MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

NUCLEAR PRODUCTION DEPARTMENT

July 26, 1982

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416 and 50-417
License No. NPF-13
File 0260/L-814.2/M-087.0
RE: 1. AECM-81/391, Oct. 9, 1981
2. AECM-81/483, Dec. 15, 1981
3. AECM-82/258, June 25, 1982
SQRT - HPCS Service Water Pump
Analysis OL Condition
2.C(11(b)), SSER 2, 3.10(4)
AECM-82/329

During the Grand Gulf Nuclear Station SQRT site audit conducted July 28 through July 30, 1981, the Equipment Qualification Branch (EQB) was concerned only with the methodology used to determine the relative displacement of the pump shaft and impeller in the HPCS Service Water Pump. After a February 2, 1982 conference call, Mississippi Power & Light arranged to provide the EQB with the detailed drawings of the Could HPCS Service Water Pump for the purpose of performing an independent stress analysis. In Supplement No. 2 to MP&L's Safety Evaluation Report, the EQB identified overstresses at the pump base to be the single issue as a result of their independent analysis performed by an NRC consultant. Consequently, the EQB required this issue to be resolved prior to operation beyond 5% power.

Since this time, the independent analysis performed for the EQB has been revised, and the second analysis shows that the stresses calculated are well below the allowable limits. In fact, results of the revised analysis are similar to those of the McDonald Engineering report which was the original basis for qualification. The results of this comparison are attached. Consequently, the independent analysis performed by the NRC's consultant would seem to verify both the methodology and results of the qualification analysis performed by McDonald Engineering.

Based upon the comparison showing similar results for the stresses on the pump shaft between EQB's independent analysis and the McDonald Engineering report, the issue as identified in Supplement No. 2 to MP&L's Safety Evaluation Report has been resolved.

B001

MISSISSIPPI POWER & LIGHT COMPANY

If you have any questions or require further information, please contact this office.

Yours truly,

L. F. Dale
Manager of Nuclear Services

RAB/SHH/JDR:ac
Attachment

cc: Mr. N. L. Stampley (w/o)
Mr. R. B. McGehee (w/o)
Mr. T. B. Conner (w/o)
Mr. G. B. Taylor (w/o)

Mr. Richard C. DeYoung, Director (w/o)
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. J. P. O'Reilly, Regional Administrator (w/a)
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Region II
101 Marietta St., N.W., Suite 3100
Atlanta, Georgia 30303

TABLE 1

COMPARISON BETWEEN MCDONALD AND EG&G METHODOLOGIES

ITEM NO.	ITEM	MCDONALD ANALYSIS	EG&G ANALYSIS
a	Computer Code	STRUDL	SAP
b	Geometry Modeling Technique	Single Beam	Two Parallel Beams
c	Dynamic Analysis Technique	Response Spectra	Response Spectra
d	Diameter of Shaft (in)	1.6	1.93
e.	Housing Properties	$A=10.07\ in^2$ $I=137.5\ in^4$	$A=11.9\ in^2$ $I=160.7\ in^4$
f	Mass Distribution	Nodal Mass	Nodal Mass Plus Distributive Mass
g	Spectra Input	Values at Natural Frequencies	Complete Curve was Digitized

TABLE 2

COMPARISON BETWEEN MCDONALD AND EG&G ANALYSIS RESULTS

ITEM	MCDONALD ANALYSIS	EG&G ANALYSIS	ALLOWABLE
Maximum Deflection at the Bottom of the pump (in)	15.25	16.2	N/A*
Maximum Moment in the housing (in-lb)	538,120	649,831	N/A
Maximum Dynamic[1] Stress in the housing (psi)	21,042	21,773	36,000[2] - Faulted Case 24,750 - Upset Case

* Not Applicable

1. Stress due to deadweight and pressure is less than 2000 psi total.
2. These allowables include non-dynamic stresses.

APPENDIX A

MCDONALD ENGINEERING ANALYSIS REPORT

ME-207
(EXTRACT)

RECORD DOCUMENT

BECHTEL POWER CORP.
RECEIVED
FEB 17 1977

ME-207

JOB NO. 9645

CERTIFICATION STATEMENT

This Goulds Pumps, Inc. Model VITX-SD-10x14JHC - 2 stage pump has been analyzed in accordance with Bechtel Power Corp. Specification No. 9645 M-087.0 Revision 8 including Appendix H.2 and Z, Specification 9645-C-196.0 Revision 1 and Appendix W; the ASME Section III, Class 3 Code; and accepted good practice in seismic stress analysis.

