



Entergy

9701220232

Entergy Operations, Inc.  
River Bend Station  
5485 U.S. Highway 61  
P.O. Box 220  
St. Francisville, LA 70775  
Tel 504 381 4374  
Fax 504 381 4872

John R. McGaha, Jr.  
Vice President  
Operations

January 10, 1997

U. S. Nuclear Regulatory Commission  
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Mail Station P1-37  
Washington, DC 20555

Subject: River Bend Station - Unit 1  
Docket No. 50-458  
License No. NPF-47  
License Amendment Request (LAR) 96-09, Change to Technical Specifications  
3.4.11, "RCS Pressure and Temperature (P/T) Limits," Figure 3.4.11-1,  
"Minimum Temperature Required vs. RCS Pressure"

File Nos.: G9.5, G9.42

RBEXEC-97-001  
RBF1-96-0469  
RBG-43560

Gentlemen:

In accordance with 10CFR50.90, Entergy Operations, Inc. (EOI) hereby applies for amendment of Facility Operating License No. NPF-47, Appendix A - Technical Specifications, for River Bend Station (RBS). The proposed change revises Technical Specification Figure 3.4.11-1, "Minimum Temperature Required vs. RCS Pressure," P/T curves for heatup, cooldown, and inservice leak and hydrostatic testing. The P/T curves valid for 2 effective full power years (EFPY) are replaced by curves valid for 12 EFPY. The 8 EFPY curves are retained for comparative purposes.

10CFR50, Appendix G requires establishing reactor pressure vessel P/T limits to provide adequate margins of safety in accordance with ASME Code, Section III, Appendix G. Shifts in the reference temperature,  $RT_{NDT}$ , are periodically established in accordance with ASTM E 185 and 10CFR50, Appendix H. Furthermore, USNRC Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," provides guidance for calculating shifts in reference temperature (with or without surveillance data available), and the methods given in ASME Section III, Appendix G are to be used in calculating the P/T limit curves.

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PDR ADOCK 05000458  
P PDR

USNRC Generic Letter 88-11 called attention to issuance of RG 1.99, Revision 2, and required use of the methods of RG 1.99 to predict the effects of neutron irradiation on reactor vessel beltline materials. In response to this generic letter, RBS submitted and was issued revised P/T curves, valid through 8 EFPY (ref. TS Amendment 45 and associated Safety Evaluation Report, NRC letter dated August 1, 1990). These curves establish the current RBS Technical Specification operating limits.

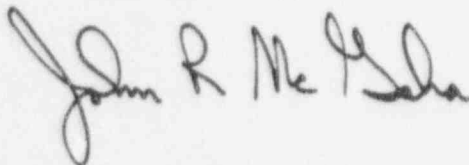
RBS anticipates achieving 8 EFPY of cumulative operating time in early September 1997 just prior to the start of Refueling Outage 7 (RF-7). It will be necessary to provide for approved P/T curves valid beyond 8 EFPY at that time. This license amendment request proposes to replace the current TS Figure 3.4.11-1 P/T limit curves valid through 2 EFPY with curves valid through 12 EFPY. The 8 EFPY curves will be retained for comparative purposes.

An affidavit supporting the facts set forth in this transmittal and its attachments is provided in Attachment 1. Attachment 2 provides a description of the proposed changes, associated technical justification and no significant hazards consideration. Attachment 3 provides a marked-up copy of the affected Technical Specification figure and proposed revision. Enclosure 1 provides the Structural Integrity Associates, Inc. report for the RBS revised 12 EFPY curves.

EOI has reviewed this request against the criteria of 10CFR51.22 for environmental considerations. Since this request involves (i) no significant hazards consideration, (ii) no significant change in the types or significant increase in the amounts of any effluents that may be released offsite, and (iii) no significant increase in individual or cumulative occupational radiation exposure, EOI has concluded that the proposed change meets the criteria given in 10CFR51.22(c)(9) for a categorical exclusion from the requirement for an environmental impact statement.

