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AUTH.NAME AUTHOR AFFILIATION
HAMPTON,J.W. Duke Power Co.
RECIP.NAME RECIPIENT AFFILIATION
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SUBJECT: Forwards third ten yr ISI interval Request for Relief 93-08 supplemental info,including B&W ltr dtd 950608 providing description of rev to B&W TR BAW-2228, "Fracture Mechanics Assessment of Postulated Outer Surfaces,Semi-Elliptical...."

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Duke Power Company
Oconee Nuclear Site
P.O. Box 1439
Seneca, SC 29679

J. W. HAMPTON
Vice President
(803)885-3499 Office
(803)885-3564 Fax

DUKE POWER

June 12, 1995

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

Subject: Duke Power Company
Oconee Nuclear Station, Unit 3
Docket Nos. 50-269, -270, -287
Third Ten Year Inservice Inspection Interval
Request for Relief No. 93-08
Supplemental Information

On September 13, 1984, Duke Power submitted a Relief from Code requirement concerning the Reactor Vessel Core Flood, Inlet, and Outlet nozzle to pipe welds. This request was needed due to the unusual difficulty, without a compensating increase in quality or safety, in performing the required surface examination. This difficulty is a result of the radiation dose levels and time required to perform a surface examination of these welds. This request was to allow the use of an ultrasonic examination of the welds from the inside diameter in lieu of the required surface examination on the outside weld surface.

Throughout the Second ISI Interval, resolution to this item was pursued by Duke/BWOG through dialogue with the NRC. As Duke approached the end of the second interval, it was recognized that this issue would not be resolved before the last outages of each Oconee Unit. Therefore, Relief Request 93-08, dated December 21, 1993, was submitted to delay performance of the code-required examination on each of the units to the first outages of the Third ISI Interval based on results of the alternate examinations. In an SER dated March 31, 1994, the NRC approved the delay requested in Relief Request 93-08.

In August 1994, in followup to a final NRC request for additional information regarding the acceptability of the proposed alternate testing, B&W Topical Report BAW-2228 was submitted to the NRC for review. The NRC reviewed and approved this topical report in an SER dated December 2, 1994. In this SER, the NRC states that

> "Each licensee that references this topical report as the basis for the request for relief from the external surface examination of RV nozzle-to-piping welds must confirm plant specific applicability by demonstrating that (1) the input stresses shown in Table 1 for its

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plant is a result of using the bounding transient analysis and (2) the material in its inlet, outlet, and core flood nozzles is (the same as those stated in the B&W topical report)."

Duke verified that the assumptions and stress values used in the B&W Topical Report BAW-2228 are consistent with current Oconee parameters. This verification required a review of Oconee's original stress reports along with a search for any changes or modifications to the plant which would conflict with the original stress reports. Although this review has required a revision to BAW-2228, the analyses conducted to support this revision conclude that Oconee Units remain within the assumptions and limitations described in the original report reviewed by the NRC. A description of this revision is provided in the attached B&W letter dated 6/8/95. Duke considers this item satisfactorily completed with no further actions required.

If there are any questions or further information is needed you may contact D. A. Nix at (803) 885-3634.

Very truly yours,

J. W. Hampton
Site Vice President

Attachment

xc (w/attch): Mr. L. A. Wiens
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, DC 20555

xc (w/o attch): Mr. S. D. Ebneter
Regional Administrator, Region II
U. S. Nuclear Regulatory Commission

Mr. P. E. Harmon
Senior NRC Resident Inspector
Oconee Nuclear Station

Mr. Virgil R. Autry
Bureau of Radiological Health
SC Dept. of Health & Environmental Control
2600 Bull St.
Columbia, SC 29201

B&W NUCLEAR TECHNOLOGIES

3315 Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935
Telephone: 804-832-3000
Telecopy: 804-832-3663

June 9, 1995
ESC-95-441

Mr. David Nix
Duke Power Company
Oconee Nuclear Station
P.O. Box 1439
Seneca, SC 29679

Subject: Revision to BWNT Report BAW-2228A

References: 1) BWNT Report BAW-2228A, Entitled "Fracture Mechanics Assessment of Postulated Outer Surface, Semi-Elliptical Circumferential RV Nozzle-To-Pipe Weld Flaws," Rev. 0 dated February 1995

