50-317/318

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 3, 1998

Mr. Charles H. Cruse
Vice President - Nuclear Energy
Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Station
1650 Calvert Cliffs Parkway
Lusby, MD 20657

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING REACTOR PRESSURE VESSEL INTEGRITY AT CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 (TAC NOS. MA0532 AND MA0533)

Dear Mr. Cruse:

Generic Letter (GL) 92-01, Revision 1, Supplement 1 (GL 92-01, Rev.1, Supp. 1), "Reactor Vessel Structural Integrity" was issued in May 1995. 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 on their RPV integrity analyses relative to the requirements of Section 50.60 of Title 10 of the Code of Federal Regulations (10 CFR Part 50.60), 10 CFR 50.61, Appendices G and H to 10 CFR Part 50 (which encompass pressurized thermal shock (PTS) and upper shelf energy evaluations), and any potential impact on low temperature overpressure (LTOP) limits or pressure-temperature (PT) limits.

After reviewing your response, the NRC issued you a letter dated August 1, 1996, for Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2. In this letter we indicated that you had submitted the requested information and that you indicated that the previously submitted evaluations remained valid. As a result, the NRC concluded that no additional information regarding the structural integrity of your RPV was available at that time. In July 1997, the Combustion Engineering Owners Group (CEOG) provided a report with additional RPV weld chemistry data for RPVs fabricated by CE. This additional RPV weld chemistry data may affect previous RPV integrity analyses supplied by licensees with CE fabricated RPVs. In consideration of the data presented in the June 1997 CEOG report, the NRC requests that you confirm that your original response is still correct. The comments in the enclosed request for additional information (RAI) should be considered in the assessment of your original submittal. If the report does include data that would alter your original evaluation and in order to provide a complete response to items 2, 3, and 4 of the GL, the NRC requests that you provide a response to the enclosed RAI within 90 days of receipt of this letter. If a question does not apply to your situation, please indicate this in your RAI response along with your technical basis and, per GL 92-01, Rev. 1, Supp. 1, provide a certification that previously submitted evaluations remain valid.

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DF01

The information provided will be used in updating the Reactor Vessel Integrity Data Base. Also, please note that RPV integrity analyses utilizing newly identified data could result in the need for license amendments in order to maintain compliance with 10 CFR Part 50.60,

10 CFR 50.61 (pressurized thermal shock, PTS), and Appendices G and H to 10 CFR Part 50, and to address any potential impact on low temperature overpressure (LTOP) limits or pressure-temperature (PT) limits. If additional license amendments or assessments are necessary, the attached requests that you provide a schedule for such submittals.

If you should have any questions regarding this request, please contact me at (301) 415-3473.

Sincerely,

Original Signed by:

Alexander W. Dromerick, Senior Project Manager
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-317
and 50-318

Enclosure: Request for Additional Information

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10 CFR 50.61 (pressurized thermal shock, PTS), and Appendices G and H to 10 CFR Part 50, and to address any potential impact on low temperature overpressure (LTOP) limits or pressure-temperature (P-T) limits. If additional license amendments or assessments are necessary, the attached requests that you provide a schedule for such submittals.

If you should have any questions regarding this request, please contact me at (301) 415-3473.

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10 CFR 50.61 (PTS), and Appendices G and H to 10 CFR Part 50, and to address any potential impact on LTOP limits or PT limits. If additional license amendments or assessments are necessary, the enclosure requests that you provide a schedule for such submittals.

If you should have any questions regarding this request, please contact me at (301) 415-3473.

Sincerely,

Alexander W Dromerick

Alexander W. Dromerick, Senior Project Manager
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

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REQUEST FOR ADDITIONAL INFORMATION

REACTOR PRESSURE VESSEL INTEGRITY

Section 1.0: Assessment of Best-Estimate Chemistry

The staff recently received additional information that may affect the determination of the best-estimate chemistry composition for your RPV welds or your surveillance weld material. This information was provided to the NRC by the Combustion Engineering Owners' Group in report CE NPSD-1039, Revision 02, "Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds," dated June 1997.

Based on this information, in accordance with the provisions of Generic Letter 92-01, Revision 1, Supplement 1, the NRC requests the following:

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 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.

With respect to your response to this question, the staff notes that some issues regarding the evaluation of the data were discussed in a public meeting with the staff, NEI, and industry representatives on November 12, 1997. A summary of this meeting is documented in a meeting summary dated November 19, 1997, "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" (Reference 1). The information in Reference 1 may be useful in helping you to prepare your response.

In addition to the issues discussed in the referenced meeting, you should also consider what method should be used for grouping 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, 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 the aforementioned details, but sufficient evidence exists to reasonably assume the details are the same, 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 for which assumption was chosen when the best-estimate chemistry was determined.

