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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

April 26, 2001

Mr. William A. Eaton  
Vice President, Operations GGNS  
Entergy Operations, Inc.  
P. O. Box 756  
Port Gibson, MS 39150

SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 - ISSUANCE OF AMENDMENT  
RE: REVISION OF THE MINIMUM CRITICAL POWER RATIO SAFETY LIMIT  
FOR CYCLE 12 OPERATION (TAC NO. MB0514)

Dear Mr. Eaton:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 146 to Facility Operating License No. NPF-29 for the Grand Gulf Nuclear Station, Unit 1. This amendment revises the Technical Specifications in response to your application dated November 10, 2000, supplemented by letters dated February 15 and March 22, 2001.

The amendment changes the safety limit minimum critical power ratio (SLMCPR) for Cycle 12 operation with a mixed core of Siemens Power Corporation (now known as Framatome ANP Richland, Inc.) ATRIUM-10 reload fuel, and General Electric GE11 reactor fuel. The amendment reflects a decrease of the two recirculation loop SLMCPR from 1.09 to 1.08, with the single recirculation loop SLMCPR remaining unchanged at 1.10.

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

Sincerely,

A handwritten signature in cursive script that reads "S. Patrick Sekerak".

S. Patrick Sekerak, Project Manager, Section 1  
Project Directorate IV & Decommissioning  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-416

Enclosures: 1. Amendment No. 146 to NPF-29  
2. Safety Evaluation

cc w/encls: See next page

Grand Gulf Nuclear Station

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

ENTERGY OPERATIONS, INC.

SYSTEM ENERGY RESOURCES, INC.

SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION

ENTERGY MISSISSIPPI, INC.

DOCKET NO. 50-416

GRAND GULF NUCLEAR STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 146  
License No. NPF-29

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Entergy Operations, Inc. (the licensee) dated November 10, 2000, as supplemented by letters dated February 15, and March 22, 2001, 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, 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 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 the Technical Specifications, as indicated in the attachment to this license amendment; and paragraph 2.C.(2) of Facility Operating License No. NPF-29 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 146, are hereby incorporated into this license. Entergy Operations, Inc. shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Robert A. Gramm, Chief, Section 1  
Project Directorate IV & Decommissioning  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical  
Specifications

Date of Issuance: April 26, 2001

ATTACHMENT TO LICENSE AMENDMENT NO. 146

FACILITY OPERATING LICENSE NO. NPF-29

DOCKET NO. 50-416

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove

2.0-1  
5.0-19  
5.0-20  
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Insert

2.0-1  
5.0-19  
5.0-20  
5.0-20a

## 2.0 SAFETY LIMITS (SLs)

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### 2.1 SLs

#### 2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10% rated core flow:

THERMAL POWER shall be  $\leq$  25% RTP.

2.1.1.2 With the reactor steam dome pressure  $\geq$  785 psig and core flow  $\geq$  10% rated core flow:

MCPR shall be  $\geq$  1.08 for two recirculation loop operation or  $\geq$  1.10 for single recirculation loop operation.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

#### 2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be  $\leq$  1325 psig.

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### 2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

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(continued)

## 5.6 Reporting Requirements

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### 5.6.5 Core Operating Limits Report (COLR) (continued)

- b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents.
1. XN-NF-81-58(P)(A), "RODEX2 Fuel Rod Thermal-Mechanical Response Evaluation Model", Exxon Nuclear Company, Inc., Richland, WA.
  2. XN-NF-85-67(P)(A), "Generic Mechanical Design for Exxon Nuclear Jet Pump BWR Reload Fuel", Exxon Nuclear Company, Richland, WA.
  3. EMF-8574(P) Supplement 1 (P)(A) and Supplement 2(P)(A), "RODEX2A (BWR) Fuel Rod Thermal-Mechanical Evaluation Model", Siemens Power Corporation, Richland, WA.
  4. ANF-89-98(P)(A), "Generic Mechanical Design Criteria for BWR Fuel Designs", Advanced Nuclear Fuels Corporation, Richland, WA.
  5. XN-NF-80-19(P)(A), Volume 1, "Exxon Nuclear Methodology for Boiling Water Reactors - Neutronic Methods for Design and Analysis", Exxon Nuclear Company, Richland, WA.
  6. XN-NF-80-19(P)(A), Volume 4, "Exxon Nuclear Methodology for Boiling Water Reactors: Application for the ENC Methodology to BWR Reloads", Exxon Nuclear Company, Richland, WA.
  7. EMF-2158(P)(A), "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2", Siemens Power Corporation, Richland, WA.
  8. XN-NF-80-19(P)(A), Volume 3, "Exxon Nuclear Methodology for Boiling Water Reactors, THERMEX: Thermal Limits Methodology Summary Description", Exxon Nuclear Company, Richland, WA.
  9. XN-NF-84-105(P)(A), Volume 1, "XCOBRA-T: A Computer Code for BWR Transient Thermal-Hydraulic Core Analysis", Exxon Nuclear Company, Inc., Richland, WA.

