

WOLF CREEK

NUCLEAR OPERATING CORPORATION

Otto L. Maynard
President and Chief Executive Officer

SEP 25 1998

WM 98-0101

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-137
Washington, D. C. 20555

Reference: 1) NRC Generic Letter 92-01, Revision 1, Supplement 1:
Reactor Vessel Structural Integrity, dated May 19, 1995
2) Letter ET 95-0084 dated August 17, 1995, from
R. C. Hagan, WCNOG, to USNRC
3) Letter ET 96-0044 dated June 25, 1996, from
R. A. Muerch, WCNOG, to USNRC
4) NRC Request for Additional Information Regarding
Generic Letter 92-01, Revision 1, Supplement 1,
dated March 26, 1998
5) Letter WM 98-0056 dated July 10, 1998, from
O. L. Maynard, WCNOG to USNRC

Subject: Docket No. 50-482: Response to Request for Additional
Information Regarding Reactor Pressure Vessel Integrity
(Generic Letter 92-01, Revision 1, Supplement 1) and
Submission of Reactor Vessel Surveillance Capsule Test
Results per 10 CFR 50, Appendix H (TAC NO. MA0584)

Gen'l Lemen:

Reference 1 requested all Licensees of operating plants to identify, collect, and report any new data pertinent to the analysis of the structural integrity of their reactor pressure vessels (RPVs). Reference 1 also requested all Licensees 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 Part 50.61, Appendices G and H to 10 CFR Part 50 (which encompass pressurized thermal shock [PTS] and upper shelf energy [USE] evaluations), and any potential impact on low temperature over pressure (LTOP) limits or pressure-temperature (P-T) limits. Wolf Creek Nuclear Operating Corporation (WCNOG) provided responses to that request in References 2 and 3.

In July, 1997, the Combustion Engineering Owners Group (CEOG) issued a report, CE NPSD-1039, Revision 2, "Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds," that provides additional RPV weld chemistry data for vessel welds fabricated by Combustion Engineering. On March 26, 1998, the NRC issued Reference 4, requesting that WCNOG consider the impact of the revised best-estimate chemistries for vessel beltline welds from the CEOG

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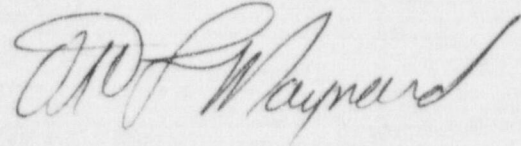
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report, and to consider the need to revise previous evaluations of RPV integrity for the WCGS reactor pressure vessel.

In Reference 5 WCNOG informed the NRC that we had shipped to Westinghouse a vessel capsule specimen (Capsule V) removed in November, 1997, during our ninth refueling outage, and that the test results for the capsule, along with the information needed to address Reference 4, would be provided to the NRC by September 30, 1998. Attached to this letter is WCNOG's response to Reference 4. Also enclosed are three WCAPs from Westinghouse, which provide the report of Capsule V test results, in accordance with 10 CFR 50, Appendix H, Section III, Paragraph A.

If you have any questions regarding this response, please contact me at (316) 364-8831, extension 4000, or Mr. Michael J. Angus at extension 4077.

Very truly yours,



Otto L. Maynard

OLM/rlr

Attachments
Enclosures:

1. WCAP-15078, "Analysis of Capsule V from the Wolf Creek Nuclear Operating Corporation Wolf Creek Reactor Vessel Radiation Surveillance Program," Revision 1, dated September, 1998
2. WCAP-15079, "Wolf Creek Heatup and Cooldown Limit Curves for Normal Operation," Revision 1, dated September, 1998
3. WCAP-15080, "Evaluation of Pressurized Thermal Shock for Wolf Creek", Revision 1, dated September, 1998

cc: W. D. Johnson (NRC), w/a, w/e
E. W. Merschoff (NRC), w/a, w/e
B. A. Smalldridge (NRC), w/a, w/e
K. M. Thomas (NRC), w/a, w/e

STATE OF KANSAS)
) SS
COUNTY OF COFFEY)

Otto L. Maynard, of lawful age, being first duly sworn upon oath says that he is President and Chief Executive Officer of Wolf Creek Nuclear Operating Corporation; that he has read the foregoing document and knows the content thereof; that he has executed that same for and on behalf of said Corporation with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By *Otto L. Maynard*
Otto L. Maynard
President and
Chief Executive Officer

SUBSCRIBED and sworn to before me this 25th day of September, 1998.



