1
		?	VALID	ARCOS B5	D4032	f			
0.20		?	VALID	ARCOS B5	D4032	f			
0.21	0.05	No	VALID	ARCOS B5	D4032	f			
				Group g			0.167	0.070	1
0.17	0.05	No	INDETERMINATE	ARCOS B5	BCL-585-84-6	g			
0.17	0.05	No	INVALID	ARCOS B5	DKT 50-220	g			
0.18	0.05	No	INDETERMINATE	ARCOS B5	BCL-585-84-6	g			
0.18	0.05	No	INVALID	ARCOS B5	DKT 50-220	g			
0.16	0.06	No	INDETERMINATE	ARCOS B5	BCL-585-84-6	g			
0.16	0.06	No	INVALID	ARCOS B5	DKT 50-220	g			
0.16	0.08	No	INDETERMINATE	ARCOS B5	BCL-585-84-6	g			
0.16	0.08	No	INVALID	ARCOS B5	DKT 50-220	g			
0.17	0.08	No	INDETERMINATE	ARCOS B5	BCL-585-84-6	g			
0.17	0.08	No	INVALID	ARCOS B5	BCL-585-84-6	g			
0.17	0.08	No	INDETERMINATE	ARCOS B5	DKT 50-220	g			
0.17	0.08	No	INVALID	ARCOS B5	DKT 50-220	g			
0.16	0.09	No	INDETERMINATE	ARCOS B5	BCL-585-84-6	g			
0.16	0.09	No	INVALID	ARCOS B5	DKT 50-220	g			
0.17	0.07	No	INVALID	ARCOS B5	NMEL-90001	g			
				Group h					1
			VALID	B5 (MOD)	D3684	h			
				Group I			0.260	0.050	1
			VALID	B5 (MOD)	D4031	I			
0.26	0.05	No	VALID	B5 (MOD)	D4031	I			
				Group J				1.190	1
	1.15	Yes	VALID	B5 (MOD)	D3911	J			
	1.23	Yes	VALID	B5 (MOD)	D3912	J			
				Group k				0.960	1
	0.93	Yes	VALID	S11	D4050	k			
	0.94	Yes	VALID	S11	D4049	k			
	0.95	Yes	VALID	S11	D4048	k			
	1.02	Yes	VALID	S11	D4051	k			

Simple Avg.*	
Cu	Ni
0.217	0.076

Sample Weighted Average*	
Cu	Ni
0.214	0.067

Coil Weighted Average*	
Cu	Ni
0.214	0.067

* Average Cu and Ni values determined from valid data only; Average Ni calculated for data without nickel wire addition

Table 3. Evaluation of Best-Estimate Chemistry for Weld Wire Heat No. 86054B

Weld Wire Heat No. 86054B						Group Average Chemistry		
Cu	Ni				Group	Avg. Cu	Avg. Ni	Est. # of
wt%	wt%	PEDIGREE	FLUX TYPE	SOURCE	Tag	wt%	wt%	Coils
		Group a				0.230	0.050	1
		VALID	Linde 1092	D4047	a			
0.23	0.05	VALID	Linde 1092	D4047	a			
		Group b				0.190	0.042	1
0.19	0.042	VALID	ARCOS B5	WCAP-10236	b			
		Group c				0.220	0.046	1
0.22	0.046	VALID	ARCOS B5	WCAP-10236	c			
		Group d				0.240	0.050	1
0.24	0.05	VALID	ARCOS B5	D3524	d			
		Group e					0.040	1
	0.04	VALID	ARCOS B5	D3340	e			
		Group f				0.190	0.050	1
0.19	0.05	VALID	ARCOS B5	D4256	f			

Simple Avg.	
Cu	Ni
0.214	0.046

Sample Weighted Average	
Cu	Ni
0.214	0.046

Coil Weighted Average	
Cu	Ni
0.214	0.046