

April 21, 2000

Mr. Charles M. Dugger
Vice President Operations
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P. O. Box B
Killona, LA 70066

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 - ISSUANCE OF
AMENDMENT RE: MODERATOR TEMPERATURE COEFFICIENT TEST NEAR
END OF EACH CYCLE (TAC NO. MA3781)

Dear Mr. Dugger:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 159 to Facility Operating License No. NPF-38 for the Waterford Steam Electric Station, Unit 3. The amendment consists of changes to the plant technical specifications in response to your application dated October 6, 1998, as supplemented by letter dated March 3, 2000.

The amendment modifies the requirements to perform a Moderator Temperature Coefficient test near the end of each cycle.

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/

N. Kalyanam, Project Manager, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosures: 1. Amendment No. 159 to NPF-38
2. Safety Evaluation

cc w/encls: See next page

Waterford Generating Station 3

cc:

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ENERGY OPERATIONS, INC.

DOCKET NO. 50-382

WATERFORD STEAM ELECTRIC STATION, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 159
License No. NPF-38

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Entergy Operations, Inc. (the licensee) dated October 6, 1998, as supplemented by letter dated March 3, 2000, 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-38 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 159, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. The licensee 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 60 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA by J. Nakoski For/

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 21, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 159

TO FACILITY OPERATING LICENSE NO. NPF-38

DOCKET NO. 50-382

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

3/4 1-4
B 3/4 1-1a

Insert

3/4 1-4
B 3/4 1-1a

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 159 TO

FACILITY OPERATING LICENSE NO. NPF-38

CHANGES FOR THE MODERATOR TEMPERATURE COEFFICIENT

TEST NEAR END OF CYCLE

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

1.0 INTRODUCTION

By letter dated October 6, 1998, as supplemented by letter dated March 3, 2000, Entergy Operations, Inc. (Entergy) requested changes to the Waterford Steam Electric Station, Unit 3 (Waterford 3) Technical Specifications (TS). The proposed changes consist of modifying the requirement to perform a Moderator Temperature Coefficient (MTC) test near the end of each cycle and minor administrative changes. Review of the MTC test change involved review of the Combustion Engineering (CE) Owners Group Topical Report, CE NPSD-911, "Analysis of Moderator Temperature Coefficients in Support of a Change in the Technical Specifications End of Cycle Negative MTC Limit," dated May 1993, and CE NPSD-911, Amendment 1, dated January 1998. Amendment 1 provides the answers to the Nuclear Regulatory Commission's (NRC or the Commission) request for additional information dated February 26, 1997.

The proposed change modifies TS 4.1.1.3.2c by adding a provision that eliminates the need to determine the MTC upon reaching two-thirds of core burnup if the results of the MTC tests required in TS 4.1.1.3.2a and 4.1.1.3.2b are within a tolerance of $\pm 0.16 \times 10^{-4} \Delta k/k/^\circ F$. CE NPSD-911 and its amendment provide the justification for this TS change. The administrative changes consist of adding a plus/minus (\pm) prior to the "7 EFPD" of Surveillance Requirement (SR) 4.1.1.3.2c, deleting the footnote identified by #(1) under SR 4.1.1.3.2c, and adding a footnote (3) regarding MTC determination requirements. The annotations for the footnotes are also changed and a Bases change is included to support the TS change.

TS 3.1.1.3 provides limitations on the MTC to ensure that the assumptions used in the accident and transient analysis remain valid through each fuel cycle. The requirement to measure the MTC at the beginning-of-cycle (BOC), one at hot zero power and one at power, and near

end-of-cycle (EOC) (i.e., two-thirds of expected core burnup) provide confirmation that the measured MTC value is within its limits and will remain in its limits throughout each cycle.

The proposed change modifies the MTC TS to eliminate the two-thirds cycle MTC surveillance if the results of the first two MTC measurements fall within $\pm 0.16 \times 10^{-4} \Delta k/k/^\circ F$ of the calculated MTC (design value). However, if the results of the first two tests are not within that limit, then performance of the two-thirds cycle surveillance will be required.

The reports, CE NPSD-911 and its amendment, provide the justification for this proposed TS change. The reports concluded that if the MTC at the BOC is within $\pm 0.16 \times 10^{-4} \Delta k/k/^\circ F$ of the design value, then the MTC at the EOC will also be within $\pm 0.16 \times 10^{-4} \Delta k/k/^\circ F$ of the design value.

2.0 EVALUATION

Accurate knowledge of the MTC at EOC is of prime importance in order to insure that the most negative MTC will always be conservative with respect to the TS limit. If enough reliance can be placed on the analytical models and on the EOC-predicted MTC, the surveillance test can be eliminated.

CE NPSD-911 and its amendment used the following approach. Isothermal temperature coefficients (ITC) were used since they are measured quantities. The measured ITC was assumed to represent the true value. The impact of systematic errors in the measurements was reduced by combining the values obtained on several plants by several utilities. The best estimate ITC was then equal to the calculated value plus the bias (as established by the mean of the distribution of differences between measured and calculated values). The same bias and uncertainty is assigned to the MTC. Using the relationship $ITC = MTC + FTC$ (where FTC is the Fuel Temperature Coefficient) and assuming that MTC and FTC are statistically independent, it is conservative, when evaluating the MTC, to assign all of the uncertainty to the MTC and to assume that no additional uncertainty is introduced by the FTC.

