

February 22, 1989

Docket No. 50-458

Gulf States Utilities
ATTN: Mr. James C. Deddens
Senior Vice President (RBNG)
Post Office Box 220
St. Francisville, LA 70775

Dear Mr. Deddens:

SUBJECT: RIVER BEND STATION, UNIT 1 - AMENDMENT NO. 34 TO FACILITY
OPERATING LICENSE NO. NPF-47 (TAC NO. 71147)

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 34 to Facility Operating License No. NPF-47 for the River Bend Station, Unit 1. The amendment consists of changes to the license in response to your application dated November 9, 1988.

The amendment deletes the License Condition 2.C.(4), Attachment 2, Item 1 requirement to install an additional brace on the control rod hydraulic units as used in the qualification testing.

A copy of our Safety Evaluation is enclosed. Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

/s/

Walter A. Paulson, Project Manager
Project Directorate - IV
Division of Reactor Projects - III,
IV, V and Special Projects
Office of Nuclear Reactor Regulation

Enclosures:

1. Amendment No. 34 to License No. NPF-47
2. Safety Evaluation
3. Notice of Issuance

cc w/enclosures:
See next page

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DOCUMENT NAME: RIVER BEND AMEND 2/2

PD4/LA	PD4/PM	OGC	PD4/D
PNoonan	WPaulson:bj	gm	JCalvo
02/18/89	02/07/89	02/15/89	02/22/89

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555
February 22, 1989

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Sincerely,

A handwritten signature in cursive script that reads "Walter A. Paulson".

Walter A. Paulson, Project Manager
Project Directorate - IV
Division of Reactor Projects - III,
IV, V and Special Projects
Office of Nuclear Reactor Regulation

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Mr. James C. Deddens
Gulf States Utilities Company

River Bend Nuclear Plant

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

GULF STATES UTILITIES COMPANY

DOCKET NO. 50-458

RIVER BEND STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No.34
License No. NPF-47

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Gulf States Utilities Company (the licensee) dated November 9, 1988, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, as amended, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to License Condition 2.C.(4), Attachment 2, Item 1 of Facility Operating License No. NPF-47. Attachment 2 is hereby amended to read as follows:

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ATTACHMENT 2
TO NPF-47
SEISMIC AND DYNAMIC QUALIFICATION OF SEISMIC CATEGORY 1 MECHANICAL AND
ELECTRICAL EQUIPMENT

GSU shall complete the following requirements for seismic and dynamic qualification on the schedule noted below:

1. GSU shall complete the seismic qualification of the in-vessel rack prior to its use.

3. The license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Jose A. Calvo

Jose A. Calvo, Director
Project Directorate - IV
Division of Reactor Projects - III,
IV, V and Special Projects
Office of Nuclear Reactor Regulation

Date of Issuance: February 22, 1989



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 34 TO FACILITY OPERATING LICENSE NO. NPF-47

GULF STATES UTILITIES COMPANY

RIVER BEND STATION, UNIT 1

DOCKET NO. 50-458

1.0 INTRODUCTION

By letter dated November 9, 1988, Gulf States Utilities Company (GSU) (the licensee) requested an amendment to Facility Operating License No. NPF-47 for the River Bend Station, Unit 1. The proposed amendment would delete the License Condition 2.C.(4), Attachment 2, Item 1 requirement to install an additional brace on the control rod hydraulic drive units as used in the qualification testing. The license condition requires that the additional brace be installed prior startup from the second refueling outage which is currently scheduled to begin March 15, 1989.

During the shake table testing, using a test response spectrum which bounded the test BWR/6 conditions, the hanger holding the nitrogen cylinder on the hydraulic control unit (HCU) test assembly failed due to fatigue. As a result, an additional brace was installed on the HCU test assembly prior to the successful completion of the seismic and dynamic qualification test.