Linda DeLong-Ohmie
Notary Public
Expiration Date August 31, 2002

Response to NRC Request for Additional Information
Regarding Reactor Pressure Vessel Integrity at Wolf Creek

RAI Section 1.0 Assessment of Best-Estimate Chemistry

Based on the information in the CEOG Report CE NPSD-1039, Revision 2, "Best Estimate Copper and Nickel Values in CE Fabricated Reactor Vessel Welds," 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 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/P-T 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 to Item 1:

There is one weld heat, Heat Number 90146, in the Wolf Creek Generating Station (WCGS) vessel beltline. The best-estimate copper and nickel chemistries for this weld heat were reevaluated using the mean-of-the-mean method recommended in the Combustion Engineering Owners Group (CEOG) report. In addition, there was a chemistry analysis performed on three weld metal Charpy specimens from WCGS Capsule V. Hence, these values were also included in the determination of the revised copper and nickel values (See Table 1).

Contained in the following table is a comparison of the best-estimate copper and nickel values from the CEOG report and the latest reactor vessel integrity evaluation for the WCGS reactor vessel beltline weld metal.

| Reactor Vessel Beltline Weld Material | CEOG Values | | Current Values | |
|---------------------------------------|-------------|----------|----------------|----------|
| | Cu wt. % | Ni wt. % | Cu wt. % | Ni wt. % |
| Heat # 90146 | 0.039 | 0.082 | 0.043 | 0.083 |

The current best-estimate chemistries are included in Table 2. The current chemistries are slightly higher than the values determined in the CEOG report. Updated Adjusted Reference Temperature values are computed for this weld along with the information and calculated values for limiting lower shell plate R2508-1. The RT_{PTS} values presented in Table 2 are documented in WCAP-15080, "Evaluation of Pressurized Thermal Shock for Wolf Creek", Revision 1, dated September, 1998, and have been updated as part of the WCGS Capsule V evaluation.

RAI Section 2.0 Evaluation and Use of Surveillance Data

Since the evaluation of surveillance data relies on both the best-estimate chemical composition of the RPV weld and the surveillance weld, the information in the CEOG report may result in the need to revise previous evaluations of RPV integrity (including LTOP setpoints and P-T 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/P-T 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 to Item 2:

The beltline weld metal is not the limiting beltline material. Lower shell plate R2508-1 is the limiting material for the PTS evaluation and lower shell plate R2508-3 is the limiting material for the pressure-temperature curves evaluation. The data requested by Item 2 is contained in Tables 2, 3, 4 and 5 below. The surveillance data for the WCGS reactor vessel is considered credible. The credibility evaluation is presented in Appendix D of WCAP-15078, "Analysis of Capsule V from the Wolf Creek Nuclear Operating Corporation Wolf Creek Reactor Vessel Radiation Surveillance Program," Revision 1, dated September, 1998.

Based on the latest Capsule V evaluation (WCAP-15078), the pressurized thermal shock (PTS) evaluation (WCAP-15080), and the pressure-temperature (P-T) curves (WCAP-15079), have been revised. Charpy curves developed using the CVGRAPH TANH fitting program are given in Appendix C of WCAP-15078.

RAI Section 3.0 PTS/P-T 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 P-T and LTOP limits. The schedule should ensure that compliance with 10 CFR Part 50, Appendix G, is maintained.

Response 3:

The limiting material for WCGS has not changed. The beltline weld metal is not the limiting beltline material. Lower shell plate R2508-1 is the limiting material for the PTS evaluation and lower shell plate R2508-3 is the limiting material for the pressure-temperature curves evaluation. The PTS Evaluation and the P-T Limit Curves have been updated based on the Capsule V evaluation and the current copper and nickel values given in Section 1 of this response. The revised RT_{PTS} values for the limiting materials are documented in WCAP-15080 and the revised P-T Limit Curves are provided in WCAP-15079. The LTOP Limits are being reviewed based on the new P-T Limit Curves and WCNOG anticipates submitting any necessary revisions by December 31, 1998. This schedule will not impact 10 CFR Part 50, Appendix G compliance for WCGS.

TABLE 1

Facility: Wolf Creek

Vessel Manufacturer: Combustion Engineering

Information Requested on RPV Weld and/or Limiting Material

| RPV Weld Wire Heat/Plate ⁽¹⁾ | Best-Estimate Copper | Best-Estimate Nickel | EOL ID Fluence (x 10 ¹⁹) ⁽³⁾ | Assigned Material Chemistry Factor (CF) ⁽³⁾ | Method of Determining CF ⁽²⁾ | Initial RT _{NDT} (RT _{NDT(U)}) | σ_1 | σ_D | Margin | ART or RT _{PTS} at EOL |
|---|----------------------|----------------------|---|--|---|---|------------|------------|--------|---------------------------------|
| 90146 | 0.04 ⁽⁴⁾ | 0.08 ⁽⁴⁾ | 2.18 | 28.3 | Surv. Data | -50 | 0 | 14 | 28 | 12 |
| R2508-1 | 0.09 ⁽⁵⁾ | 0.67 ⁽⁵⁾ | 2.18 | 58.0 | Table | 0 | 0 | 17 | 34 | 104 |
| R2508-3 | 0.09 ⁽⁴⁾ | 0.58 ⁽⁴⁾ | 2.18 | 35.8 | Surv. Data | 40 | 0 | 8.5 | 17 | 100 |