2) NRC Letter B. W. Sheron (NRC) to D. A. Gulling (FPC) dated December 2, 1994

Dear Mr. Nix:

The purpose of this letter is to provide technical justification in support of Duke Power Company's (DPCo) review of the Reference 1 report. The NRC's acceptance of the report is documented in the Reference 2 Safety Evaluation Report (SER). However, as part of the NRC's SER, the NRC requested that DPCo confirm the applicability of the Reference 1 conclusions to the Oconee Unit 1, 2, and 3 plants. Specifically the NRC stated:

> "Each licensee that references this topical report as the basis for the request for relief from the external examination of RV nozzle-to-piping welds must confirm plant specific applicability by demonstrating that (1) the input stresses shown in Table 1 is applicable to the plant and the materials are the same as those used in BAW-2228A."

During the review of Oconee specific applications DPCo and BWNT discovered that there is a need for a revision to BAW-2228A since:

- Stress values are slightly different since the original stresses were obtained from the component stress reports and consequently only nozzle cross-sections were considered. Additional stresses based on the thinner piping cross-sections (piping side of the weld) should be included in the evaluation.

- The calculation of the attached piping stresses and thermal transient stresses should be refined for the emergency/faulted condition.

- A more appropriate, but still conservative, fracture mechanics solution methodology was determined to be applicable to the analysis.

BWNT has completed the calculations to support the revision to the Reference 1 report. To aid with the Oconee review, BWNT is providing copies of the new stress tables which replace Tables 1 through 4 in BAW-2228A, Rev. 0. In addition, a transient description is also included. A re-analysis of these new stresses resulted in new allowable flaw sizes as shown below:

	Maximum Allowable Flaw Depth as Function of Wall Thickness	
Core Flood Nozzle	BAW- 2228A	BAW-2228 Rev. 1
i) Nozzle-to-safe end weld	37.0%	>60%
ii) Safe end-to-pipe weld	58.7%	60%
Inlet Nozzle		
i) Nozzle-to-pipe weld	56.5%	57%
Outlet Nozzle		
i) Nozzle-to-pipe weld	25.9%	25.5%

As can be seen from the allowable flaw size table above, the changes in stresses resulted in only a minor change to the previously reported allowable flaw size values. Therefore, it is BWNT's technical position that the conclusions reached in BAW-2228A are still valid and applicable to Oconee Units 1, 2 and 3. The alternate examination performed on the RV nozzle-to-pipe welds in the Unit 3 refueling outage 14 (12/93) is adequate for the full inspection interval.

BWNT is currently revising the Reference 1 report to include the stress values and flaw sizes discussed in this letter.

If you have any questions regarding this letter or the attached stress tables, please call me at (804)832-3290.

Sincerely,

A. W. Robinson
Project Manager
Owners Group Projects

AWR/mcl

Attachment

c: NDE Committee

E. E. Addison	- Entergy Operations, Inc.
R. G. Sheffield	- Duke Power Company
D. A. Gulling	- Florida Power Corporation
G. J. Navratil	- GPU Nuclear Corporation
M. D. Shepherd	- Toledo Edison Company
W. F. Brady	- Duke Power Company

Revised BAW-2228 Stresses

Table 1a. Stresses at Core Flood Nozzle, Safe End-to-Pipe Weld (piping side)