To validate the completed dynamic test results and support timely operating license review, the licensee committed to modify the HCUs by adding an additional brace, similar to the one installed during the test, prior to startup following the second refueling outage. An immediate fix was not required based on a licensee's estimation that the unbraced HCUs currently installed at River Bend Station (RBS) were qualified for a reduced service life of 4.4 years based on an estimated 200 safety/relief valve (SRV) actuations (of 1800 expected for 40 year life) occurring at the test response spectra (TRS) level in addition to three upset and one faulted events.

Interim operation was granted based on this justification and the current license condition to install the additional braces prior to startup following the second refueling outage was issued with the RBS low power operating license. There have been only 77 SRV actuations at RBS to date. The original reduced service estimate was extremely conservative because it was based on only the successful 3 minutes 40 seconds of random, multifrequency (RMF) SRV aging testing that occurred in the side-to-side and vertical test orientation before the failure of the nitrogen cylinder support hanger. The HCU assembly was also successfully tested for 90 minutes of vibration aging in each orthogonal axis and 15 minutes of SRV aging RMF testing in the front-to-back and vertical orientation prior to the fatigue of the hanger.

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The licensee also did not take credit for the significant margins that exist between the SRV aging RMF test response spectra (TRS) and the RBS unique SRV required response spectra (RRS). The RMF TRS was established to envelop the required response spectra (RRS) for another BWR/6 reactor. The RRS of the test BWR/6, and hence the TRS used in the dynamic testing, is substantially higher than the unique RRS for SRV loading and upset condition loading at the HCU mounting locations at RBS.

Because of the severity of the original qualification testing, an additional evaluation was conducted by the licensee to determine the actual number of stress cycles imposed on the HCU by the successful testing completed prior to the fatigue failure of the nitrogen cylinder hanger. The intention was to demonstrate that the HCU configuration currently installed at RBS was qualified for more than 40 years for seismic/dynamic conditions postulated to occur at RBS without any of the previously stated modifications.

2.0 EVALUATION

The HCUs were originally qualified by General Electric (GE) as documented in Qualification Report NEDC-30820 dated January 1985. This qualification was performed in accordance with Regulatory Guide 1.100, Revision 1 and IEEE 344-1975. The following tests were successfully conducted prior to the hanger failure: (1) 90 minutes of vibration aging at 0.75 g input (one in each orthogonal axis), (2) 15 minutes of RMF testing with biaxial excitation in the front-to-back and vertical directions, and (3) 3 minutes 40 seconds of RMF testing with biaxial excitation in the side-to-side and vertical directions. Testing was continued after repairing the test assembly by replacing the failed hanger and adding a brace and clamp around the bottom of the nitrogen cylinder. According to the November 9, 1988 submittal, the remaining dynamic tests were successfully completed, and the functional adequacy of the test assembly was verified during and after the simulated faulted condition loads (generic safety/relief valve (SRV), chugging (LOCA) and seismic loading requirements of HCUs).

The licensee has made a comparison between the equivalent stress cycles that were imposed on the HCU test assembly during the successful dynamic testing prior to the fatigue failure of the nitrogen cylinder hanger and the stress cycles that are required from the RBS specific upset condition RRS loads. Both values are normalized to the same response magnitude in order to make the comparison meaningful.

The concept of equivalent stress cycle is based on Miner's theory of cumulative fatigue damage which is a standard industry practice and is recommended in IEEE 344-1987 and Section III of the ASME Code. Stated simply, two points on the S-N curve of a typical structural material are equivalent to each other when related by an exponential relationship. An average exponent of 2.5 as recommended by IEEE 344-1987 was used to establish the equivalence between the stress cycles induced at the TRS and the equivalent stress cycles at the RBS upset condition RRS. The staff

concurs with the licensee's approach and agrees that this is a conservative average exponent considering that the ASME Section III, Appendix II-1520, 1983 and 1986 Editions recommend a less conservative average exponent of 4.3 for cyclic testing of components. Fatigue failure occurs when the cumulative usage factor approaches unity. As was already stated this happened for the nitrogen cylinder hanger at 3 minutes 40 seconds into the second biaxial RMF test.