To support the required reactor coolant pressure boundary hydrostatic testing near the end of RF-7, currently scheduled to start September 12, 1997, EOI respectfully requests that this application be reviewed on a schedule sufficient to support approval by September 1, 1997. This request has been reviewed and approved by the RBS Facility Review Committee and the Nuclear Review Board. If you have any questions regarding this request or require additional information, please contact Mr. T. W. Gates at (504) 381-4866.

Sincerely,



JRM/EJZ/MGC

attachments

enclosure

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cc: Mr. David L. Wigginton  
U. S. Nuclear Regulatory Commission  
M/S OWFN 13-H-15  
Washington, DC 20555

NRC Resident Inspector  
P. O. Box 1050  
St. Francisville, LA 70775

U. S. Nuclear Regulatory Commission  
Region IV  
611 Ryan Plaza Drive, Suite 400  
Arlington, TX 76011

Department of Environmental Quality  
Radiation Protection Division  
P. O. Box 82135  
Baton Rouge, LA 70884-2135  
Attn: Administrator

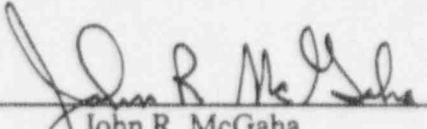
BEFORE THE  
UNITED STATES NUCLEAR REGULATORY COMMISSION

LICENSE NO. NPF-47

IN THE MATTER OF  
ENTERGY GULF STATES, INC.  
CAJUN ELECTRIC POWER COOPERATIVE AND  
ENTERGY OPERATIONS, INC.

AFFIRMATION


I, John R. McGaha, state that I am Vice President-Operations of Entergy Operations, Inc., at River Bend Station; that on behalf of Entergy Operations, Inc., I am authorized by Entergy Operations, Inc., to sign and file with the Nuclear Regulatory Commission, this River Bend Station License Amendment Request (LAR) 96-09, Change to Technical Specification 3.4.11, "RCS Pressure and Temperature (P/T) Limits," Figure 3.4.11-1, "Minimum Temperature Required vs. RCS Pressure;" that I signed this letter as Vice President-Operations at River Bend Station of Entergy Operations, Inc.; and that the statements made and the matters set forth therein are true and correct to the best of my knowledge, information, and belief.

  
John R. McGaha

STATE OF LOUISIANA  
PARISH OF WEST FELICIANA

SUBSCRIBED AND SWORN TO before me, a Notary Public, commissioned in the Parish above named, this 10<sup>th</sup> day of January, 1997.

(SEAL)

  
Claudia F. Hurst  
Notary Public

My Commission expires with life

ENTERGY OPERATIONS, INC.  
RIVER BEND STATION  
DOCKET 50-458/LICENSE NO. NPF-47  
LICENSE AMENDMENT REQUEST 96-09

## LICENSING DOCUMENT INVOLVED

This License Amendment Request proposes a revision of Technical Specification Figure 3.4.11-1, "Minimum Temperature Required vs. RCS Pressure." This figure contains the pressure-temperature (P-T) limit curves for heatup, cooldown, and inservice leak and hydrostatic testing. This amendment request proposes deletion of the P-T curves valid through 2 effective full power years (EFPY) of operation and addition of P-T curves valid through 12 EFPY of operation.

## BACKGROUND

10CFR50, Appendix G requires the establishment of P-T limits for the reactor pressure vessel to provide adequate margins of safety during normal operating conditions, including anticipated operational occurrences and system hydrostatic tests. 10CFR50, Appendix G mandates use of the methods of analysis and required margins of safety of ASME Code, Section III, Appendix G in determining these P-T limits. Shifts in the reference temperature,  $RT_{NDT}$ , are to be established periodically by removing and evaluating the irradiated reactor vessel specimens in accordance with ASTM E 185 and 10CFR50, Appendix H. USNRC Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials" is to be followed for calculating shifts in reference temperature (with or without surveillance data available), and the methods given in ASME Section III, Appendix G are to be used in calculating the P-T limit curves.

