

August 3, 1994

Mr. Ross P. Barkhurst  
Vice President Operations  
Entergy Operations, Inc.  
Post Office Box B  
Killona, Louisiana 70066

Dear Mr. Barkhurst:

SUBJECT: ISSUANCE OF AMENDMENT NO. 97 TO FACILITY OPERATING LICENSE  
NPF-38 - WATERFORD STEAM ELECTRIC STATION, UNIT 3 (TAC NO. M88433)

The Commission has issued the enclosed Amendment No. 97 to Facility Operating License No. NPF-38 for the Waterford Steam Electric Station, Unit 3. The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated December 14, 1993.

The amendment changes the Appendix A TSs by revising the azimuthal power tilt limit and the action statement for control element assembly (CEA) misalignment to allow 24 hours to restore the tilt to its limits.

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

Sincerely,

ORIGINAL SIGNED BY:

David L. Wigginton, Senior Project Manager  
Project Directorate IV-1  
Division of Reactor Projects - III/IV  
Office of Nuclear Reactor Regulation

9408110283 940803  
PDR ADOCK 05000382  
P PDR

Enclosures:

- 1. Amendment No. 97 to NPF-38
- 2. Safety Evaluation

cc w/enclosures:  
See next page

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Docket File NRC & Local PDRs PD4-1 Reading  
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OFC	LA: PDA-1	PM: PDA-1	OGC	D: PD4-1 WOB
NAME	PNoonan	DWigginton:mk	OPW	WBeckner
DATE	7/18/94	7/18/94	7/19/94	7/19/94

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DFE



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

August 3, 1994

Docket No. 50-382

Mr. Ross P. Barkhurst  
Vice President Operations  
Entergy Operations, Inc.  
Post Office Box B  
Killona, Louisiana 70066

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

Sincerely,

A handwritten signature in black ink, appearing to read "D. Wigginton".

David L. Wigginton, Senior Project Manager  
Project Directorate IV-1  
Division of Reactor Projects - III/IV  
Office of Nuclear Reactor Regulation

Enclosures:

1. Amendment No. 97 to NPF-38
2. Safety Evaluation

cc w/enclosures:  
See next page

Mr. Ross P. Barkhurst  
Entergy Operations, Inc.

Waterford 3

cc:

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

ENERGY OPERATIONS, INC.

DOCKET NO. 50-382

WATERFORD STEAM ELECTRIC STATION, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 97  
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 December 14, 1993, 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.

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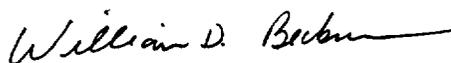
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C(2) of Facility Operating License No. NPF-38 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 97, 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.

FOR THE NUCLEAR REGULATORY COMMISSION



William D. Beckner, Director  
Project Directorate IV-1  
Division of Reactor Projects - III/IV  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Technical  
Specifications

Date of Issuance: August 3, 1994

ATTACHMENT TO LICENSE AMENDMENT NO. 97

TO FACILITY OPERATING LICENSE NO. NPF-38

DOCKET NO. 50-382

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by Amendment number and contain vertical lines indicating the areas of change. The corresponding overleaf pages are also provided to maintain document completeness.

REMOVE PAGES

3/4 2-4  
B 3/4 2-2  
B 3/4 2-3

INSERT PAGES

3/4 2-4  
B 3/4 2-2  
B 3/4 2-3

## POWER DISTRIBUTION LIMITS

### 3/4.2.3 AZIMUTHAL POWER TILT - $T_q$

#### LIMITING CONDITION FOR OPERATION

3.2.3 The AZIMUTHAL POWER TILT ( $T_q$ ) shall be less than or equal to the FOLLOWING LIMITS:

- a. AZIMUTHAL POWER TILT Allowance used in the Core Protection Calculators (CPCs) and
- b. 0.03%.