For the calculation of equivalent stress cycles, all the resonant frequencies in the vicinity of the nitrogen cylinder hanger were identified. The transmissibility plots and locations of the accelerometers mounted on the HCU test assembly are obtained from GE's test report NEDC-30820. The minimum difference between the accelerations of the TRS and the RBS upset condition RRS at each of the resonant frequencies was utilized to calculate the equivalent stress cycles at the RBS upset condition RRS.

Equivalent Stress Cycles Induced by Vibration Aging Tests

The equivalent stress cycles normalized to the RBS upset condition RRS induced from the 90 minute vibration aging tests at 0.75g input were calculated, resulting in 8000 equivalent stress cycles. The number of response cycles within $\pm 5\%$ of the first three resonant frequencies of the HCU at $17H_z$, $25H_z$, and $28H_z$ were calculated. The response cycles were then converted to equivalent stress cycles by normalizing the TRS accelerations to the corresponding peak accelerations at resonant frequencies in the worst RBS upset condition RRS, with the aid of the corresponding transmissibilities and the conservative average exponent of 2.5 as previously stated. The above calculations were reviewed by the staff and found to be acceptable.

Equivalent Stress Cycles Induced by RMF Testing

The number of equivalent stress cycles imposed on the HCU test assembly as a result of the SRV aging RMF testing in the side-to-side orientation was determined next. From the 3 minute 40 second RMF testing, 30 seconds were subtracted to allow for the faulted condition loads (SSE, SRV and LOCA loads). The number of stress cycles from the remaining 3 minute 10 seconds (190 seconds) of RMF testing were first determined and then normalized to the RBS upset condition RRS (OBE and SRV loads). A number of shaker table time-history motions were analyzed to determine the number of stress cycles that are expected in the response of a component from a RMF test of 30 seconds duration in which the TRS envelopes an RRS. This analysis concluded that from a 30 second RMF test, 200 cycles can be expected in the response of single-degree-of-freedom (SDOF) oscillators having a frequency greater than $25H_z$. For oscillators with a natural frequency less than $25H_z$, the number of cycle would be slightly lower. However, the number also depends on the frequency content of the input motion. RMF testing which simulates hydrodynamic loads has a relatively high frequency content. It is noted that the first resonance of the HCU

is 17H₂, with successive resonances of 25H₂ and greater. Therefore, the staff determined that the results of this analysis are applicable to the acceleration responses of the HCU test assembly considering that the ratio of the TRS and RBS upset condition RRS accelerations at 17H₂ is much larger than the ratio used below in determining the equivalent stress cycles induced in the HCU test assembly at all resonant frequencies. As a result, a 3 minute 10 second RMF test gives 1,265 (i.e., 200 x 190/30) stress cycles at the TRS, as presented in the November 9, 1988 submittal.

The HCUs at RBS are attached to the floor, a middle and an upper support point on the multifunction supporting structure. The minimum ratio of accelerations between the TRS and the RRS at any resonant frequency at any of the three attachment points is 2.9. This is the lowest of all the ratios obtained by the licensee in examining the magnitude of the SRV TRS with respect to the RBS design upset condition RRS at all three attachment points for all the resonant frequencies obtained from the qualification test report. Therefore, the equivalent stress cycles at the RBS upset condition induced by the RMF testing were 1,265 x (2.9)^{2.5} (i.e., 18,100 equivalent stress cycles). Based on this and the number of cycles induced by vibration aging, the total number of equivalent stress cycles induced from the dynamic testing successfully completed prior to the failure of the nitrogen cylinder hanger are (8,000 + 18,100) or, 26,100 equivalent stress cycles normalized to the RBS design upset condition RRS.