Section 2.0: Evaluation and Use of Surveillance Data

The chemical composition report referenced in Section 1.0 includes updated chemistry estimates for heats of weld metal. These reports not only provide a suggested best estimate value but also include the source data used in estimating the chemical composition of the heat of material. This permits the determination of the best estimate chemical composition for the various sources of data including surveillance welds. Since the evaluation of surveillance data rely on both the best estimate chemical composition of the RPV weld and the surveillance weld, the information in these reports may result in the need to revise previous evaluations of RPV integrity (including LTOP setpoints and PT limits) per the requirements of 10 CFR 50.60, 10 CFR 50.61, and Appendices G and H to 10 CFR Part 50.

Based on this information and consistent with the provisions of Generic Letter 92-01, Revision 1, Supplement 1, the NRC requests the following:

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 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).

The information discussed in Section 1.0 of this RAI regarding the chemistry reports should be considered in this response along with the following questions and comments.

All surveillance program results for the heats of material in a RPV should be considered in evaluating its integrity regardless of source per 10 CFR 50.61 ("Surveillance program results means any data that demonstrates the embrittlement trends for the limiting beltline material, including but not limited to data from test reactors or from surveillance programs at other plants with or without surveillance program integrated per 10 CFR 50, Appendix H."). If any of the data provided in Table 2 are not used in the calculation of the embrittlement trend for a particular RPV weld, the technical basis for not including/using the data should be provided.

When assessing credibility of surveillance data that come from more than one source, adjustments to the surveillance data may be needed to account for differences in the chemical composition and irradiation environment of the different sources consistent with the requirements in 10 CFR 50.61. A method for accounting for these differences is discussed in Reference 1.

Based on the information provided in Table 2, the credibility of the surveillance data can be evaluated. The results of these analyses including the slope of the best fit line through the surveillance data can be provided in a format similar to that of Table 3. If the method for adjusting and/or normalizing the surveillance data when assessing credibility differ from the methods documented in Reference 1, provide the technical basis for the adjustment and/or the normalization procedure. If the chemical compositions of the surveillance weld is not determined in accordance with Reference 1 (i.e., the mean of all chemistry analyses performed on the surveillance weld), provide the technical basis for the estimate.

When determining the chemistry factor for a RPV weld from surveillance data, adjustments to the surveillance data may be needed to account for differences in the chemical composition and irradiation environment between the surveillance specimens and the vessel being assessed consistent with the requirements in 10 CFR 50.61. A method to account for these differences is provided in Reference 1.

In addition, 10 CFR 50.61(c)(2) specifies that licensees shall consider plant-specific information (e.g., operating temperature and surveillance data) to verify that the RT_{NDT} for each vessel beltline material is a bounding value. Regulatory Guide 1.99, Revision 2 describes two methods for determining the amount of margin and the chemistry factor used in determining RT_{NDT}. Position 1.1 describes the use of the Generic Tables in the Regulatory Guide. Position 2.1 describes the use of credible surveillance data. If the surveillance data are credible, the σ_Δ may be reduced in half to calculate the margin term and the chemistry factor is to be determined from the best-fit line of the surveillance data. If the evaluation of the surveillance data indicate that the surveillance data set is not credible and the measured values of ΔRT_{NDT} are less than the projected mean from the Tables plus the generic $2\sigma_\Delta$, the chemistry factor may be calculated using either Position 1.1 or Position 2.1; however, the full margin term must be applied. The method chosen must bound all the surveillance data to be in compliance with 10 CFR 50.61(c)(2).

Based on the information provided in Table 2 along with the best estimate chemical composition of the heat of material and the irradiation temperature of the plant whose vessel is being assessed, the chemistry factor of the RPV weld can be determined. Note that the adjusted ΔRT_{NDT} for a particular surveillance data point may be one value when determining credibility and another value when determining the chemistry factor as a result of the different normalization procedures. If the method for adjusting and/or normalizing the surveillance data when determining the chemistry factor differs from the methods documented in Reference 1, provide the technical basis for the adjustment and/or the normalization procedure.

In a meeting between the staff and industry representatives at the NRC on February 12, 1998, an industry representative requested a clarification as to when the ratio procedure should be used to evaluate surveillance data. The ratio procedure is described in the PTS rule and RG 1.99, Revision 2. The ratio procedure is used to adjust the measured value of ΔRT_{NDT} to account for differences in the chemical composition between the surveillance weld and the vessel beltline weld. The PTS rule and RG 1.99, Revision 2 indicate that when there is clear evidence that the copper and nickel content of the surveillance weld differs from the vessel weld, i.e. differs from the average for the weld wire heat number associated with the vessel weld and the surveillance weld, the ratio procedure must be used.

Section 3.0: PTS/PT Limit Evaluation

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.

Reference

1. Memorandum 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 Responses", dated November 19, 1997.

Attachments:
1. Table 1
2. Tables 2, 3

TABLE 1

Facility: _____
Vessel Manufacturer: _____

Information requested on RPV Weld and/or Limiting Materials

RPV Weld Wire Heat [1]	Best-Estimate Copper	Best-Estimate Nickel	EOL ID Fluence ($\times 10^{19}$)	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

(1) or the material identification of the limiting material as requested in Section 1.0 (1.)
(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

Attachment 1

Table 2: Heat xxxx

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)

Table 3: Heat xxxx

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)

Attachment 2