

March 1, 1995

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

SUBJECT: ISSUANCE OF AMENDMENT NO. 102 TO FACILITY OPERATING LICENSE  
NPF-38 - WATERFORD STEAM ELECTRIC STATION, UNIT 3 (TAC NO. M90204)

Dear Mr. Barkhurst:

The Commission has issued the enclosed Amendment No. 102 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 August 11, 1994, as supplemented by letter dated December 2, 1994.

The amendment changes the Appendix A TSs by modifying the specifications having cycle-specific parameter limits by replacing the values of those limits with a reference to a core operating limits report for the values of those limits. These changes are in accordance with the requirements of Generic Letter 88-16.

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:

Chandu P. Patel, Project Manager  
Project Directorate IV-1  
Division of Reactor Projects - III/IV  
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosures: 1. Amendment No. 102 to NPF-38  
2. Safety Evaluation

cc w/encls: See next page

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Docket File	PUBLIC	PD4-1 R/F
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OPA (2G5)	OC/LFDCB	T. Huang

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OFC	LA:PD4-1	PM:PD4-1	OGC <i>NO updated records</i>
NAME	PNoonan	CPatel:mk	<i>11/11/94</i>
DATE	<i>2/16/94</i>	<i>2/16/94 3/1/95</i>	<i>2/29/94</i>
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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555

March 1, 1995

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Vice President Operations  
Entergy Operations, Inc.  
Post Office Box B  
Killona, Louisiana 70066

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Sincerely,

*Chandu P. Patel*

Chandu P. Patel, Project Manager  
Project Directorate IV-1  
Division of Reactor Projects - III/IV  
Office of Nuclear Reactor Regulation

Docket No. 50-382

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2. Safety Evaluation

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Mr. Ross P. Barkhurst  
Entergy Operations, Inc.

Waterford 3

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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. 102  
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 August 11, 1994, as supplemented by letter dated December 2, 1994, 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. 102, 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

*Chandu P. Patel*

Chandu P. Patel, Project Manager  
Project Directorate IV-1  
Division of Reactor Projects - III/IV  
Office of Nuclear Reactor Regulation

Attachment: Changes to the  
Technical Specifications

Date of Issuance: March 1, 1995

ATTACHMENT TO LICENSE AMENDMENT NO. 102

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

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## DEFINITIONS

### IDENTIFIED LEAKAGE (Continued)

- b. Leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be PRESSURE BOUNDARY LEAKAGE, or
- c. Reactor Coolant System leakage through a steam generator to the secondary system.

### MEMBER(S) OF THE PUBLIC

1.15 MEMBER(S) OF THE PUBLIC shall include all persons who are not occupationally associated with the plant. This category does not include employees of the licensee, its contractors, or vendors. Also excluded from this category are persons who enter the site to service equipment or make deliveries. This category does include persons who use portions of the site for recreational, occupational, or other purposes not associated with the plant.

### OFFSITE DOSE CALCULATION MANUAL (ODCM)

1.16 The OFFSITE DOSE CALCULATION MANUAL (ODCM) shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Environmental Radiological Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs required by Section 6.8.4 and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Annual Radioactive Effluent Release Reports required by Specification 6.9.1.7 and 6.9.1.8.

### OPERABLE - OPERABILITY

1.17 A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).

### OPERATIONAL MODE - MODE

1.18 An OPERATIONAL MODE (i.e. MODE) shall correspond to any one inclusive combination of core reactivity condition, power level and average reactor coolant temperature specified in Table 1.2.

## DEFINITIONS

### CORE ALTERATION

1.9 CORE ALTERATION shall be the movement or manipulation of any component within the reactor pressure vessel with the vessel head removed and fuel in the vessel. Suspension of CORE ALTERATION shall not preclude completion of movement of a component to a safe conservative position.

### COLR - CORE OPERATING LIMITS REPORT

1.9a The CORE OPERATING LIMITS REPORT is the Waterford 3 specific document that provides core operating limits for the current operating reload cycle. These cycle-specific core operating limits shall be determined for each reload cycle in accordance with Technical Specification 6.9.1.11. Plant operation within these operating limits is addressed in individual specifications.

### DOSE EQUIVALENT I-131

1.10 DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, " Calculation of Distance Factors for Power and Test Reactor Sites."

### $\bar{E}$ - AVERAGE DISINTEGRATION ENERGY

1.11  $\bar{E}$  shall be the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies per disintegration (in MeV) for isotopes, other than iodines, with half-lives greater than 15 minutes, making up at least 95% of the total noniodine activity in the coolant.