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(continued)

## 5.6 Reporting Requirements

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### 5.6.5 Core Operating Limits Report (COLR) (continued)

10. ANF-524(P)(A), "ANF Critical Power Methodology for Boiling Water Reactors", Advanced Nuclear Fuels Corporation, Richland, WA.
11. ANF-913(P)(A), Volume 1, "CONTRANSA2: A Computer Program for Boiling Water Reactor Transient Analysis", Advanced Nuclear Fuels Corporation, Richland, WA.
12. XN-NF-825(P)(A), "BWR/6 Generic Rod Withdrawal Error Analysis, MCPR, for Plant Operations within the Extended Operating Domain", Exxon Nuclear Company, Inc., Richland, WA.
13. ANF-1358(P)(A), "The Loss of Feedwater Heating Transient in Boiling Water Reactors", Advanced Nuclear Fuels Corporation, Richland, WA.
14. EMF-1997(P)(A), "ANFB-10 Critical Power Correlation", Siemens Power Corporation, Richland, WA.
15. EMF-1997(P) Supplement 1 (P)(A), "ANFB-10 Critical Power Correlation: High Local Peaking Results", Siemens Power Corporation, Richland, WA.
16. EMF-2209(P)(A), "SPCB Critical Power Correlation", Siemens Power Corporation, Richland, WA.
17. EMF-2245(P)(A), "Application of Siemens Power Corporation's Critical Power Correlations to Co-Resident Fuel", Siemens Power Corporation, Richland, WA.
18. XN-NF-80-19(P)(A) Volumes 2, 2A, 2B, & 2C, "Exxon Nuclear Methodology for Boiling Water Reactors: EXEM BWR ECCS Evaluation Model", Exxon Nuclear Company, Inc., Richland, WA.
19. ANF-91-048(P)(A), "Advanced Nuclear Fuels Corporation Methodology for Boiling Water Reactors EXEM BWR Evaluation Model", Advanced Nuclear Fuels, Richland, WA.
20. ANF-91-048(P)(A) Supplements 1 and 2, "BWR Jet Pump Model Revision for RELAX", Siemens Power Corporation, Richland, WA.

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(continued)



## 5.6 Reporting Requirements

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### 5.6.5 Core Operating Limits Report (COLR) (continued)

21. XN-CC-33(A), "HUXY: A Generalized Multirod Heatup Code with 10 CFR 50 Appendix K Heatup Option Users Manual", Exxon Nuclear Company, Richland, WA.
22. EMF-CC-074(P)(A), Volume 4, "BWR Stability Analysis Assessment of STAIF with Input from MICROBURN-B2", Siemens Power Corporation, Richland, WA.
23. EMF-2292(P)(A), "ATRIUM-10 Appendix K Spray Heat Transfer Coefficients", Siemens Power Corporation, Richland, WA.
24. NEDE-24011 -P-A, General Electric Standard Application for Reactor Fuel (GESTAR-II) with exception to the misplaced fuel bundle analyses as discussed in GNRO-96/00087 and the generic MCPR Safety Limit analysis as discussed in GNRO-96/00100, letters from C. R. Hutchinson to USNRC.

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(continued)



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 146 TO FACILITY OPERATING LICENSE NO. NPF-29

ENTERGY OPERATIONS, INC., ET AL.