RBS Design Requirements

The RBS required stress cycles for equipment in containment, according to the November 9, 1988 submittal, are 5,200 due to SRV actuations and 100 due to upset condition loads or, conservatively, 5,300 equivalent stress cycles at the RBS design upset condition RRS for a 40 year life. The calculation of the above equivalent stress cycles is based on the relative response of SDOF oscillators to the selected hydrodynamic event acceleration time-histories (ATH) that generated the most severe amplified response spectra in the reactor building, both in magnitude and frequency content. It was assumed that the stress level is proportional to the SDOF oscillator's relative displacement. The result of the required 5,200 stress cycles is based on the maximum envelope of the accelerations corresponding to the actuations of 1, 2, 7 and 16 SRVs.

The equivalent stress cycles induced from the 3 minute 10 second side-to-side dynamic testing were, therefore, approximately 3.5 times the RBS design required stress cycles. The margins in the front-to-back and vertical orientation are significantly higher, since testing in this orientation was completed for a full 15 minutes without failure.

From the evaluation summarized above, the staff concludes that the unmodified test HCU was subject to vibration fatigue far in excess of the seismic/dynamic design environment, including SRV, upset, and faulted condition events that are postulated to occur at RBS over the 40 year life. Further,

there have been much fewer SRV actuations at RBS to date than the original estimation (200 at the TRS) used in determining the implementation schedule. Therefore, fatigue failure of the HCU nitrogen cylinder hanger supports at RBS is not expected to occur. Using the methods described in IEEE 344-1987 and Regulatory Guide 1.100, Revision 2, the unmodified HCUs have been shown to be completely qualified at RBS, and the licensee's request for deleting License Condition 2.C.(4) is acceptable.

3.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32 and 51.35, an environmental assessment and finding of no significant impact was published in the Federal Register on February 13, 1989 (54 FR 6628).

Accordingly, based upon the environmental assessment, the Commission has determined that issuance of this amendment will not have a significant effect on the quality of the human environment.

4.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public. The staff therefore concludes that the proposed changes are acceptable.

Principal Contributor: A. Lee

Dated: February 22, 1989

UNITED STATES NUCLEAR REGULATORY COMMISSION
GULF STATES UTILITIES COMPANY
NOTICE OF ISSUANCE OF AMENDMENT
TO FACILITY OPERATING LICENSE

The U.S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 34 to Facility Operating License No. NPF-47, issued to Gulf States Utilities Company, (the licensee), which revised the license for operation of the River Bend Station, Unit 1 located in West Feliciana Parish, Louisiana.

The amendment was effective as of the date of its issuance.

The amendment deleted the License Condition 2.C.(4), Attachment 2, Item 1 requirement to install an additional brace on the control rod hydraulic units as used in the qualification testing.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment.

The Notice of Consideration of Issuance of Amendment was published in the FEDERAL REGISTER on December 2, 1988 (53 FR 48743).

No request for a hearing or petition for leave to intervene was filed following the notice.

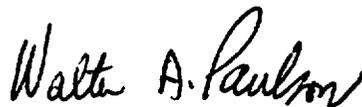
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The Commission has prepared an Environmental Assessment related to the action and has determined not to prepare an environmental impact statement. Based upon the environmental assessment, the Commission has concluded that the issuance of this amendment will not have a significant effect on the quality of the human environment.

For further details with respect to the action, see: (1) the application for amendment dated November 9, 1988; (2) Amendment No. 34 to Facility Operating License No. NPR-47; and (3) the Commission's related Safety Evaluation and Environmental Assessment. All these items are available for public inspection at the Commission's Public Document Room, 2120 L Street, N.W., Washington, D.C. 20555 and at the Government Documents Department, Louisiana State University, Baton Rouge, Louisiana 70803. A copy of items (3) and (4) may be obtained upon request addressed to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Reactor Projects - III, IV, V and Special Projects.

Dated at Rockville, Maryland this 22nd day of February 1989.

FOR THE NUCLEAR REGULATORY COMMISSION



Walter A. Paulson, Project Manager
Project Directorate - IV
Division of Reactor Projects - III,
IV, V and Special Projects
Office of Nuclear Reactor Regulation