Plant	Fatigue Group	Cycles until next 10 yr. ISI	Normal / Upset Maximum Membrane (ksi)	Normal / Upset Maximum Bending (ksi)	Normal / Upset Minimum Membrane (ksi)	Normal / Upset Minimum Bending (ksi)	Emergency / Faulted Maximum Membrane (ksi)	Emergency / Faulted Maximum Bending (ksi)
OC- 1,2,3	1a	90	13.9	6.8	0.0	0.0	4.8	-85.5
	1b	90	10.0	6.3	9.1	1.9		
	1c	90	9.1	5.3	9.1	3.4		
	2	4500	13.9	6.8	13.3	6.5	23.2	7.3
ANO-1	1a	60	26.1	8.0	0.0	0.0	16.5	-84.4
	1b	60	22.2	7.5	21.3	3.1		
	1c	60	21.3	6.5	21.2	4.6		
	2	12000	26.1	8.0	25.5	7.7	35.1	8.5
DB-1	1a	60	13.5	6.7	0.0	-0.8	4.1	-85.8
	1b	60	10.7	6.5	10.0	-0.8		
	1c	60	9.5	5.3	9.5	3.5		
	2	12000	13.5	6.7	13.5	6.0	22.8	6.9
CR-3	1a	60	13.8	6.9	0.0	0.0	4.8	-85.5
	1b	60	13.8	3.9	9.8	2.1		
	1c	60	13.8	5.1	9.3	3.9		
	2	12000	13.8	6.9	13.2	3.9	23.0	4.7
TMI-1	1a	60	21.7	7.6	0.0	0.0	16.1	-84.5
	1b	60	21.7	4.6	17.7	2.8		
	1c	60	21.7	5.8	17.2	4.6		
	2	12000	21.7	7.6	21.1	4.6	32.5	5.6

Table 1b. Stresses at Core Flood Nozzle, Safe End-to-Pipe Weld (nozzle side) for Limiting Plant

Plant	Fatigue Group	Cycles until next 10 yr. ISI	Normal / Upset Maximum Membrane (ksi)	Normal / Upset Maximum Bending (ksi)	Normal / Upset Minimum Membrane (ksi)	Normal / Upset Minimum Bending (ksi)	Emergency / Faulted Maximum Membrane (ksi)	Emergency / Faulted Maximum Bending (ksi)
ANO-1	1a	60	23.3	6.9	0.0	0.0	14.7	-84.4
	1b	60	19.8	6.5	19.0	2.8		
	1c	60	19.0	5.7	18.9	4.1		
	2	12000	23.3	6.9	22.7	6.6	31.2	7.4

Revised BAW-2228 Stresses

Table 2. Stresses at Core Flood Nozzle, Nozzle-to-Safe End Weld

Plant	Fatigue Group	Cycles until next 10 yr. ISI	Normal / Upset Maximum Membrane (ksi)	Normal / Upset Maximum Bending (ksi)	Normal / Upset Minimum Membrane (ksi)	Normal / Upset Minimum Bending (ksi)	Emergency / Faulted Maximum Membrane (ksi)	Emergency / Faulted Maximum Bending (ksi)
OC- 1,2,3	1a	90	10.6	5.1	0.0	-13.8	3.3	-74.1
	1b	90	7.1	-0.4	6.3	-13.8		
	1c	90	6.3	-2.1	6.2	-7.7		
	2	4500	10.6	5.1	10.0	0.2	16.9	9.1
ANO-1	1a	60	18.9	6.0	0.0	-13.0	11.2	-73.2
	1b	60	15.3	0.4	14.5	-13.0		
	1c	60	14.5	-1.3	14.5	-6.8		
	2	12000	18.9	6.0	18.3	1.1	25.0	9.8
DB-1	1a	60	10.3	5.1	0.0	-14.5	2.9	-74.3
	1b	60	7.8	0.3	7.3	-14.5		
	1c	60	6.8	-2.5	6.8	-8.2		
	2	12000	10.3	5.1	10.3	0.8	16.6	8.9
CR-3	1a	60	10.4	4.6	0.0	-11.4	3.3	-74.1
	1b	60	10.4	4.1	6.9	-11.4		
	1c	60	10.4	4.1	5.9	-5.4		
	2	12000	10.4	4.6	9.9	4.1	16.7	9.1
TMI-1	1a	60	15.8	5.2	0.0	-10.8	11.0	-73.3
	1b	60	15.8	4.7	12.3	-10.8		
	1c	60	15.8	4.7	11.3	-4.8		
	2	12000	15.8	5.2	15.3	4.7	23.2	9.8

Revised BAW-2228 Stresses

Table 3a. Stresses at RV Outlet Nozzle, Nozzle-to-Pipe Weld (piping side)