GRAND GULF NUCLEAR STATION, UNIT 1

DOCKET NO. 50-416

1.0 INTRODUCTION

By letter dated November 10, 2000 (Reference 1), as supplemented by letters dated February 15, 2001, and March 22, 2001 (Reference 2). The March 22, 2001, supplemental letter was in response to a Nuclear Regulatory Commission (NRC or the Commission) Request for Additional Information (RAI). Entergy Operations, Inc. (EOI or the licensee) proposed changes to the Technical Specifications (TS) for the Grand Gulf Nuclear Station (GGNS), Unit 1 Cycle 12 operation. The proposed changes involve: (1) the value of the safety limit minimum critical power ratio (SLMCPR) in TS 2.1.1.2; (2) the update of Core Operating Limits Report (COLR) in TS 5.6.5.b, and (3) the associated TS Bases B 2.1.1.1, B 2.1.1.2, B 3.2.2, and References.

2.0 BACKGROUND

GGNS reactor core operation Cycle 12 utilizes a mixed core of 800 fuel assemblies, which consists of 204 fresh Framatome (formerly known as Siemens Power Corporation) ATRIUM-10 bundles, 228 once burned General Electric (GE) GE11 bundles, 268 twice burned GE11 bundles, and 100 thrice burned GE11 bundles. It utilizes a conventional core loading in which fresh and irradiated fuel bundles are distributed in a checker board configuration throughout the interior region of the core with the more depleted fuel loaded on the core periphery. The specific loading pattern is selected to meet fuel design limits while maximizing cycle energy.

3.0 EVALUATION

The licensee requested changes to the GGNS Facility Operating License in accordance with 10 CFR 50.90. The revised TSs were proposed as follows:

3.1 TS 2.1.1.2 Reactor Core SLs [Safety Limits]

The proposed change in TS 2.1.1.2 would change the SLMCPR values from 1.09 to 1.08 for two recirculation loop operation with the reactor steam dome pressure greater than or equal to 785 psig and core flow greater than or equal to 10% rated core flow for Cycle 12 operation.

The licensee described the methodologies used to calculate the SLMCPR value for the TS in the submittal. The Cycle 12 SLMCPR analysis was performed through a technology transfer

program (Reference 3) by EOI using the plant- and cycle-specific fuel and core parameters; NRC approved methodologies including ANF-524(P)(A), Revision 2 and Supplements 1 and 2 (Reference 4); EMF-2209(P)(A) (Reference 5); and EMF-2245(P)(A) (Reference 6). EOI performed analyses to determine additive constants and additive constant uncertainties for the Global Nuclear Fuel GE11 fuel type for use with the Siemens Power Corporation critical power correlation. The NRC-approved methodology (Reference 4) was used to determine the minimum critical power ratio (MCPR) by a statistical convolution of all the uncertainties (both fuel-related and nonfuel-related) associated with the calculation of thermal margin via a Monte Carlo procedure. Through a technology transfer program (Reference 3), the licensee has performed its SLMCPR calculation for GGNS Cycle 12 operation.

The NRC staff has reviewed the justification (Reference 2) for the SLMCPR value of 1.08 for two recirculation loop operation. Based on its review of the submittal and the licensee response to the NRC staff RAI (Reference 2), the NRC staff has found that the Cycle 12 SLMCPR analysis for GGNS, using the plant- and cycle-specific calculation in conjunction with the approved methodologies, is acceptable for the following reasons: use of this analytical process concludes that 99.9% of fuel rods in the core will not experience boiling transition to comply with 10 CFR Part 50, Appendix A, General Design Criterion 10, and is in accordance with Standard Review Plan 4.4, Section II.1.b. Therefore, the NRC staff has concluded that the justification for analyzing and determining the SLMCPR of 1.08 for two recirculation loop operation, and no change in the previous SLMCPR value of 1.10 for single loop operation for the GGNS Cycle 12 is acceptable, since approved methodologies including an approved mixed core calculation method were used.

### 3.2 Specification 5.6.5.b Core Operating Limits Report (COLR)

The licensee proposed to remove the references to analytical methods no longer used to determine the core operating limits, and add references to the analytical methods used for calculation of core operating parameters applicable to Cycle 12.

