



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

March 27, 1998

Mr. W. R. McCollum
Vice President, Oconee Site
Duke Energy Corporation
P. O. Box 1439
Seneca, SC 29679

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING REACTOR
PRESSURE VESSEL INTEGRITY - OCONEE NUCLEAR STATION UNITS 1, 2,
AND 3 (TAC NOS. MA0557, MA0558, AND MA0559)

Dear Mr. McCollum:

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 a letter to you dated August 6, 1996. In this letter the NRC requested, in part, that you provide an assessment of the application of the ratio procedure, as described in Position 2.1 of Regulatory Guide 1.99, Revision 2, to your PT limits curves and LTOP limits.

Subsequent to issuing its letter, the NRC conducted an inspection of Framatome Technologies, Inc. (FTI) in May 1997. This inspection focused on obtaining all available RPV weld chemistry data for RPVs fabricated by B&W. As a result of this inspection, additional data were identified that may affect previous RPV integrity analyses supplied by licensees with B&W fabricated RPVs.

As a follow-up to the letter and the FTI inspection, 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 request for additional information (RAI) within 90 days of receipt of this letter. This response should include application of the ratio procedure in the assessment of surveillance data from welds. 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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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 (PTS), and Appendices G and H to 10 CFR Part 50, and to address any potential impact on low temperature overpressure limits or pressure-temperature limits. If additional license amendments or assessments are necessary, the enclosure requests that you provide a schedule for such submittals.

Sincerely,



David E. LaBarge, Senior Project Manager
Project Directorate II-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosures:

1. Request for Additional Information
2. Tables 1, 2, and 3

cc w/encls: See next page

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ORIGINAL SIGNED BY:

David E. LaBarge, Senior Project Manager
Project Directorate II-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation.

Docket Nos. 50-269, 50-270, and 50-287

Enclosures:

- 1. Request for Additional Information
- 2. Tables 1, 2, and 3

cc w/encls: See next page

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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 data was provided by FTI in letters from Mr. Matthew J. DeVan (FTI) to Mr. Barry J. Elliot (NRC) dated June 6, 1997 (INS-97-2262), June 19, 1997 (INS-97-2450), and July 10, 1997 (INS-97-2741). In addition, it is the NRC staff's understanding that an evaluation of this data was provided to members of the B&W Owner's Group, Mr. R. E. Jaquin (Rochester Gas and Electric), and Mr. P. S. Askins (Tennessee Valley Authority) via letter dated June 30, 1997 (INS-97-2526).

Based on this information, and 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 references 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 manufacture 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 reports referenced in Section 1.0 include updated chemistry estimates for heats of weld metal. These reports provide information regarding a best estimate value and the source of the 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 an 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 composition 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 an 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.

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 (x 10 ¹⁹)	Assigned Material Chemistry Factor (CF)	Method of Determining CF ⁽²⁾	Initial RT _{NDT} (RT _{NDT(U)})	σ_1	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

Table 2: Heat xxxx

Capsule ID (including source)	Cu	Ni	Irradiation Temperature (°F)	Fluence ($\times 10^{19}n/cm^2$)	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)