MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
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NUCLEAR PRODUCTION DEPARTMENT

October 18, 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
SQRT Qualification of HPCS
Service Water Pump - SSER 2,
Section 3.10 (4)
Reference: MAEC-82/208,
9/8/82
AECM-82/435,
10/4/82
AECM-82/489

SSER 2, Section 3.10 (4) and MAEC-82/208 outlined the NRC's concerns over the seismic qualification of the HPCS standby service water pump. The concerns arose from an Idaho Nuclear Engineering Laboratory (INEL) study, and focused on two points: flow induced vibration during normal opeation, and pump operability during and following seismic deflection. These concerns were addressed by Mississippi Power & Light Company (MP&L) in AECM-82/435 and during a meeting with the NRC in Bethesda, Maryland, October 8, 1982.

The purpose of the October 8, 1982, meeting was to allow MP&L to discuss and, where necessary, to supplement the information in AECM-82/435; significant points presented during the meeting are summarized in Attachment 1. At the NRC's request, MP&L committed to perform an in situ test to close the concern over flow induced vibration. The test is outlined in Attachment 2 and will be performed prior to startup following the first refueling outage.

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With the commitment to perform in situ testing, MP&L considers the HPCS service water pump concerns in SSER 2, Section 3.10 (4) to be resolved for full power licensing. If you have any questions, please do not hesitate to contact us.

Yours truly,

L. F. Dale
Manager of Nuclear Services

MJD/JDR:lm

Attachments: 1) Handout from October 8, 1982, NRC-MP&L Meeting
2) HPCS Service Water Pump In Situ Test Program

cc: Mr. N. L. Stampley (w/a)
Mr. R. B. McGehee (w/o)
Mr. T. B. Conner (w/o)
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AE2Z2

GRAND GULF NUCLEAR STATION

HPCS SERVICE WATER PUMP

STAFF CONCERNS (SEPTEMBER 8, 1982)

A. FUNDAMENTAL FREQUENCY CONCERN

- PUMP FUNDAMENTAL FREQUENCY IS LOW, THEREFORE ASSEMBLY IS FLEXIBLE.
- NATURAL FREQUENCIES OCCUR CLOSE TO OPERATING SPEEDS.
- MODEL DOES NOT CONSIDER FLOW INDUCED VIBRATION.

B. PUMP OPERABILITY CONCERN

- CAN THE PUMP OPERATE WHEN MAXIMUM DEFLECTION AT THE PUMP END OCCURS?

C. STAFF RECOMMENDATIONS

- CONDUCT TESTS OR ADD RESTRAINT.

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HPCS SERVICE WATER PUMP

A. NATURAL FREQUENCY, OPERATING SPEED, FLOW INDUCED VIBRATION

1. LOW FUNDAMENTAL FREQUENCY (LESS THAN 1HZ) WILL ENHANCE THE PUMP'S RESPONSE DURING AN EARTHQUAKE EVENT.

   A. AT LOW FREQUENCY THE SEISMIC ACCELERATION VALUES ARE SMALL (<0.15G)
   B. PARTICIPATION OF THE FIRST MODE IS MORE THAN 90% OF THE TOTAL RESPONSE

2. PARTICIPATION OF THE MODES CLOSE TO THE OPERATING SPEED (30HZ) IS EXTREMELY SMALL.

3. FLOW INDUCED VIBRATION IS NOT A CONCERN DUE TO THE FOLLOWING:

   A. THE MAIN EXCITATION MECHANISM FOR THE FLOW INDUCED VIBRATION IS THE TURBULENT WALL-PRESSURE FLUCTUATIONS WHICH HAS A "PINK" NOISE CHARACTERISTIC (THE AMPLITUDE OF THE POWER SPECTRAL DENSITY HAS AN EXPONENTIALLY DECAYING SHAPE VS. FREQUENCY)

   B. THE MODAL PARTICIPATION FOR HIGHER MODES ALSO DROPS EXPONENTIALLY

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B. RELATIVE DEFLECTION DETERMINES OPERABILITY - THIS IS A FUNCTION OF BEARING STIFFNESS

1. THE 20 LB/IN VALUE FOR THE RUBBER BEARING STIFFNESS USED BY EG&G IS INAPPROPRIATE IN THE GGNS APPLICATION.

   A. ANALYTICALLY DETERMINED TO BE 22,581 LB/IN (MCDONALD)
   B. TEST RESULTS WERE 26,100 LB/IN (NUTECH)

2. COMPARISON OF ALLOWABLE/ACTUAL VALUES OF SHAFT DEFLECTION, SHAFT TO BEARING DEFLECTION, AND IMPELLER TO HOUSING DEFLECTION ARE MET.

	ALLOWABLE	ACTUAL
SHAFT DEFLECTION RELATIVE TO BEARING	50 MILS (1)	15 MILS
SHAFT TO BEARING DEFLECTION	12 MILS (2)	4 MILS
IMPELLER DEFLECTION	12 MILS (1)	0.01 MILS (1)

(1) MCDONALD ENGINEERING

(2) GOULD PUMP INCORPORATED

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C. TEST OR RESTRAIN

1. TEST

THE NRC'S PROPOSED STATIC TEST WILL NOT ADDRESS OPERABILITY.

2. RESTRAINTS

A. SINGLE

WILL CHANGE MODE SHAPE AND FREQUENCY

- WILL INCREASE RELATIVE DISPLACEMENT

- WILL INCREASE SEISMIC LOAD

B. MULTIPLE

WILL CHANGE MODE SHAPE AND FREQUENCY

- MAY LOWER RELATIVE DISPLACEMENT AND SEISMIC LOAD BUT WILL INCREASE FLOW INDUCED VIBRATION

HPCS Service Water Pump In Situ Test Program

Purpose

MP&L will conduct an in-situ operating test which will evaluate the effects of flow induced vibration (FIV) on the pump. The purpose of the test is to show that FIV and the dynamic characteristic forces on the pump will not impair its operation.

Discussion

The test will be performed while the pump is operating. The duration of the test will allow for sufficient time to bring the pump to its normal operating conditions. Sufficient measurements will be taken from test sensors at different intervals to ensure that a reliable and statistically sufficient data set is collected.

A pressure sensor will be installed as close as possible to the pump discharge elbow. The recorded data for this sensor will be used to determine the magnitude and the frequency content of the FIV load. A non-contact probe will be installed in the vicinity of the motor to shaft coupling. It will measure the response of the shaft. The recorded data from this sensor will be used to determine the dynamic characteristics of the shaft. MP&L will evaluate the feasibility of installing an accelerometer on the pump housing.

The results of the test data from the pressure sensor will verify that the FIV load has a "pink" noise characteristic (i.e., the amplitude of the power spectra density function has an exponential decay shape with an increase in frequency). The dynamic characterists of the pump determined from the non-contact probe data will be used to show that the participation of the modes at higher frequencies is small. By verifying that the pink noise characteristics of the FIV load is correct, and that the participation of the modes at higher frequencies is low, it will be concluded that the FIV will not impair the operation of the pump.