

ATTACHMENT
DUKE POWER COMPANY
OCONEE NUCLEAR STATION

9312020459 931122
PDR ADOCK 05000269
P PDR

Reply to RAI Regarding Generic Letter 92-01, Revision 1
Response for Oconee Units 1, 2, and 3

77-1228575-00

Prepared for
Duke Power Company

Prepared By
B&W Nuclear Service Company
Engineering and Plant Services Division
P. O. Box 10935
Lynchburg, Virginia 24506-0935

NONPROPRIETARY

Prepared By MJ DeVan 11/1/93
M. J. DeVan Date

Reviewed By L B Gross 11/1/93
L. B. Gross Date

Approved By K E Moore 11-1-93
K. E. Moore Date

Approved By D L Howell 11/1/93
D. L. Howell Date

The Nuclear Regulatory Commission (NRC) issued a Request for Additional Information (RAI) to Duke Power Company (DPCo) on October 8, 1993 regarding DPCo's response to Generic Letter 92-01, Revision 1 for Oconee Units 1, 2, and 3. (A copy of the RAI is appended to this document.) This document contains a proposed reply to the RAI.

Prepared By: M. J. DeVan
Reviewed By: L. B. Gross

Date: 11/01/93
Date: 11/01/93

77-1228575-00
Page 2

Oconee Unit 1

- (1) Table 1 lists the unirradiated C_V USE data for all the beltline materials.
- (2) Review of the Weld Qualification Test Report¹ for the weld SA-1073 states that the weld wire heat number is 1P0962. The heat number for this weld in identified in Table 1 of BAW-1500² is a typographical error and has been corrected in BAW-2121P,³ the supplement to BAW-1500.
- (3) Review of the Weld Qualification Test Report⁴ for the weld WF-9 states that the weld wire heat number is 72445. This weld was not included in reports BAW-1511P⁵ and BAW-1543, Revision 3,⁶ because this weld was used in the fabrication of the lower shell to dutchman circumferential weld which is below the 249 cm below the core and will not exceed an end-of-life fluence of 1.0×10^{17} n/cm². This is documented in Table 6 of BAW-2108, Revision 1,⁷ which states that the 32 EFPY fluence prediction for this weld is 5.06×10^{16} n/cm².

The information for weld WF-9 that would be required for Table 3 of BAW-2166⁸ is describe below:

WF-9 (Values are for 48 hr stress-relief.)

C_V 10 F (ft-lb)	46,43,45
C_V 30 ft-lb (F)	Not Determined
C_V 50 ft-lb (F)	Not Determined
C_V 35 MLE (F)	Not Determined
T_{NDT} (F)	Not Determined
RT_{NDT} (F)	-5 (Estimated - BAW-1803, Revision 1, ⁹ Tables 3-1 and 3-2; mean of RT_{NDT} values for 34 Linde 80 welds.)

- (4) Analyses demonstrating that the Oconee Unit 1 beltline weld metals provide margin of safety against fracture equivalent to that required by ASME Section III, Section G, have been performed under the sponsorship of the B&W Owners Group's Reactor Vessel Working Group. These analyses are documented in topical reports BAW-2192P¹⁰ for load levels A & B and BAW-2178P¹¹ for load levels C & D. These reports demonstrate that all beltline weld in Oconee Unit 1 meet the upper-shelf energy requirements of 10CFR50, Appendix G,¹² and will be used as the licensing basis for that purpose by Duke Power Company.

Table 1. Unirradiated C _v USE Values		
Oconee Unit 1		
Material	Initial C _v USE (ft-lbs)	Source
Nozzle Belt Forging Ht. No. AHR 54	124	Estimated (BAW-10046A,R2 ¹³)
Intermediate Shell Plate Ht. No. C2197-2	91	Estimated (BAW-10046A,R2)
Upper Shell Plate Ht. No. C3265-1	108 (Transverse)	BAW-2050 ¹⁴
Upper Shell Plate Ht. No. C3278-1	91	Estimated (BAW-10046A,R2)
Lower Shell Plate Ht. No. C2800-1	91	Estimated (BAW-10046A,R2)
Lower Shell Plate Ht. No. C2800-2	119 (Transverse)	BAW-1421,R1 ¹⁵
Upper Circ. Weld SA-1135	70	Estimated (BAW-1803 ¹⁶)
Intermediate Circ. Weld (ID 61%) SA-1229	70	Estimated (BAW-1803)
Intermediate Circ. Weld (OD 39%) WF-25	70	Estimated (BAW-1803)
Middle Circ. Weld SA-1585	70	Estimated (BAW-1803)
Lower Circ. Weld WF-9	70	Estimated (BAW-1803)
Intermediate Long. Weld SA-1073	70	Estimated (BAW-1803)
Middle Long. Weld SA-1493	70	Estimated (BAW-1803)
Lower Long. Weld SA-1430	70	Estimated (BAW-1803)
Lower Long. Weld SA-1426	70	Estimated (BAW-1803)