### ENGINEERED SAFETY FEATURES RESPONSE TIME

1.12 The ENGINEERED SAFETY FEATURES RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays where applicable.

### FREQUENCY NOTATION

1.13 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.1.

### IDENTIFIED LEAKAGE

1.14 IDENTIFIED LEAKAGE shall be:

- a. Leakage (except CONTROLLED LEAKAGE) into closed systems, such as pump seal or valve packing leaks that are captured, and conducted to a sump or collecting tank, or

### 3/4.1 REACTIVITY CONTROL SYSTEMS

#### 3/4.1.1 BORATION CONTROL

##### SHUTDOWN MARGIN - ANY FULL LENGTH CEA WITHDRAWN

#### LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be greater than or equal to that specified in the COLR.

APPLICABILITY: MODES 1, 2\*, 3, 4, and 5 with any full length CEA fully or partially withdrawn.

ACTION:

With the SHUTDOWN MARGIN less than that required above, immediately initiate and continue boration at greater than or equal to 40 gpm of a solution containing greater than or equal to 1720 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

#### SURVEILLANCE REQUIREMENTS

4.1.1.1.1 With any full length CEA fully or partially withdrawn, the SHUTDOWN MARGIN shall be determined to be greater than or equal to that specified in the COLR:

- a. Within 1 hour after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is immovable or untrippable, the above required SHUTDOWN MARGIN shall be verified acceptable with an increased allowance for the withdrawn worth of the immovable or untrippable CEA(s).
- b. When in MODE 1 or MODE 2 with  $K_{eff}$  greater than or equal to 1.0, at least once per 12 hours by verifying that CEA group withdrawal is within the Transient Insertion Limits of Specification 3.1.3.6.
- c. When in MODE 2 with  $K_{eff}$  less than 1.0, within 4 hours prior to achieving reactor criticality by verifying that the predicted critical CEA position is within the limits of Specification 3.1.3.6.

\* See Special Test Exception 3.10.1.



## REACTIVITY CONTROL SYSTEMS

### SURVEILLANCE REQUIREMENTS (Continued)

---

- d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of e. below, with the CEA groups at the Transient Insertion Limits of Specification 3.1.3.6.
- e. When in MODE 3, 4, or 5, at least once per 24 hours by consideration of at least the following factors:
  - 1. Reactor Coolant System boron concentration,
  - 2. CEA position,
  - 3. Reactor Coolant System average temperature,
  - 4. Fuel burnup based on gross thermal energy generation,
  - 5. Xenon concentration, and
  - 6. Samarium concentration.

4.1.1.1.2 The overall core reactivity balance shall be compared to predicted values to demonstrate agreement within  $\pm 1.0\%$  delta k/k at least once per 31 Effective Full Power Days (EFPD). This comparison shall consider at least those factors stated in Specification 4.1.1.1.e., above. The predicted reactivity values shall be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 EFPDs after each fuel loading.

## REACTIVITY CONTROL SYSTEMS

### SHUTDOWN MARGIN - ALL FULL LENGTH CEAS FULLY INSERTED

#### LIMITING CONDITION FOR OPERATION

---

3.1.1.2 The SHUTDOWN MARGIN shall be greater than or equal to that specified in the COLR.

APPLICABILITY: MODES 3, 4 and 5 with all full length CEAs fully inserted.

ACTION:

With the SHUTDOWN MARGIN less than that specified in the COLR, immediately initiate and continue boration at greater than or equal to 40 gpm of a solution containing greater than or equal to 1720 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

#### SURVEILLANCE REQUIREMENTS

---

4.1.1.2 With all full length CEAs fully inserted, the SHUTDOWN MARGIN shall be determined to be greater than or equal to that specified in the COLR, at least once per 24 hours by consideration of the following factors:

1. Reactor Coolant System boron concentration,
2. CEA position,
3. Reactor Coolant System average temperature,
4. Fuel burnup based on gross thermal energy generation,
5. Xenon concentration, and
6. Samarium concentration.

## REACTIVITY CONTROL SYSTEMS

### MODERATOR TEMPERATURE COEFFICIENT

#### LIMITING CONDITION FOR OPERATION

3.1.1.3 The moderator temperature coefficient (MTC) shall be within the limits specified in the COLR. The maximum upper design limit shall be:

- a. Less positive than  $0.5 \times 10^{-4}$  delta k/k/°F whenever THERMAL POWER is  $\leq 70\%$  RATED THERMAL POWER, and
- b. Less positive than  $0.0 \times 10^{-4}$  delta k/k/°F whenever THERMAL POWER is  $>70\%$  RATED THERMAL POWER.