- (1) or the material identification of the limiting material as requested in Section 1.0
- (2) determined from tables or from surveillance data
- (3) documented in the WCGS PTS Evaluation (WCAP-15080)
- (4) Best-estimate copper and nickel values are from Tables 6 and 7 and have been rounded to two decimal places
- (5) Best-estimate copper and nickel values are from Material Certification

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

Weld Wire Heat Discussion

90146 weighted mean copper and nickel based on 16 measurements (See Table 6)

TABLE 2: Heat 90146⁽¹⁾

| Capsule ID (including source) | Cu ⁽²⁾ | Ni ⁽²⁾ | Irradiation Temperature (°F) | Fluence (x10 ¹⁹ n/cm ²) | Measured ΔRT_{NDT} (°F) | Data Used in Assessing Vessel (Y or N) |
|-------------------------------|-------------------|-------------------|------------------------------|--|---------------------------------|--|
| U | 0.04 | 0.08 | 553.7 | 0.3429 | 27.21 | Y |
| Y | 0.04 | 0.08 | 553.7 | 1.308 | 45.09 | Y |
| V | 0.04 | 0.08 | 553.7 | 2.528 | 46.33 | Y |

NOTES:

- 1) All data contained in Table 2, with the exception of the irradiation temperature, was obtained from the Capsule V analysis (see WCAP-15078)
- 2) Best-estimate copper and nickel values are from Table 6 and have been rounded to two decimal places

TABLE 3: Heat 90146⁽¹⁾

| Capsule ID (including source) | Cu ⁽²⁾ | Ni ⁽²⁾ | Irradiation Temperature (°F) | Fluence Factor | Measured ΔRT_{NDT} (°F) | Adjusted ΔRT_{NDT} (°F) | Predicted ΔRT_{NDT} (°F) | (Adjusted - Predicted) ΔRT_{NDT} (°F) ⁽³⁾ |
|-------------------------------------|-------------------|-------------------|------------------------------------|-------------------|---------------------------------------|---------------------------------------|--|---|
| U | 0.04 | 0.08 | 553.7 | 0.705 | 27.21 | 19.75 | 27.50 | -7.75 |
| Y | 0.04 | 0.08 | 553.7 | 1.075 | 45.09 | 32.74 | 41.93 | -9.19 |
| V | 0.04 | 0.08 | 553.7 | 1.249 | 46.33 | 33.64 | 48.71 | -15.07 |

NOTES:

- 1) All data contained in Table 3, with the exception of the irradiation temperature, was obtained from the Capsule V analysis (see WCAP-15078) and the PTS Evaluation report (WCAP-15080)
- 2) Best-estimate copper and nickel values are from Table 6 and have been rounded to two decimal places
- 3) The "Adjusted ΔRT_{NDT} " is the "Measured ΔRT_{NDT} " adjusted by a ratio of 0.726 ($CF_{VW} / CF_{SW} = 31.6 / 43.5 = 0.726$)

TABLE 4: Plate R2508-3⁽¹⁾

| Capsule ID (including source) | Orient. | Cu ⁽²⁾ | Ni ⁽²⁾ | Irradiation Temperature (°F) | Fluence ($\times 10^{19}$ n/cm ²) | Measured ΔRT_{NDT} (°F) | Data Used in assessing Vessel (Y or N) |
|-------------------------------------|---------|-------------------|-------------------|------------------------------------|--|---------------------------------------|--|
| U | Long. | 0.09 | 0.58 | 553.7 | 0.3429 | 36.46 | Y |
| Y | Long. | 0.09 | 0.58 | 553.7 | 1.308 | 16.03 | Y |
| V | Long. | 0.09 | 0.58 | 553.7 | 2.528 | 52.03 | Y |
| U | Trans. | 0.09 | 0.58 | 553.7 | 0.3429 | 23.79 | Y |
| Y | Trans. | 0.09 | 0.58 | 553.7 | 1.308 | 35.39 | Y |
| V | Trans. | 0.09 | 0.58 | 553.7 | 2.528 | 54.53 | Y |

NOTES:

- 1) All data contained in Table 4, with the exception of the irradiation temperature, was obtained from the Capsule V analysis (see WCAP-15078)
- 2) Best-estimate copper and nickel values are from Table 7 and have been rounded to two decimal places