Prepared By: M. J. DeVan
Reviewed By: L. B. Gross

Date: 11/01/93
Date: 11/01/93

77-1228575-00
Page 4

Oconee Unit 2

- (1) Table 2 lists the unirradiated C_V USE data for all the beltline materials.
- (2) Analyses demonstrating that the Oconee Unit 2 beltline weld metals provide margin of safety against fracture equivalent to that required by ASME Section III, Section G, have been performed under the sponsorship of the B&W Owners Group's Reactor Vessel Working Group. These analyses are documented in topical reports BAW-2192P for load levels A & B and BAW-2178P for load levels C & D. These reports demonstrate that all beltline weld in Oconee Unit 2 meet the upper-shelf energy requirements of 10CFR50, Appendix G, and will be used as the licensing basis for that purpose by Duke Power Company.

Table 2. Unirradiated C_V USE Values		
Oconee Unit 2		
Material	Initial C_V USE (ft-lbs)	Source
Nozzle Belt Forging Ht. No. AMX 77	124	Estimated (BAW-10046A,R2)
Upper Shell Forging Ht. No. AAW 163	128 (Axial)	Supplier Test Report ¹⁷
Lower Shell Forging Ht. No. AWG 164	145 (Axial)	Supplier Test Report ¹⁸
Upper Circ. Weld WF-154	70	Estimated (BAW-1803)
Middle Circ. Weld WF-25	70	Estimated (BAW-1803)
Lower Circ. Weld WF-112	70	Estimated (BAW-1803)

Prepared By: M. J. DeVan
Reviewed By: L. B. Gross

Date: 11/01/93
Date: 11/01/93

77-1228575-00

Page 5

M. J. DeV
L. B. Gros

Oconee Unit 3

- (1) Table 3 lists the unirradiated C_v USE data for all the beltline materials.
- (2) The copper content for the lower nozzle belt forging is not available, however, the copper contents for similar forgings (A508, Cl. 2) are available. The chemical contents of these forgings are shown in Table 4. Based on the similarities in the chemical contents for these similar forging materials, a conservative copper content of 0.16wt% is assumed for the lower nozzle belt forging 4680.
- (3) Analyses demonstrating that the Oconee Unit 3 beltline weld metals provide margin of safety against fracture equivalent to that required by ASME Section III, Section G, have been performed under the sponsorship of the B&W Owners Group's Reactor Vessel Working Group. These analyses are documented in topical reports BAW-2192P for load levels A & B and BAW-2178P for load levels C & D. These reports demonstrate that all beltline weld in Oconee Unit 3 meet the upper-shelf energy requirements of 10CFR50, Appendix G, and will be used as the licensing basis for that purpose by Duke Power Company.

Table 3. Unirradiated C_v USE Values		
Oconee Unit 3		
Material	Initial C_v USE (ft-lbs)	Source
Nozzle Belt Forging Ht. No. 4680	124	Estimated (BAW-10046A,R2)
Upper Shell Forging Ht. No. AWS 192	90 (Axial)	Supplier Test Report ¹⁹
Lower Shell Forging Ht. No. ANK 191	110 (Axial)	Supplier Test Report ²⁰
Upper Circ. Weld WF-200	70	Estimated (BAW-1803)
Middle Circ. Weld (ID 75%) WF-67	70	Estimated (BAW-1803)
Middle Circ. Weld (OD 25%) WF-70	70	Estimated (BAW-1803)
Lower Circ. Weld WF-169-1	70	Estimated (BAW-1803)