APPLICABILITY: MODES 1<sup>#(1)</sup> and 2\*#

#### ACTION:

With the moderator temperature coefficient outside any one of the above limits, be in at least HOT STANDBY within 6 hours.

#### SURVEILLANCE REQUIREMENTS

4.1.1.3.1 The MTC shall be determined to be within its limits by confirmatory measurements. MTC measured values shall be extrapolated and/or compensated to permit direct comparison with the above limits.

4.1.1.3.2 The MTC shall be determined at the following frequencies and THERMAL POWER conditions during each fuel cycle:

- a. Prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading.
- b. At greater than 15% of RATED THERMAL POWER, prior to reaching 40 EFPD core burnup.
- c. At any THERMAL POWER, within 7 EFPD of reaching two-thirds of expected core burnup.

\*With  $K_{eff}$  greater than or equal to 1.0.

#See Special Test Exception 3.10.2.

<sup>#(1)</sup>See Special Test Exception 3.10.2 applicable for Mode 1 during startup test of Cycle 2.

REACTIVITY CONTROL SYSTEMS

BORON DILUTION

LIMITING CONDITION FOR OPERATION

3.1.2.9 Boron concentration shall be verified consistent with SHUTDOWN MARGIN requirements of Specifications 3.1.1.1, 3.1.1.2, and 3.9.1. Boron dilution events shall be precluded by either "a" or "b" below.

- a. 1. Two boron dilution alarms (startup channel high neutron flux) shall be OPERABLE with the alarms set in accordance with Specification 4.1.2.9.5

and

2. i. If the plant is in MODE 4, then remove power to at least one charging pump.  
ii. If the plant is in MODE 5 with  $k_{eff} \leq 0.97$ , then remove power to at least one charging pump.  
iii. If the plant is in MODE 5 with  $k_{eff} > 0.97$ , then remove power to at least two charging pumps.  
iv. If the plant is in MODE 6, then remove power to at least two charging pumps.

OR

- b. 1. The primary makeup water flow path to the reactor coolant system shall be isolated  
and  
2. Do not operate the plant in the configurations prohibited by the COLR for the current MODE.

APPLICABILITY: MODES 3\*, 4, 5, and 6.

\*While any shutdown CEA is less than 145 inches withdrawn.

ACTION:

- a. With the boron concentration not consistent with required SHUTDOWN MARGIN, initiate emergency boration.  
b. With one boron dilution alarm inoperable and the primary makeup water flow path to the reactor coolant system not isolated, determine reactor coolant system boron concentration within one hour and at least at the monitoring frequency specified in the COLR.  
c. With both boron dilution alarms inoperable and the primary makeup water flow path to the reactor coolant system not isolated, determine the reactor coolant system boron concentration by two independent means within one hour and at least at the monitoring frequency specified in the COLR; otherwise, immediately suspend all operations involving positive reactivity changes or CORE ALTERATIONS (if applicable).

## REACTIVITY CONTROL SYSTEMS

### LIMITING CONDITION FOR OPERATION (Continued)

#### ACTION: (Continued)

- d. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

### SURVEILLANCE REQUIREMENTS

4.1.2.9.1 The provisions of Specification 4.0.4 are not applicable for entry into MODE 3 from MODE 2.

4.1.2.9.2 Each required boron dilution alarm shall be demonstrated OPERABLE by the performance of a CHANNEL CHECK at least once per 12 hours, a CHANNEL FUNCTIONAL TEST at least once per 31 days, and a CHANNEL CALIBRATION at least once per 18 months.

4.1.2.9.3 If the primary makeup water flow path to the Reactor Coolant System is isolated to fulfill 3.1.2.9.b, the required primary makeup water flow path to the Reactor Coolant System shall be verified to be isolated by either locked closed manual valves, deactivated automatic valves secured in the isolation position, or by power being removed from all charging pumps, at least once per 24 hours.

4.1.2.9.4 The requirements of Specification 3.1.2.9.a.2 or 3.1.2.9.b.2 shall be verified at least once per 24 hours.

4.1.2.9.5 Each required boron dilution alarm setpoint shall be adjusted to less than or equal to the existing neutron flux (cps) multiplied by the value specified in the COLR, at the frequencies specified in the COLR.