USNRC Generic Letter 88-11 called Licensees' attention to issuance of Regulatory Guide 1.99, Revision 2 and required Licensees to use the methods of Revision 2 to predict the effects of neutron irradiation on reactor vessel beltline materials. In response to Generic Letter 88-11, revised P-T curves, valid through 8 EFPY, were submitted (GSU letter RBG-32835 dated May 14, 1990) and approved (Amendment 45 and Safety Evaluation Report, NRC letter dated August 1, 1990) as River Bend Station's Technical Specification operating limits. As RBS is expected to achieve 8 EFPY of cumulative operating time around September, 1997, it is necessary to provide approved P-T limit curves which are valid beyond 8 EFPY. Therefore, this amendment request proposes deletion of P-T limit curves valid through 2 EFPY in the current Figure 3.4.11-1 and replacement with a revised Figure 3.4.11-1 showing P-T limit curves valid through 12 EFPY. The curves valid through 8 EFPY are retained for comparative purposes.

## DESCRIPTION OF THE PROPOSED CHANGES

This amendment request proposes replacement of Technical Specification Figure 3.4.11-1 showing P-T limit curves for 2 and 8 effective full power years (EFPY) of operation with a revised Figure 3.4.11-1 showing P-T curves for 8 and 12 EFPY of operation. The revised Figure 3.4.11-1 is provided in Attachment 3.

## JUSTIFICATION FOR PROPOSED CHANGES

As stated in the Bases for Technical Specification 3.4.11, 10CFR50, Appendix G requires the establishment of P-T limits for material fracture toughness requirements of the reactor coolant pressure boundary (RCPB) materials. Limiting Condition of Operation (LCO) 3.4.11 defines operating limits that provide a margin to brittle fracture of the reactor vessel and piping of the RCPB. The reactor vessel is the component most subject to brittle failure. Therefore, the LCO limits apply mainly to the reactor vessel. Figure 3.4.11-1 contains P-T limit curves for heatup, cooldown, and inservice leak and hydrostatic testing. The heatup curve provides limits for both heatup and criticality.

As stated above, valid pressure-temperature limit curves for the reactor vessel are required to ensure adequate margins against brittle fracture of the vessel during plant operations and leakage testing. The P-T limit curves currently contained in RBS's Technical Specifications (curves A', B', and C') are valid through 8 EFPY. River Bend Station is expected to accumulate 8 EFPY of operations around September, 1997. Thus, curves valid beyond 8 EFPY are required to be in place prior to that point in time. Revised P-T limit curves, which account for the change in cumulative neutron fluence at the vessel wall due to the additional irradiation time, are necessary to ensure that, when stressed under operating, maintenance, and test conditions, the vessel behaves in a nonbrittle manner and the probability of rapidly propagating fracture is minimized.

The proposed P-T limit curves of this amendment request have been prepared in accordance with the applicable NRC-approved codes and standards. Adjusted reference temperatures (ART) have been calculated in accordance with Regulatory Guide 1.99, Revision 2 (Rev. 2) Regulatory Position C.1 as two credible surveillance data sets are not yet available for RBS. Values of initial  $RT_{NDT}$  and beltline chemistry information were taken from USAR Table 5.3-1 and chemistry factors were obtained from Tables 1 and 2 of Rev. 2. Neutron fluence at 1/4T depth was calculated per Rev. 2 using the extrapolated peak vessel inside diameter fluence for 12 EFPY based on results of the first cycle flux wire analysis. A margin term per Rev. 2 was added to ensure that conservative, upper-bound values of ART were used in P-T limit curve calculations. Details of these calculations are shown in Table 1 of the enclosed report (Enclosure 1). The ART value for the limiting beltline material (tandem weld, heat #5P6756, lot #0342) was then applied in the ASME Appendix G calculations for P-T limits.