Table 4. Chemical Composition of Reactor Vessel Forgings									
Forging Number (Supplier)	C	Mn	P	S	Si	Ni	Cr	Mo	Cu
4680 (Rotterdam)	0.21	0.67	0.009	0.012	0.22	0.91	0.36	0.56	---
AHR 54 (Ladish)	0.18	0.64	0.006	0.010	0.29	0.65	0.31	0.57	0.16
122S347VA1 (Bethlehem)	0.21	0.60	0.010	0.008	0.24	0.70	0.33	0.60	0.08
AMX 77 (Ladish)	0.21	0.63	0.006	0.010	0.25	0.72	0.34	0.61	0.06
AAW 163 (Ladish)	0.24	0.63	0.006	0.012	0.25	0.75	0.36	0.62	0.04
AWG 164 (Ladish)	0.21	0.62	0.010	0.010	0.23	0.80	0.39	0.58	0.02
122T293VA1 (Bethlehem)	0.20	0.66	0.007	0.014	0.24	0.70	0.35	0.61	0.11
ARY 59 (Ladish)	0.26	0.63	0.006	0.008	0.28	0.72	0.34	0.64	0.08
122T229VA1 (Bethlehem)	0.21	0.64	0.008	0.010	0.27	0.69	0.36	0.60	0.08
124W295VA1 (Bethlehem)	0.22	0.59	0.010	0.012	0.24	0.78	0.34	0.58	0.10
AYN 131 (Ladish)	0.27	0.64	0.009	0.015	0.21	0.70	0.32	0.66	0.03
125W609VA1 (Bethlehem)	0.24	0.66	0.011	0.009	0.27	0.76	0.34	0.62	0.11
AWS 192 (Ladish)	0.21	0.58	0.011	0.015	0.24	0.73	0.30	0.60	0.01
ANK 191 (Ladish)	0.24	0.72	0.014	0.012	0.21	0.76	0.34	0.62	0.02
ADB 203 (Ladish)	0.23	0.70	0.007	0.009	0.29	0.68	0.39	0.63	0.04
AKJ 233 (Ladish)	0.26	0.68	0.004	0.006	0.30	0.77	0.38	0.64	0.04
BCC 241 (Ladish)	0.22	0.63	0.011	0.011	0.27	0.81	0.32	0.63	0.02
122Y384VA1 (Bethlehem)	0.21	0.61	0.008	0.008	0.25	0.72	0.32	0.61	0.08

Prepared By: M. J. DeVan
Reviewed By: L. B. Gross

Date: 11/01/93
Date: 11/01/93

77-1228575-00
Page 7

References

1. The Babcock & Wilcox Company, Mt. Vernon Works, Qualification of Wire and Flux for Automatic Submerged Arc Welding, Test No. SA-1073, June 26, 1967.
2. K. E. Moore and A. S. Heller, Chemistry of 177-FA B&W Owners' Group Reactor Vessel Beltline Welds, BAW-1500, Babcock & Wilcox, Nuclear Power Generation Division, Lynchburg, Virginia, September 1978.
3. L. B. Gross, Chemical Composition of B&W Fabricated Reactor Vessel Beltline Welds, BAW-2121P, B&W Nuclear Service Company, Lynchburg, Virginia, April 1991.
4. The Babcock & Wilcox Company, Mt. Vernon Works, Laboratory Work Request and Report, Test No. WF-9, April 8, 1969.
5. A. L. Lowe, Jr. (Editor), Irradiation-Induced Reduction in Charpy Upper-Shelf Energy of Reactor Vessel Welds, BAW-1511P, Babcock & Wilcox, Nuclear Power Generation Division, Lynchburg, Virginia, October 1980.
6. S. Fyfe, L. B. Gross, and A. L. Lowe, Jr., Master Integrated Reactor Vessel Surveillance Program, BAW-1543, Revision 3, Babcock & Wilcox, Nuclear Power Division, Lynchburg, Virginia, September 1989.
7. L. Petrusha, Fluence Tracking System, BAW-2108, Revision 1, B&W Nuclear Service Company, Lynchburg, Virginia, May 1992.
8. M. J. DeVan, L. B. Gross, and A. L. Lowe, Jr., B&W Owners Group Response to Generic Letter 92-01, BAW-2166, B&W Nuclear Service Company, Lynchburg, Virginia, June 1992.
9. A. L. Lowe, Jr. and J. W. Pegram, Correlations for Predicting the Effects of Neutron Radiation on Linde 80 Submerged-Arc Welds, BAW-1803, Revision 1, B&W Nuclear Service Company, Lynchburg, Virginia, May 1991.
10. K. K. Yoon, Low Upper-Shelf Toughness Fracture Analysis of Reactor Vessels of B&W Owners Group Reactor Vessel Working Group for Level A & B Conditions, BAW-2192P, B&W Nuclear Service Company, Lynchburg, Virginia, August 1993.
11. K. K. Yoon, Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Level C & D Service Loads, BAW-2178P, B&W Nuclear Service Company, Lynchburg, Virginia, February 1993.