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.\*

#### ACTION:

- a. With the measured AZIMUTHAL POWER TILT determined to exceed the AZIMUTHAL POWER TILT Allowance used in the CPCs within 2 hours either correct the power tilt or adjust the AZIMUTHAL POWER TILT Allowance used in the CPCs to greater than or equal to the measured value.
- b. With the measured AZIMUTHAL POWER TILT determined to exceed 0.03:
  1. Due to misalignment of either a part length or full length CEA, within 30 minutes verify that the Core Operating Limit Supervisory System (COLSS) (when COLSS is being used to monitor the core power distribution per Specifications 4.2.1.2 and 4.2.4.2) is detecting the CEA misalignment.
  2. Verify that the AZIMUTHAL POWER TILT is within its limit within 2 hours (24 hours for a CEA misalignment event) or reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and reduce the Linear Power Level - High trip setpoints to less than or equal to 55% of RATED THERMAL POWER within the next 4 hours.
  3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the AZIMUTHAL POWER TILT is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

\*See Special Test Exception 3.10.2.

## POWER DISTRIBUTION LIMITS

### 3/4.2.2 PLANAR RADIAL PEAKING FACTORS - $F_{xy}$

#### LIMITING CONDITION FOR OPERATION

3.2.2 The measured PLANAR RADIAL PEAKING FACTORS ( $F_{xy}^m$ ) shall be less than or equal to the PLANAR RADIAL PEAKING FACTORS ( $F_{xy}^c$ ) used in the Core Operating Limit Supervisory System (COLSS) and in the Core Protection Calculators (CPC).

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.\*

#### ACTION:

With a  $F_{xy}^m$  exceeding a corresponding  $F_{xy}^c$ , within 6 hours either:

- a. Adjust the CPC addressable constants to increase the multiplier applied to planar radial peaking by a factor equivalent to greater than or equal to  $F_{xy}^m/F_{xy}^c$  and restrict subsequent operation so that a margin to the COLSS operating limits of at least  $[F_{xy}^m/F_{xy}^c - 1.0] \times 100\%$  is maintained; or
- b. Adjust the affected PLANAR RADIAL PEAKING FACTORS ( $F_{xy}^c$ ) used in the COLSS and CPC to a value greater than or equal to the measured PLANAR RADIAL PEAKING FACTORS ( $F_{xy}^m$ ) or
- c. Be in at least HOT STANDBY.

#### SURVEILLANCE REQUIREMENTS

4.2.2.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.2 The measured PLANAR RADIAL PEAKING FACTORS ( $F_{xy}^m$ ) obtained by using the incore detection system, shall be determined to be less than or equal to the PLANAR RADIAL PEAKING FACTORS ( $F_{xy}^c$ ), used in the COLSS and CPC at the following intervals:

- a. After each fuel loading with THERMAL POWER greater than 40% but prior to operation above 70% of RATED THERMAL POWER, and
- b. At least once per 31 effective full power days (EFPD).

\*See Special Test Exception 3.10.2.

## POWER DISTRIBUTION LIMITS

### BASES

#### 3/4.2.2 PLANAR RADIAL PEAKING FACTORS

Limiting the values of the PLANAR RADIAL PEAKING FACTORS ( $F_{xy}^c$ ) used in the COLSS and CPCs to values equal to or greater than the measured PLANAR RADIAL PEAKING FACTORS ( $F_{xy}^m$ ) provides assurance that the limits calculated by COLSS and the CPCs remain valid. Data from the incore detectors are used for determining the measured PLANAR RADIAL PEAKING FACTORS. A minimum core power at 20% of RATED THERMAL POWER is assumed in determining the PLANAR RADIAL PEAKING FACTORS. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The periodic Surveillance Requirements for determining the measured PLANAR RADIAL PEAKING FACTORS provide assurance that the PLANAR RADIAL PEAKING FACTORS used in COLSS and the CPCs remain valid throughout the fuel cycle. Determining the measured PLANAR RADIAL PEAKING FACTORS after each fuel loading prior to exceeding 70% of RATED THERMAL POWER provides additional assurance that the core was properly loaded.

#### 3/4.2.3 AZIMUTHAL POWER TILT - $T_q$

The limitations on the AZIMUTHAL POWER TILT are provided to ensure that design safety margins are maintained. The LCO places a 3% limit on the maximum azimuthal tilt during normal steady state power operation. With AZIMUTHAL POWER TILT greater than 3%, operation is restricted to only those conditions required to identify the cause of the tilt. However, Action item b.2 allows 24 hours to restore the tilt to less than 3% following a CEA misalignment event (i.e., CEA drop). A CEA misalignment event causes an asymmetric core power generation and an increase in xenon concentration in the vicinity of the dropped rod. This event may cause the azimuthal tilt to exceed 3%. The 2 hour action time to reduce core power is not sufficient to recover from the xenon transient. The 24 hour period allows for correction of the misaligned CEA and allows time for the xenon redistribution effects to dampen out due to radioactive decay and absorption. The reduction in xenon concentration (which is aided by operation at full power) will in turn reduce the tilt below the 3% limit.