The pump meets all requirements of the specification and the ASME Code and will perform its intended function during both OBE and SSE seismic loads combined with the maximum nozzle and normal loads.

VENDOR'S DOCUMENT REVIEW
1 ☑ Approved - Mfg. may proceed.
2 ☐ Approved - Submit final dwg. - Mfg. may proceed.
3 ☐ Approved - except as noted - Make changes and submit final dwg. - Mfg. may proceed as approved.
4 ☐ Not Approved - Correct and resubmit.
5 ☐ Review not required - Mfg. may proceed.
Approval of this drawing does not relieve supplier from full compliance with contract or purchase order requirement.
By D. Tuco Date 2-28-77
BECHTEL

JOB NO. 9645-01 | BECHTEL CORPORATION POWER & INDUSTRIAL DIVISION P.O. BOX 607 GAITHERSBURG, MD

C K McDonald

C. K. McDonald, Ph.D., P.E.

Albama Registration No. 9586

May 28, 1975

Revised February 27, 1976

Revised December 28, 1976

ADDITIONAL Eq. No. and Document No. HAVE BEEN ADDED AS FOLLOWS: RB 6/29/77F
ALSO APPLIES TO Q2P41CC002C
and DOCUMENT CATEGORY 8.0

9645-M-087.0-Q1P41C002-C-7.0-1-B

0232 07736

2. SUMMARY OF RESULTS

2.1 Normal Case

	Actual	Allowable
Maximum Column Stress, PSI	2,994	15,000
Max. Column Flange Stress, PSI	4,845	17,500
Bolt Stress, PSI	9,449	25,000
Max. Pump Flange Stress, PSI	6,895	14,000
Bolt Stress, PSI	23,523	25,000
Max. Pump Casing Stress, PSI	3,990	14,000
Max. Shaft Stress, PSI	7,876	10,000
Motor Hold Down Bolt Stress, PSI		
Tensile	0	25,000
Shear	526	10,000
Shaft Key Stress, PSI	3,197	10,000
Shaft Deflection, inches	0	.05
Impeller Deflection(clearance),in.	.0000	.012
Nozzle Stress, PSI	10,496	15,000
Nozzle Flange Stress, PSI	13,596	17,500
Bolt Stress, PSI	11,977	15,000
Anchor Bolt Stress, PSI		
Tensile	4,634	40,000
Shear	1,871	12,320
Discharge Head Hold Down Bolts		
Tensile Stress, PSI	2,870	25,000
Shearing Stress, PSI	819	12,500
Discharge Head Stress, PSI	147	15,000
Discharge Head Flange Stress, PSI	5,959	12,600
Discharge Head Weld Stress, PSI	3,870	15,000

2. SUMMARY OF RESULTS

2.2 Upset Case

	Actual	Allowable
Maximum Column Stress, PSI	12,185	24,750
Max. Column Flange Stress, PSI	21,955	28,875
Bolt Stress, PSI	20,074	27,500
Max. Pump Flange Stress, PSI	6,028	23,100
Bolt Stress, PSI	16,158	27,500
Max. Pump Casing Stress, PSI	3,990	14,000
Max. Shaft Stress, PSI	9,158	16,500
Motor Hold Down Bolt Stress, PSI		
Tensile	129	27,500
Shear	744	11,000
Shaft Key Stress, PSI	3,197	10,000
Shaft Deflection, inches	.008	.05
Impeller Deflection(clearance),in.	.0000	.012
Nozzle Stress, PSI	19,811	24,750
Nozzle Flange Stress, PSI	16,695	28,875
Bolt Stress, PSI	11,977	16,500
Anchor Bolt Stress, PSI		
Tensile	22,226	44,000
Shear	2,230	13,552
Discharge Head Hold Down Bolts		
Tensile Stress, PSI	13,767	27,500
Shearing Stress, PSI	977	13,750
Discharge Head Stress, PSI	4,560	24,750
Discharge Head Flange Stress, PSI	13,830	20,790
Discharge Head Weld Stress, PSI	3,514	16,500