Prepared By: M. J. DeVan

Date: 11/01/93

77-1228575-00

Reviewed By: L. B. Gross

Date: 11/01/93

Page 8

12. Code of Federal Regulation, Title 10, Part 50, Domestic Licensing of Production and Utilization Facilities, Appendix G, Fracture Toughness Requirements.
13. H. W. Behnke, et al., Methods of Compliance with Fracture Toughness and Operational Requirements of 10CFR50, Appendix G, BAW-10046A, Revision 2, Babcock & Wilcox, Nuclear Power Division, Lynchburg, Virginia, June 1986.
14. A. L. Lowe, Jr., et al., Analysis of Capsule OCI-C Duke Power Company Oconee Nuclear Station Unit 1, Reactor Vessel Material Surveillance Program, BAW-2050, Babcock & Wilcox, Nuclear Power Division, Lynchburg, Virginia, October 1988.
15. A. L. Lowe, Jr., et al., Analysis of Capsule OC1-F from Duke Power Company Oconee Unit 1, Reactor Vessel Materials Surveillance Program, BAW-1421, Revision 1, Babcock & Wilcox, Nuclear Power Generation Division, Lynchburg, Virginia, September 1975.
16. A. S. Heller and A. L. Lowe, Jr., Correlations for Predicting the Effects of Neutron Radiation on Linde 80 Submerged-Arc Welds, BAW-1803, Babcock & Wilcox, Utility Power Generation Division, Lynchburg, Virginia, January 1984.
17. Ladish Co., Materials Analysis Report, Heat No. AAW 163, April 28, 1969.
18. Ladish Co., Materials Analysis Report, Heat No. AWG 164, May 13, 1969.
19. Ladish Co., Materials Analysis Report, Heat No. AWS 192, August 12, 1969.
20. Ladish Co., Materials Analysis Report, Heat No. ANK 191, August 20, 1969.

Prepared By: M. J. DeVan
Reviewed By: L. B. Gross

Date: 11/01/93
Date: 11/01/93

77-1228575-00
Page 9.

110-20-93, 10-02



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20558-0001

October 8, 1993

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

Mr. J. W. Hampton
Vice President, Oconee Site
Duke Power Company
P. O. Box 1439
Seneca, South Carolina 29679

Dear Mr. Hampton:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING OCONEE RESPONSE TO
GENERIC LETTER 92-01, REVISION 1 (TAC NOS. M83734, M83735, AND
M83736)

The NRC staff is reviewing your response to Generic Letter (GL) 92-01 for Oconee Units 1, 2, and 3. We find that further information, as indicated in the enclosure, is required to complete our review. Your response to the enclosed questions is requested within 45 days of the date of this letter. If you have any questions regarding this matter, I may be contacted at (301) 492-1495.

This requirement affects one respondent and, therefore, is not subject to Office of Management and Budget review under P.L. 96-511.

Sincerely,

A handwritten signature in dark ink, appearing to read "L. A. Wiens", written over a horizontal line.

Leonard A. Wiens, Project Manager
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosure:
Request for Additional
Information

cc w/enclosure:
See next page

Prepared By: M. J. DeVan
Reviewed By: L. B. Gross

Date: 11/01/93
Date: 11/01/93

77-1228575-00
Page 10

V&E
FSS

Mr. J. W. Hampton
Duke Power Company

Oconee Nuclear Station

cc:
Mr. A. V. Carr, Esquire
Duke Power Company
422 South Church Street
Charlotte, North Carolina 28242-0001

J. Michael McGarry, III, Esquire
Winston and Strawn
1400 L Street, NW.
Washington, DC 20005

Mr. Robert B. Borsum
Babcock & Wilcox
Nuclear Power Division
Suite 525
1700 Rockville Pike
Rockville, Maryland 20852

Manager, LIS
NUS Corporation
2650 McCormick Drive, 3rd Floor
Clearwater, Florida 34619-1035

Senior Resident Inspector
U. S. Nuclear Regulatory Commission
Route 2, Box 610
Seneca, South Carolina 29678

Regional Administrator, Region II
U. S. Nuclear Regulatory Commission
101 Marietta Street, NW. Suite 2900
Atlanta, Georgia 30323