The analysis used measured MTC data from several plants and compared those data to the calculated MTC. This was done to evaluate the methodology used in calculating the MTC. The reports concluded that evaluation of the data showed that if the MTC measured at the BOC is within $\pm 0.16 \times 10^{-4} \Delta k/k/^\circ F$ of the calculated MTC, then the near EOC calculated MTC will be within $\pm 0.16 \times 10^{-4} \Delta k/k/^\circ F$ of the true MTC. Thus, the method would adequately model the MTC for the entire cycle, and the near EOC MTC surveillance would not be required.

The NRC staff reviewed CE NPSD-911 and its amendment, and found that the database used for the analysis consisted of 105 data points taken from ten different CE plants (2700 MW, 2815 MW, 3400 MW and 3800 MW). The measurements used both the rod insertion and the power trade measurement techniques. For 15 cycles, all three conditions (BOC at hot zero power, near BOC at power, and near EOC at power) were analyzed. A total of 30 near EOC values were analyzed. Of the 105 data points, only one shows a residual deviation that equals the design margin.

ITC predictions were all made at the measured critical conditions, so that no adjustments were needed. The test initial conditions (power level, exposure, inlet temperature, soluble boron concentration, and lead bank insertion) were simulated, taking into account all thermal-hydraulics and xenon feedbacks. Then, without changing the xenon distribution, a change of $\pm 3^{\circ}\text{F}$ was applied to the inlet temperature, keeping the thermal-hydraulics feedback effects active. The core average temperature was obtained from edited output, and the ITC calculated.

The 105 data points were analyzed for normality using the American National Standard Institute Standard Normality Test. The D-Test statistic was 301.39, which implied that the assumption of normality is appropriate based on the percentage points of the D-Test Statistic. The NRC staff reviewed the complete list of all measured and calculated ITC's. The data given consisted of the plants and cycles, the core enrichment and exposure, the operating conditions (PPM (parts per million) soluble boron, power, and moderator temperature), the measured and calculated ITC, and the difference between measured and calculated ITC in units of pcm/ $^{\circ}\text{F}$ (1pcm = $10^{-5}\Delta\text{k/k}$). In addition, the staff reviewed the statistical approach taken and determined that it was a straightforward approach and that it was correctly applied. The staff performed spot checks and found no discrepancies.

The analysis to support this application was done and the design margin established using the methodology described in CE NPSD-911, Amendment 1. During its review, the staff questioned the use of methodologies, other than that presented in CE NPSD-911, Amendment 1, for calculation of MTC to eliminate the EOC MTC test. The staff concluded that elimination of EOC MTC tests should be restricted to applications based on the CE NPSD-911, Amendment 1 methodology. Licensees who choose to use other methodologies would be required to submit further justification for NRC review and approval.

3.0 TECHNICAL SPECIFICATION CHANGES

In TS 4.1.1.3.2 c, “ \pm ” is inserted between “within” and “7,” a footnote that was applicable during Cycle 7 is removed, and footnote 3 is added.

Adding the “ \pm ” and removing the Cycle 7 footnote are purely administrative changes and thus are acceptable. Footnote 3 explains that the MTC measurement at two-thirds of the expected core burnup is not required if the surveillances of 4.1.1.3.2a and 4.1.1.3.2b are within $\pm 0.16 \times 10^{-4} \Delta\text{k/k}/^{\circ}\text{F}$ of the corresponding design values. This change is acceptable based on the conclusions of CE NPSD-911 and its amendment which the staff has reviewed and found acceptable.

Based on the review, as described in Section 2, the staff finds that the approach described in CE NPSD-911 and its amendment is an acceptable method for eliminating EOC MTC, provided the following conditions, as described in CE NPSD-911, Amendment 1 are satisfied (it should be noted that, for this application, the licensee has satisfied these conditions).

1. In order to ensure that the moderator temperature coefficient will not exceed the Technical Specification limit with a confidence/tolerance of 95/95%, the cycle must be designed, using the ABB-CE methodology, such that the best estimate MTC is:
 - a. more negative than the BOC Technical Specification limit by the design margin, and
 - b. more positive than the EOC Technical Specification limit by the design margin.
2. The design margin is determined to be 1.6 pcm/°F at all times in life.
3. The analysis of a revised data base, including the most recent measured and calculated MTCs, has established that, if the measured beginning-of-cycle moderator temperature coefficients fall within 1.6 pcm/° F of the best estimate prediction, then it can be assumed that the end-of-cycle coefficient will too and its measurement is not required.
4. The measured data reduction must be based on the current ABB-CE methodology as described in this report.
5. If the beginning-of-cycle fails the acceptance criteria of ± 1.6 pcm/° F and the discrepancy cannot be resolved, then the end-of-cycle EOC surveillance test must be performed.

4.0 STATE CONSULTATION

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

5.0 ENVIRONMENTAL CONSIDERATION

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 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 (64 FR 46435, dated August 25, 1999). The March 3, 2000, letter did not change the scope of the initial proposed no significant hazards consideration determination. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). 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.

Principal Contributor: M. Chatterton

Date: April 21, 2000