The stress intensity factors and pressure-temperature series were calculated in accordance with the 1992 Edition of the ASME Code, Section III, Appendix G. A side by side comparison of the

1992 Edition with the 1989 Edition (the latest NRC-approved edition) shows that the methodologies for calculating stress intensity factors and P-T limits are identical. As described in our May 14, 1990 amendment submittal, the stress intensity factors ( $K_I$ ) were based on a combination of pressure and thermal stresses for a 1/4T flaw in a flat plate. The pressure stresses were calculated using thin-walled cylinder equations as required. Thermal stresses were calculated assuming the through-wall temperature distribution of a flat plate subjected to a 100°F per hour thermal gradient. Safety factors and the membrane stress correction factor as required by ASME Appendix G were applied in the analysis. In addition to limits for the beltline region, 10CFR50, Appendix G imposes limits for the closure flange regions. These limits, shown as the lower portions of the curves A, B, and C, were retained in this analysis as originally provided for RBS as these regions are away from the beltline region and are not affected significantly by the neutron fluence. Additional information regarding the inputs, methodology, and analysis are given in the enclosed report (Enclosure 1). The methodology was also benchmarked and found to match calculated values for the currently approved 8 EFPY P-T limit curves. Thus, it is concluded that the proposed P-T limit curves conform to the requirements of 10CFR50, Appendices G and H and are valid for 12 EFPY.

#### NO SIGNIFICANT HAZARDS CONSIDERATION

EOI proposes to change the current RBS Technical Specification Figure 3.4.11-1 to show P-T limit curves valid through 12 EFPY.

In accordance with 10CFR50.92, a proposed change to the operating facility involves no "significant hazards" if operation of the facility, in accordance with the proposed change, would not 1) involve a significant increase in the probability or consequences of any accident previously evaluated, 2) create the possibility of a new or different kind of accident from that previously evaluated, or 3) involve a significant reduction in a margin of safety.

EOI has evaluated the no significant hazards consideration in its request for this license amendment and has determined that no significant hazards consideration results from the proposed change. The no significant hazards evaluation follows.

1. *The proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.*

[Reactor Pressure Vessel]

Pressure-temperature (P-T) limits (RBS Technical Specifications Figure 3.4.11-1) are imposed on the reactor coolant system to ensure that adequate safety margins against nonductile or rapidly propagating failure exist during normal operation, anticipated operational occurrences, and system hydrostatic tests. The P-T limits are related to the nil-ductility reference temperature,  $RT_{NDT}$ , as described in ASME Section III, Appendix G. Changes in the fracture toughness properties of RPV beltline materials, resulting from the neutron irradiation and the thermal environment, are monitored by a surveillance program in compliance with the requirements of 10CFR50, Appendix H. The effect of neutron

fluence on the shift in the nil-ductility reference temperature of pressure vessel steel is predicted by methods given in Regulatory Guide 1.99, Rev. 2.

The revised P-T limits of this amendment request were established based on adjusted reference temperatures developed in accordance with the procedures prescribed in Reg. Guide 1.99, Rev. 2, Regulatory Position C.1. Calculation of adjusted reference temperature by these procedures includes a margin term to ensure conservative, upper-bound values are used for the calculation of the P-T limits. Stress intensity factors used to compute the pressures were calculated in accordance with, and include the required safety factors given in ASME Section III, Appendix G. The limits established by the lower portion of the P-T curves, which cover the discontinuity (non-beltline) regions of the vessel (e.g., flanges, nozzles, etc.), were retained throughout this current analysis. The limits established by the lower portion of these curves do not change as they are not affected significantly by the neutron fluence.

This change is not related to any accidents previously evaluated. The proposed change will provide for approved P-T limit curves which are valid through 12 EFPY. This change will not affect any Safety Limits, Power Distribution Limits, or Limiting Conditions for Operation. The proposed change will not affect reactor pressure vessel performance as no physical changes are involved and RBS vessel P-T limits will remain conservative in accordance with Reg. Guide 1.99, Rev. 2 and ASME Section III, Appendix G requirements. The proposed change will not cause the reactor pressure vessel or interfacing systems to be operated outside of their design or testing limits. Also, the proposed change will not alter any assumptions previously made in evaluating the radiological consequences of accidents. The proposed change ensures that adequate margins against brittle fracture of the vessel are maintained through 12 EFPY of reactor operations. Therefore, the probability or consequences of accidents previously evaluated will not be increased by the proposed change.