The NRC staff has reviewed the proposed changes to include 21 new references and three which are referenced in the previous COLR. Because the NRC staff has previously approved the methodologies in the 24 topical reports, in accordance with the guidance in Generic Letter (GL) 88-16, the proposed amendment to TS 5.6.5 is acceptable. However, for clarity, TS 5.6.5.a.5, LCO 3.3.1.1, RPS Instrumentation, should be revised to reflect the actual core operating limit contained within LCO 3.3.1.1, and should reference specifically TS Table 3.3.1.1-1, Function 2.d, Allowable Values of the Average Power Range Monitors flow bias scram. It is the NRC staff's understanding that the licensee will make this clarifying revision to COLR TS 5.6.5 in a future license amendment request provided within a reasonable time frame. Revision of TS 5.6.5.a.5 has no direct affect on determination of the SLMCPR.

### 3.3 Bases B 2.1.1.1, B 2.1.1.2, and B 3.2.2

The licensee submitted the proposed TS Bases changes for information only. While the Bases are not part of the TS, and changes to them do not require NRC approval, the proposed Bases changes are acceptable because they modify the cycle-specific references associated with the SLMCPR methodology to reflect the proposed TS changes stated above and are administrative in nature.

Based on its review, the staff concludes that the above described TS changes involving the SLMCPRs for two recirculation loop operation, and the update of the references in the COLR TS are acceptable.

### 3.4 Conclusions

We have reviewed the EOI request to revise the TSs and its associated Bases for the GGNS Cycle 12 operation. Based on the review, which is described above, we conclude that these revisions are acceptable, since the analysis was based on the NRC staff approved methodologies for the SLMCPR calculation, and the update of the COLR references is in accordance with the guidance specified in GL 88-16.

### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Mississippi State official was notified of the proposed issuance of the amendment. The State official had no comments.

### 5.0 ENVIRONMENTAL CONSIDERATION

With respect to TS 2.1.1.2, the amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (65 FR 81917 dated December 27, 2000). Accordingly, with respect to TS 2.1.1.2, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). With respect to TS 5.6.5, the amendment changes reporting requirements and meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(10). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

### 6.0 CONCLUSION

The Commission 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, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

### 7.0 REFERENCES

1. Letter (GNRO-2000/00084) from William A. Eaton, EOI, to NRC, "Grand Gulf Nuclear Station Cycle 12 Reload, Proposed Amendment to the Operating License, LDC-2000-076," November 10, 2000.

2. Letter (GNRO-2001/00025) from William A. Eaton, EOI, to NRC, "Grand Gulf Nuclear Station Unit 1, Response to NRC Request for Additional Information Regarding Cycle 12 Reload Proposed Amendment, LDC-2000-076," March 22, 2001.
3. Letter (GNRO-2000-00024) from Michael A. Krupa, EOI, to NRC, "Entergy Operations, Inc. Implementation of GL 83-11, Supplement 1, for Co-Resident Fuel CPR [Critical Power Ratio] Calculations," August 4, 2000.
4. ANF-524(P)(A) Revision 2 and Supplements 1 and 2, "ANF Critical Power Methodology for Boiling Water Reactors," Advanced Nuclear Fuels Corporation, November 1990.
5. EMF-2209(P)(A), "SPCB Critical Power Correlation," Siemens Power Corporation, Richland, WA.
6. EMF-2245(P)(A), "Application of Siemens Power Corporation's Critical Power Correlations to Co-Resident Fuel," Siemens Power Corporation, Richland, WA.

Principal Contributor: T. Huang

Date: April 26, 2001

April 26, 2001

Mr. William A. Eaton  
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SUBJECT: GRAND GULF NUCLEAR STATION, UNIT 1 - ISSUANCE OF AMENDMENT  
RE: REVISION OF THE MINIMUM CRITICAL POWER RATIO SAFETY LIMIT  
FOR CYCLE 12 OPERATION (TAC NO. MB0514)

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

Sincerely,

/RA/

S. Patrick Sekerak, Project Manager, Section 1  
Project Directorate IV & Decommissioning  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-416

Enclosures:

1. Amendment No. 146 to NPF-29
2. Safety Evaluation

cc w/encls: See next page

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