2. SUMMARY OF RESULTS

2.3 Faulted Case

	Actual	Allowable
Maximum Column Stress, PSI	22,838	36,000
Max. Column Flange Stress, PSI	39,231	42,000
Bolt Stress, PSI	33,138	50,000
Max. Pump Flange Stress, PSI	6,895	33,600
Bolt Stress, PSI	17,095	50,000
Max. Pump Casing Stress, PSI	3,990	14,000
Max. Shaft Stress, PSI	10,511	24,000
Motor Hold Down Bolt Stress, PSI		
Tensile	1,352	50,000
Shear	962	20,000
Shaft Key Stress, PSI	3,197	10,000
Shaft Deflection, inches	.015	.05
Impeller Deflection(clearance),in.	.00001	.012
Nozzle Stress, PSI	29,256	36,000
Nozzle Flange Stress, PSI	21,297	42,000
Bolt Stress, PSI	11,977	30,000
Anchor Bolt Stress, PSI	47,664	80,000
Tensile	3,710	24,640
Shear		
Discharge Head Hold Down Bolts		
Tensile Stress, PSI	29,523	50,000
Shearing Stress, PSI	1,625	25,000
Discharge Head Stress, PSI	8,972	36,000
Discharge Head Flange Stress, PSI	24,789	30,240
Discharge Head Weld Stress, PSI	4,888	30,000

APPENDIX B

EG&G SAP COMPUTER RUN ANALYSIS

NUMBER BLH 1 E60

(EXTRACT)

WATER TO SUPPORT POINT

DISPLACED WATER MASSES ALONG COLUMN

MAX END DEFLECTION = $1.414 \times 11.44 = 16.18$ in

MAX STRESS (AT SUPPORT POINT) $= \frac{M}{Z} = \frac{(1.414)(459500)}{29.84} = 21773$ psi

EXPRESS MAIL NEXT DAY SERVICE POST OFFICE TO ADDRESSEE

FROM:

D L HARRIS
EGBG IDAHO INC
PO BOX 1625
IDAHO FALLS ID 83415

Customer Number, If any:

TO:

MR SAURAV PATOR
MOTECH
[illegible] VIA DEL ORO
SAN JOSE CA 95119

ORIGIN:

Initials of Receiving Clerk:

P.O. ZIP Code:

Date in: Time in:

Return Receipt Service
- [ ] To Whom & Date Del.
- [ ] To Whom, Date & Address of Del.

Weight: Lbs Postage & Fees: $

DESTINATION:

Date of Delivery:

Time of Delivery:

Initials of Delivering Employee:

Signature of Addressee or Agent:

DELIVERY WAS ATTEMPTED

Date Time:

Notice Left By:

TO REMOVE PEEL BACK HERE

EXPRESS MAIL SERVICE

LABEL 11B JAN/82 ☆ U.S.G.P.O. 1981-357-478

9	-.39280E-04	.14846E-07	0.	0.	0.	-.54357E-06
10	.96625E-03	.18136E-06	0.	0.	0.	.26874E-04
11	-.13195E-04	-.26127E-07	0.	0.	0.	-.66550E-07
12	-.40075E-06	.24599E-02	0.	0.	0.	-.11346E-07
13	-.10671E-03	.85099E-05	0.	0.	0.	-.33046E-05
14	.65203E-04	.44524E-06	0.	0.	0.	.28235E-05
15	.71085E-05	-.20913E-08	0.	0.	0.	.30135E-06
16	.32248E-03	.57413E-07	0.	0.	0.	.90089E-05
17	.37931E-06	-.25179E-07	0.	0.	0.	.37861E-07
18	-.24415E-04	.12683E-09	0.	0.	0.	.24310E-05
19	.19513E-03	-.29097E-07	0.	0.	0.	.73148E-05
20	-.14048E-03	-.62961E-08	0.	0.	0.	-.16959E-05
21	.11340E+02	.24599E-02	0.	0.	0.	.25559E-01

2

1	.11339E+02	-.10920E-09	0.	0.	0.	.25453E-01
2	-.40103E-01	-.30372E-09	0.	0.	0.	-.28818E-03
3	-.50652E-03	.18363E-10	0.	0.	0.	-.44211E-05
4	-.19042E+00	-.13018E-08	0.	0.	0.	-.23101E-02
5	-.76591E-03	-.43621E-09	0.	0.	0.	-.58678E-05
6	-.20065E-03	.43439E-09	0.	0.	0.	-.22981E-05
7	-.56010E-02	.10935E-08	0.	0.	0.	-.12096E-03
8	.42366E-04	.61807E-09	0.	0.	0.	.36862E-06
9	-.13520E-04	.72187E-09	0.	0.	0.	-.22962E-06
10	.87013E-03	.23210E-07	0.	0.	0.	.26588E-04
11	.13119E-04	-.41267E-06	0.	0.	0.	.54689E-06
12	-.25692E-06	.33211E-02	0.	0.	0.	-.79369E-08
13	-.45153E-04	-.42698E-05	0.	0.	0.	-.12921E-05
14	.15528E-04	-.17135E-06	0.	0.	0.	.23094E-06
15	.16806E-05	.37524E-09	0.	0.	0.	.37796E-07
16	.24965E-03	-.76380E-08	0.	0.	0.	.95544E-05
17	.24135E-06	.28569E-08	0.	0.	0.	.84086E-08
18	.48795E-05	-.15706E-10	0.	0.	0.	.48914E-07
19	.87191E-04	.35909E-08	0.	0.	0.	.37345E-05
20	.38907E-05	.99047E-09	0.	0.	0.	.21170E-07
21	.11341E+02	.33211E-02	0.	0.	0.	.25559E-01