The 24 hour period is applicable only to a CEA misalignment where the cause of the tilt has been identified. It is based on the time required or the expected xenon transient to dampen out. All other conditions (not due to a CEA misalignment) where the azimuthal tilt exceeds 3% require action within the specified 2 hours.

The tilt is normally calculated by COLSS. A minimum core power of 20% of RATED THERMAL POWER is assumed by the CPCs in its input to COLSS for calculation of AZIMUTHAL POWER TILT. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The Surveillance Requirements specified when COLSS is out of service provide an acceptable means of detecting the presence of a steady-state tilt. It is necessary to explicitly account for power asymmetries in the COLSS and CPCs because the radial peaking factors used in the core power distribution calculations are based on an untilted power distribution.

## POWER DISTRIBUTION LIMITS

### BASES

#### AZIMUTHAL POWER TILT - $T_q$ (Continued)

AZIMUTHAL POWER TILT is measured by assuming that the ratio of the power at any core location in the presence of a tilt to the untilted power at the location is of the form:

$$P_{\text{tilt}}/P_{\text{untilt}} = 1 + T_q g \cos (\theta - \theta_0)$$

where:

$T_q$  is the peak fractional tilt amplitude at the core periphery

$g$  is the radial normalizing factor

$\theta$  is the azimuthal core location

$\theta_0$  is the azimuthal core location of maximum tilt

$P_{\text{tilt}}/P_{\text{untilt}}$  is the ratio of the power at a core location in the presence of a tilt to the power at that location with no tilt.

#### 3/4.2.4 DNBR MARGIN

The limitation on DNBR as a function of AXIAL SHAPE INDEX represents a conservative envelope of operating conditions consistent with the safety analysis assumptions and which have been analytically demonstrated adequate to maintain an acceptable minimum DNBR throughout all anticipated operational occurrences. Operation of the core with a DNBR at or above this limit provides assurance that an acceptable minimum DNBR will be maintained.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the DNBR channels in the Core Protection Calculators (CPCs), provides adequate monitoring of the core power distribution and is capable of verifying that the DNBR does not violate its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core operating limit corresponding to the allowable minimum DNBR. The COLSS calculation of core power operating limit based on the minimum DNBR limit includes appropriate penalty factors which provide a 95/95 probability/confidence level that the core power calculated by COLSS, based on the minimum DNBR limit, is conservative with respect to the actual core power limit. These penalty factors are determined from the uncertainties associated with planar radial peaking measurements, state parameter measurement, software algorithm modelling, computer processing, rod bow, and core power measurement.

Parameters required to maintain the margin to DNB and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the limits of Figure 3.2.2 or Figure 3.2-3 can be maintained by utilizing a predetermined DNBR as a function of AXIAL SHAPE INDEX and by monitoring the CPC trip channels. The above listed uncertainty and penalty factors plus those associated with startup test acceptance criteria are also included in the CPCs which assume a minimum core power of 20% of RATED THERMAL POWER. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being less accurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings.

## POWER DISTRIBUTION LIMITS

### BASES

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#### DNBR MARGIN (Continued)

A DNBR penalty factor has been included in the COLSS and CPC DNBR calculations to accommodate the effects of rod bow. The amount of rod bow in each assembly is dependent upon the average burnup experienced by that assembly. Fuel assemblies that incur higher average burnup will experience a greater magnitude of rod bow. Conversely, lower burnup assemblies will experience less rod bow. In design calculations, the penalty for each batch required to compensate for rod bow is determined from a batch's maximum average assembly burnup applied to the batch's maximum integrated planar-radial power peak. A single net penalty for COLSS and CPC is then determined from the penalties associated with each batch, accounting for the offsetting margins due to the lower radial power peaks in the higher burnup batches.