Max Batavia, Chief
Bureau of Radiological Health
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Office of Intergovernmental
Relations
116 West Jones Street
Raleigh, North Carolina 27603

County Supervisor of Oconee County
Walhalla, South Carolina 29621

Mr. M. E. Patrick
Compliance
Duke Power Company
Oconee Nuclear Site
P. O. Box 1439
Seneca, South Carolina 29679

Mr. Alan R. Herdt, Chief
Project Branch #3
U. S. Nuclear Regulatory Commission
101 Marietta Street, NW. Suite 2900
Atlanta, Georgia 30323

Ms. Karen E. Long
Assistant Attorney General
North Carolina Department of
Justice
P. O. Box 629
Raleigh, North Carolina 27602

Mr. G. A. Copp
Licensing - EC050
Duke Power Company
P. O. Box 1006
Charlotte, North Carolina 28201-1006

Prepared By: M. J. DeVan Date: 11/01/93
Reviewed By: L. B. Gross Date: 11/01/93

77-1228575-00
Page 11

ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION
RELATING TO THE LICENSEE RESPONSE TO
GENERIC LETTER 92-01
FOR
OCONEE UNITS 1, 2, AND 3

The licensee's response to Generic Letter (GL) 92-01 is contained in the Babcock & Wilcox report, BAW-2166, "B&W Owners Group Response to Generic Letter 92-01," June 1992. Based on the review of BAW-2166, the staff has the following comments and requests for additional information under Questions 2.a and 2.b in GL 92-01:

OCONEE 1 (TAC No. M83734)

1. The licensee reported unirradiated upper shelf energy (USE) for limiting materials only. Provide unirradiated USE for all beltline materials.
2. The heat number for the weld wire of weld SA-1073 is indicated as 1P0962 in Table 5 of BAW-2166; however, Table 1 of BAW-1500 indicates the heat number as 1P9062. Explain the discrepancy and provide the correct weld wire heat number for SA-1073.
3. Table 5 of BAW-2166 indicates that the heat number of weld WF-9 is 72245. However, in BAW-1511P and BAW-1543 reports, weld WF-9 is not included under heat number 72245. Resolve the discrepancy, confirm the heat number for the weld wire of weld WF-9, and identify whether WF-9 is in the beltline region where the neutron fluence at end of life is greater than $1.0E17$ n/cm².

Also, Weld WF-9 is listed in Tables 4, 7, and 10 but not in Table 3 of BAW-2166. Resolve the discrepancy.

4. The GL 92-01 response indicates that the USE at end of license for weld SA-1229 will fall below the screening criterion of 50 ft-lb. The staff is reviewing two topical reports by Babcock & Wilcox owners group (B&WOG) on USE equivalent margin analysis regarding beltline welds with low USE values for Levels A and B (BAW-2192P) and for Levels C and D (BAW-2178P). The licensee should confirm if these two topical reports will be used as its licensing bases to demonstrate that all beltline welds in the Oconee Unit 1 reactor vessel will meet the USE requirements of Appendix G, 10 CFR 50.

OCONEE 2 (TAC No. M83735)

1. The licensee reported unirradiated USE for limiting materials only. Provide unirradiated USE for all beltline materials.
2. The 92-01 response indicates that the USE at end of license for weld WF-25 will fall below the screening criterion of 50 ft-lb. The licensee should confirm if the two aforementioned B&WOG topical reports, BAW-2192P and BAW-2178P, will be used as its licensing bases to demonstrate that all beltline welds in the Oconee Unit 2 reactor vessel will meet the USE requirements of Appendix G, 10 CFR 50.

OCONEE 3 (TAC No. M83736)

1. The licensee reported USE for limiting materials only. Provide unirradiated USE for all beltline materials.
2. There is no copper content reported for lower belt forging 4680 in Table 7 of BAW-2166. Provide the copper content and its bases.
3. The GL 92-01 response indicates that the unirradiated USE at end of license for weld WF-67 will fall below the screening criterion of 50 ft-lb. The licensee should confirm if the two aforementioned B&WOG topical reports, BAW-2192P and BAW-2178P, will be used as its licensing bases to demonstrate that all beltline welds in the Oconee Unit 3 reactor vessel will meet the USE requirements of Appendix G, 10 CFR 50.

Prepared By: M. J. DeVan
Reviewed By: L. B. Gross

Date: 11/01/93
Date: 11/01/93

77-1228575-00
Page 13