*2. The proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.*

The proposed change is a revision of Technical Specification Figure 3.4.11-1 to show P-T limit curves valid through 12 EFPY. The revised P-T limits have been established in accordance with applicable NRC regulations and the ASME Code. This proposed change does not involve a modification of the design of plant structures, systems, or components. The proposed change will not impact the manner in which the plant is operated as plant operating and testing procedures will not be affected by the change. The proposed change will not degrade the reliability of structures, systems, or components important to safety (ITS) as equipment protection features will not be deleted or modified, equipment redundancy or independence will not be reduced, supporting system performance will not

be downgraded, the frequency of operation of ITS equipment will not be increased, and increased or more severe testing of ITS equipment will not be imposed. No new accident types or failure modes will be introduced as a result of the proposed change. Therefore, the proposed change does not create the possibility of a new or different kind of accident from that previously evaluated.

*3. The proposed changes do not involve a significant reduction in a margin of safety.*

As stated in the River Bend SER, "Appendices G and H of 10CFR50 describe the conditions that require pressure-temperature limits and provide the general bases for these limits. These appendices specifically require that pressure-temperature limits must provide safety margins at least as great as those recommended in the ASME Code, Section III, Appendix G. .... Until the results from the reactor vessel surveillance program become available, the staff will use RG 1.99, Revision 1 [now Revision 2] to predict the amount of neutron irradiation damage. .... The use of operating limits based on these criteria--as defined by applicable regulations, codes, and standards--will provide reasonable assurance that nonductile or rapidly propagating failure will not occur, and will constitute an acceptable basis for satisfying the applicable requirements of GDC 31."

Bases for RBS Technical Specification 3.4.11 states: "The P/T limits are not derived from Design Basis Accident (DBA) analyses. They are prescribed during normal operation to avoid encountering pressure, temperature, and temperature rate of change conditions that might cause undetected flaws to propagate and cause nonductile failure of the RCPB, a condition that is unanalyzed. .... Since the P/T limits are not derived from any DBA, there are no acceptance limits related to the P/T limits. Rather, the P/T limits are acceptance limits themselves since they preclude operation in an unanalyzed condition."

This amendment request proposes P-T limit curves which will be valid through 12 EFPY. The proposed P-T limits were established based on adjusted reference temperatures for vessel beltline materials calculated in accordance with Regulatory Position 1 of Reg. Guide 1.99, Rev. 2 and pressures calculated in accordance with ASME Section III, Appendix G requirements. Required margins and safety factors were included to ensure that conservative, upper-bound values were used in calculation of the P-T limits. The proposed change will not affect any Safety Limits, Power Distribution Limits, or Limiting Conditions for Operation. The proposed change does not represent a change in initial conditions, or in a system response time, or in any other parameter affecting the course of an accident analysis supporting the Bases of any Technical Specification. The proposed P-T limits provide adequate safety margins against brittle failure of the reactor vessel through 12 EFPY of power operations. For these reasons, the proposed changes do not involve a reduction in any margins of safety.

## **ENVIRONMENTAL IMPACT CONSIDERATION**

EOI has reviewed this request against the criteria of 10CFR51.22 for environmental considerations. Since this request involves (i) no significant hazard consideration, (ii) no significant change in the types or significant increase in the amounts of any effluents that may be released offsite, and (iii) no significant increase in individual or cumulative occupational radiation exposure, EOI has concluded that the proposed change meets the criteria given in 10CFR51.22 (c)(9) for a categorical exclusion from the requirement for an environmental impact statement.

## **NOTIFICATION OF STATE PERSONNEL**

A copy of this amendment request has been provided to the State of Louisiana, Department of Environmental Quality - Radiation Protection Division.

## **PROPOSED LICENSE REVISIONS**

A revised Figure 3.4.11.-1, "Minimum Temperature Required vs. RCS Pressure" showing P-T limit curves A', B', and C' valid through 12 EFPY is given in Attachment 3. Curves A, B, and C, valid through 8 EFPY are also shown for comparison.