#### 3/4.2.5 RCS FLOW RATE

This specification is provided to ensure that the actual RCS total flow rate is maintained at or above the minimum value used in the LOCA safety analyses, and that the DNBR is maintained within the safety limit for Anticipated Operational Occurrences (AOO).

#### 3/4.2.6 REACTOR COOLANT COLD LEG TEMPERATURE

This specification is provided to ensure that the actual value of reactor coolant cold leg temperature is maintained within the range of values used in the safety analyses, with adjustment for instrument accuracy of  $\pm 2^\circ\text{F}$ , and that the peak linear heat generation rate and the moderator temperature coefficient effects are validated.

#### 3/4.2.7 AXIAL SHAPE INDEX

This specification is provided to ensure that the actual value of AXIAL SHAPE INDEX is maintained within the range of values used in the safety analyses, to ensure that the peak linear heat rate and DNBR remain within the safety limits for Anticipated Operational Occurrences (AOO).

#### 3/4.2.8 PRESSURIZER PRESSURE

This specification is provided to ensure that the actual value of pressurizer pressure is maintained within the range of values used in the safety analyses. The inputs to CPCs and COLSS are the most limiting. The values are adjusted for an instrument accuracy of  $\pm 25$  psi. The sensitive events are SGTR, LOCA, FWLB and loss of condenser vacuum to initial high pressure, and MSLB to initial low pressure.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 97 TO

FACILITY OPERATING LICENSE NO. NPF-38

ENERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

1.0 INTRODUCTION

By application dated December 14, 1993, Entergy Operations, Inc. (the licensee), submitted a request for changes to the Waterford Steam Electric Station, Unit 3, Technical Specifications (TSs). The requested changes would revise TS 3.2.3 "Azimuthal Power Tilt" to require that the actual tilt be less than or equal to the tilt allowance used in the core protection calculators (CPCs) and be no greater than 3%. The changes would also revise the action statement for control element assembly (CEA) misalignment to allow 24 hours to restore the tilt to less than 3%.

2.0 EVALUATION

The limitations on the azimuthal power tilt are provided to ensure that design safety margins are maintained by limiting the core power distribution to the initial values assumed in the accident analyses. The maximum tilt is a key safety parameter in the analysis of single CEA movement events such as the CEA ejection or CEA drop.

The current specification allows the maximum tilt to equal 10% above 20% of rated thermal power as long as it does not exceed the allowance used in the CPCs. However, this has been determined to be nonconservative with respect to the initial tilt value used in the analysis of single CEA movement events in which a maximum 3% tilt value was assumed. The proposed change would place a 3% limit on the maximum azimuthal tilt during normal steady state operation. This is acceptable as it would make the TSs consistent with the safety analyses. Since this discrepancy between the safety analyses and the TSs has existed since Cycle 2, the licensee has evaluated previous operation and has concluded that the plant has not operated with a steady state power azimuthal tilt greater than 3% above 20% of rated thermal power. Currently, administrative controls are in place to assure compliance with this requirement.

The proposed TSs would also allow up to 24 hours to restore the tilt to less than 3% following a CEA misalignment event. A CEA misalignment event, such as a CEA drop, causes an asymmetric core power generation and an increase in

xenon concentration in the vicinity of the dropped CEA and could cause the tilt to exceed 3%. Since a lower power reduces the rate at which xenon near the dropped CEA can be burned out, a reduction in power would tend to increase the tilt, making the transient worse. Therefore, extending the existing 2 hour action time to reduce core power to 24 hours allows for correction of the misaligned CEA, per TS 3.1.3.1, and allows time for the xenon redistribution effects to dampen out. The reduction in xenon concentration, which is aided by operation at full power, will in turn reduce the tilt below the 3% limit. Therefore, this proposed change is acceptable. However, the 24 hour period is applicable only to a CEA misalignment where the cause of the tilt has been identified. All other conditions (not due to a CEA misalignment) where the azimuthal tilt exceeds 3% require action within the specified 2 hours.

The corresponding changes to the Bases are consistent with these acceptable TS changes and are, therefore, acceptable.

### 3.0 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.

### 4.0 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 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 (59 FR 2866). 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.

### 5.0 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: L. Kopp

Date: August 3, 1994