Plant	Fatigue Group	Cycles until next 10 yr. ISI	Normal / Upset Maximum Membrane (ksi)	Normal / Upset Maximum Bending (ksi)	Normal / Upset Minimum Membrane (ksi)	Normal / Upset Minimum Bending (ksi)	Emergency / Faulted Maximum Membrane (ksi)	Emergency / Faulted Maximum Bending (ksi)
OC- 1,2,3	3	90	9.7	0.0	0.0	-12.1		
	4	4500	9.7	-9.6	9.7	-12.1		
	1	2463	9.7	-12.1	9.7	-12.1		
	2	120	9.7	-4.1	9.1	-12.1	14.1	0.1
ANO-1	1	60	10.7	3.1	0.0	-15.1		
	2	12360	10.7	2.6	10.6	-2.8		
	4	2232	11.5	2.6	10.7	-1.5	14.9	2.9
DB-1	1	60	33.0	4.6	0.0	-12.8		
	2	12360	33.0	3.7	25.9	-1.0		
	4	2232	26.8	3.7	25.9	-0.3	34.3	4.3
CR-3	1	60	10.1	2.9	0.0	-14.4		
	2	12360	10.1	2.5	10.0	-2.7		
	4	2232	10.9	2.5	10.1	-1.5	15.4	2.9
TMI-1	1	60	12.6	0.2	0.0	-11.9		
	2	12000	12.6	-9.4	12.6	-11.9		
	3	4538	12.6	-3.9	12.1	-11.9	17.1	0.1

Table 3b. Stresses at RV Outlet Nozzle, Nozzle-to-Pipe Weld (nozzle side) for Limiting Plant

Plant	Fatigue Group	Cycles until next 10 yr. ISI	Normal / Upset Maximum Membrane (ksi)	Normal / Upset Maximum Bending (ksi)	Normal / Upset Minimum Membrane (ksi)	Normal / Upset Minimum Bending (ksi)	Emergency / Faulted Maximum Membrane (ksi)	Emergency / Faulted Maximum Bending (ksi)
DB-1	1	60	29.4	4.1	0.0	-10.1		
	2	12360	29.4	3.7	29.3	-0.5		
	4	2232	30.1	3.7	29.4	0.5		
							30.5	3.8

Revised BAW-2228 Stresses

Table 4a. Stresses at RV Inlet Nozzle, Nozzle-to-Pipe Weld (piping side) for DB-1

Plant	Fatigue Group	Cycles until next 10 yr. ISI	Normal / Upset Maximum Membrane (ksi)	Normal / Upset Maximum Bending (ksi)	Normal / Upset Minimum Membrane (ksi)	Normal / Upset Minimum Bending (ksi)	Emergency / Faulted Maximum Membrane (ksi)	Emergency / Faulted Maximum Bending (ksi)
DB-1	1	60	16.7	6.4	0.0	-1.5		
	2	12360	16.6	5.0	16.2	2.6		
	5	2212	17.1	5.0	16.2	3.8	40.6	5.3

Table 4b. Stresses at RV Inlet Nozzle, Nozzle-to-Pipe Weld (nozzle side) for DB-1

Plant	Fatigue Group	Cycles until next 10 yr. ISI	Normal / Upset Maximum Membrane (ksi)	Normal / Upset Maximum Bending (ksi)	Normal / Upset Minimum Membrane (ksi)	Normal / Upset Minimum Bending (ksi)	Emergency / Faulted Maximum Membrane (ksi)	Emergency / Faulted Maximum Bending (ksi)
DB-1	1	60	14.9	5.3	0.0	-1.1		
	2	12360	14.8	4.2	14.8	2.2		
	5	2212	15.6	4.2	14.8	3.2	36.1	4.7

Transient Description for Core Flood Nozzle

Fatigue Group	Normal/Upset Condition Transient
1a	Overall heatup/cooldown transient
1b	Core flood line valve test (during cooldown)
1c	Decay heat initiation (during cooldown)
2	Power loading and unloading
	Emergency/Faulted Condition Transient
Top pair	Core flood injection transient during LOCA
Bottom pair	SRSS of (SSE + LOCA) + steady state thermal

Transient Description for the RV Inlet/Outlet Nozzles

Fatigue Group	Normal/Upset Condition Transient
1-5	Grouping of transients as selected for fatigue analysis in the component stress report
	Emergency/Faulted Condition Transient
	SRSS of (SSE + LOCA) + steady state thermal