TABLE 5: Plate R2508-3⁽¹⁾

| Capsule ID (including source) | Orient. | Cu ⁽²⁾ | Ni ⁽²⁾ | Irradiation Temperature (°F) | Fluence Factor | Measured ΔRT_{NDT} (°F) | Adjusted ΔRT_{NDT} (°F) ⁽³⁾ | Predicted ΔRT_{NDT} (°F) | (Adjusted - Predicted) ΔRT_{NDT} (°F) |
|-------------------------------------|---------|-------------------|-------------------|------------------------------------|-------------------|---------------------------------------|--|--|--|
| U | Long. | 0.09 | 0.58 | 553.7 | 0.705 | 36.46 | 36.46 | 25.24 | 11.22 |
| Y | Long. | 0.09 | 0.58 | 553.7 | 1.075 | 16.03 | 16.03 | 38.49 | -22.46 |
| V | Long. | 0.09 | 0.58 | 553.7 | 1.249 | 52.03 | 52.03 | 44.71 | 7.32 |
| U | Trans. | 0.09 | 0.58 | 553.7 | 0.705 | 23.79 | 23.79 | 25.24 | -1.45 |
| Y | Trans. | 0.09 | 0.58 | 553.7 | 1.075 | 35.39 | 35.39 | 38.49 | -3.1 |
| V | Trans. | 0.09 | 0.58 | 553.7 | 1.249 | 54.53 | 54.53 | 44.71 | 9.82 |

NOTES:

- 1) All data contained in Table 5, with the exception of the irradiation temperature, was obtained from the Capsule V analysis (see WCAP-15078)
- 2) Best-estimate copper and nickel values are from Table 7 and have been rounded to two decimal places
- 3) The Adjusted ΔRT_{NDT} is not applicable, since, the ratio procedure only applies to the weld metal

TABLE 6: Heat 90146

Best Estimate Cu and Ni Weight Percent Values for the WCGS
 Beltline Weld Seams

| Reference | Measured % Cu | Measured % Ni | Weighted Average % Cu | Weighted Average % Ni |
|--------------------------------------|------------------|------------------|-----------------------------|-----------------------------|
| CE NPSD-1039, Rev. 2 | 0.04 | 0.04 | 0.04 | 0.04 |
| CE NPSD-1039, Rev. 2 | 0.03 | 0.09 | 0.03 | 0.09 |
| CE NPSD-1039, Rev. 2 | 0.03 | 0.10 | | |
| CE NPSD-1039, Rev. 2 | 0.03 | 0.08 | | |
| CE NPSD-1039, Rev. 2 | 0.03 | 0.04 | 0.0325 | 0.0725 |
| CE NPSD-1039, Rev. 2 | 0.04 | 0.11 | | |
| CE NPSD-1039, Rev. 2 | 0.03 | 0.06 | | |
| CE NPSD-1039, Rev. 2 | 0.03 | 0.08 | | |
| CE NPSD-1039, Rev. 2 | 0.04 | 0.09 | 0.04 | 0.1467 |
| CE NPSD-1039, Rev. 2 | 0.04 | 0.15 | | |
| CE NPSD-1039, Rev. 2 | 0.04 | 0.20 | | |
| CE NPSD-1039, Rev. 2 | 0.05 | 0.05 | 0.05 | 0.05 |
| CE NPSD-1039, Rev. 2 & WCAP-10015 | 0.04 | 0.09 | 0.067 | 0.097 |
| WCAP-15078 | 0.078 | 0.103 | | |
| WCAP-15078 | 0.074 | 0.094 | | |
| WCAP-15078 | 0.075 | 0.101 | | |
| SUM | 0.697 | 1.478 | 0.2595 | 0.4962 |
| Average | 0.044 | 0.092 | 0.043 | 0.083 |

NOTE: The values used for the evaluations are the mean of the mean values rounded to two decimal places (i.e., %Cu = 0.04 and %Ni = 0.08).

TABLE 7: Plate R2508-3

Best Estimate Cu and Ni Weight percent Values for the WCGS
Lower Shell Plate R2508-3

| Reference | Measured % Cu | Measured % Ni |
|------------|---------------|---------------|
| WCAP-10015 | 0.07 | 0.62 |
| WCAP-15078 | 0.104 | 0.532 |
| SUM | 0.174 | 1.152 |
| Average | 0.087 | 0.576 |

NOTE: The values used for the evaluations are the mean of the mean values rounded to two decimal places. (i.e., %Cu = 0.09 and %Ni = 0.58)

LIST OF COMMITMENTS

The following table identifies those actions committed to by Wolf Creek Nuclear Operating Corporation (WCNOC) in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments. Please direct questions regarding these commitments to Mr. Michael J. Angus, Manager Licensing and Corrective Action at Wolf Creek Generating Station, (316) 364-8831, extension 4077.

| COMMITMENT | Due Date/Event |
|--|-----------------------|
| The LTOP Limits are being reviewed based on the new P-T Limit Curves and will be submitted by December 31, 1998. | December 31, 1998 |