1

1	.11441E+02	-.10920E-09	0.	0.	0.	.25453E-01
2	-.41256E-01	-.30372E-09	0.	0.	0.	-.28818E-03
3	-.52421E-03	.18363E-10	0.	0.	0.	-.44211E-05
4	-.19966E+00	-.13018E-08	0.	0.	0.	-.23101E-02
5	-.80938E-03	-.43621E-09	0.	0.	0.	-.58678E-05
6	-.20924E-03	.43439E-09	0.	0.	0.	-.22981E-05
7	-.60849E-02	.10935E-08	0.	0.	0.	-.12096E-03
8	.43841E-04	.61807E-09	0.	0.	0.	.36862E-06
9	-.14439E-04	.72187E-09	0.	0.	0.	-.22962E-06
10	.97648E-03	.23210E-07	0.	0.	0.	.26588E-04
11	.15306E-04	-.41267E-08	0.	0.	0.	.54689E-06
12	-.28867E-06	.33211E-02	0.	0.	0.	-.79369E-08
13	-.50321E-04	-.42698E-05	0.	0.	0.	-.12921E-05
14	.16452E-04	-.17135E-06	0.	0.	0.	.23094E-06
15	.18318E-05	.37524E-09	0.	0.	0.	.37796E-07
16	.28786E-03	-.76380E-08	0.	0.	0.	.95544E-05
17	.27498E-06	.28569E-08	0.	0.	0.	.84086E-08
18	.50752E-05	-.15706E-10	0.	0.	0.	.48914E-07
19	.10213E-03	.35909E-08	0.	0.	0.	.37345E-05
20	.39754E-05	.99047E-09	0.	0.	0.	.21170E-07
21	.11443E+02	.33211E-02	0.	0.	0.	.25559E-01

max deflection

) / / / ELEMENT NUMBER (12)

T1(I)	M2(I)	M3(I)	P1(J)	V2(J)	V3(J)	T1(J)	M2(J)	M3(J)
0.		.2031E+06	.8073E+03	.8721E+03	0.	0.	0.	.2482E+06

) / / / ELEMENT NUMBER (13)

T1(I)	M2(I)	M3(I)	P1(J)	V2(J)	V3(J)	T1(J)	M2(J)	M3(J)
0.		.2482E+06	.8941E+03	.9565E+03	0.	0.	0.	.2968E+06

) / / / ELEMENT NUMBER (14)

T1(I)	M2(I)	M3(I)	P1(J)	V2(J)	V3(J)	T1(J)	M2(J)	M3(J)
0.		.2968E+06	.9762E+03	.1026E+04	0.	0.	0.	.3495E+06

) / / / ELEMENT NUMBER (15)

T1(I)	M2(I)	M3(I)	P1(J)	V2(J)	V3(J)	T1(J)	M2(J)	M3(J)
0.		.3495E+06	.1053E+04	.1069E+04	0.	0.	0.	.4057E+06

) / / / ELEMENT NUMBER (16)

T1(I)	M2(I)	M3(I)	P1(J)	V2(J)	V3(J)	T1(J)	M2(J)	M3(J)
0.		.4057E+06	.1123E+04	.1084E+04	0.	0.	0.	.4595E+06

not bending moment

) / / / ELEMENT NUMBER (17)

T1(I)	M2(I)	M3(I)	P1(J)	V2(J)	V3(J)	T1(J)	M2(J)	M3(J)
0.		.1405E+05	.2158E+03	.2348E+03	0.	0.	0.	.9405E+04

) / / / ELEMENT NUMBER (18)

T1(I)	M2(I)	M3(I)	P1(J)	V2(J)	V3(J)	T1(J)	M2(J)	M3(J)
0.		.9405E+04	.2004E+03	.2429E+03	0.	0.	0.	.3671E+04

) / / / ELEMENT NUMBER (19)

T1(I)	M2(I)	M3(I)	P1(J)	V2(J)	V3(J)	T1(J)	M2(J)	M3(J)
0.		.3708E+04	.1086E+03	.2181E+03	0.	0.	0.	.3421E-07

) / / / ELEMENT NUMBER (20)