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## REACTIVITY CONTROL SYSTEMS

### 3/4.1.3 MOVABLE CONTROL ASSEMBLIES

#### CEA POSITION

#### LIMITING CONDITION FOR OPERATION

3.1.3.1 All full-length (shutdown and regulating) CEAs, and all part-length CEAs which are inserted in the core, shall be OPERABLE with each CEA of a given group positioned within 7 inches (indicated position) of all other CEAs in its group.

APPLICABILITY: MODES 1\* and 2\*.

#### ACTION:

- a. With one or more full-length CEAs inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in at least HOT STANDBY within 6 hours.
- b. With more than one full-length or part-length CEA trippable but misaligned from any other CEA in its group by more than 19 inches (indicated position), be in at least HOT STANDBY within 6 hours.
- c. With one full-length or part-length CEA trippable but misaligned from any other CEA in its group by more than 19 inches, operation in MODES 1 and 2 may continue, provided that core power is reduced in accordance with the limits specified in the COLR and within 1 hour the misaligned CEA is either:
  1. Restored to OPERABLE status within its above specified alignment requirements, or
  2. Declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied. After declaring the CEA inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6 provided:
    - a) Within 1 hour the remainder of the CEAs in the group with the inoperable CEA shall be aligned to within 7 inches of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown on; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.
    - b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

Otherwise, be in at least HOT STANDBY within 6 hours.

\*See Special Test Exceptions 3.10.2 and 3.10.4.

## REACTIVITY CONTROL SYSTEMS

### LIMITING CONDITION FOR OPERATION (Continued)

#### ACTION: (Continued)

- d. With one or more full-length or part-length CEAs trippable but misaligned from any other CEAs in its group by more than 7 inches but less than or equal to 19 inches, operation in MODES 1 and 2 may continue, provided that core power is reduced in accordance with the limits specified in the COLR and within 1 hour the misaligned CEA(s) is either:
1. Restored to OPERABLE status within its above specified alignment requirements, or
  2. Declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied. After declaring the CEA inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6 provided:
    - a) Within 1 hour the remainder of the CEAs in the group with the inoperable CEA shall be aligned to within 7 inches of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown on; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.
    - b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

Otherwise, be in at least HOT STANDBY within the next 6 hours.

- e. With one full-length CEA trippable but inoperable due to causes other than addressed by ACTION a., above, and inserted beyond the Long Term Steady State Insertion Limits but within its above specified alignment requirements, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6.
- f. With one full-length CEA trippable but inoperable due to causes other than addressed by ACTION a., above, but within its above specified alignment requirements and either greater than or equal to 145 inches withdrawn or within the Long Term Steady State Insertion Limits if in full-length CEA group 6, operation in MODES 1 and 2 may continue.
- g. With one part-length CEA inoperable and inserted in the core, operation may continue provided the alignment of the inoperable part-length CEA is maintained within 7 inches (indicated position) of all other part-length CEAs in its group and the CEA is maintained pursuant to the requirements of Specification 3.1.3.7.
- h. With more than one full-length or part-length CEA trippable but inoperable due to causes other than addressed by ACTION a., above, restore the inoperable CEAs to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours.



REACTIVITY CONTROL SYSTEMS

REGULATING CEA INSERTION LIMITS

LIMITING CONDITION FOR OPERATION

3.1.3.6 The regulating CEA groups shall be limited to the withdrawal sequence and to the insertion limits\* specified in the COLR\*\* with CEA insertion between the Long Term Steady State Insertion Limits and the Transient Insertion Limits restricted to:

- a. Less than or equal to 4 hours per 24 hour interval,
- b. Less than or equal to 5 Effective Full Power Days per 30 Effective Full Power Day interval, and
- c. Less than or equal to 14 Effective Full Power Days per calendar year.

APPLICABILITY: MODES 1\*\*\* and 2\*\*\* #.

ACTION:

- a. With the regulating CEA groups inserted beyond the Transient Insertion Limits, except for surveillance testing pursuant to Specification 4.1.3.1.2, or Reactor Power Cutback, within 2 hours either:
  1. Restore the regulating CEA groups to within the limits, or
  2. Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the CEA group position using the COLR.
- b. With the regulating CEA groups inserted between the Long Term Steady State Insertion Limits and the Transient Insertion Limits for intervals greater than 4 hours per 24-hour interval, operation may proceed provided either:
  1. The Short Term Steady State Insertion Limits specified in the COLR are not exceeded, or
  2. Any subsequent increase in THERMAL POWER is restricted to less than or equal to 5% of RATED THERMAL POWER per hour.

---

\*Following a reactor power cutback in which (1) Regulating Groups 5 and/or 6 are dropped or (2) Regulating Groups 5 and/or 6 are dropped and the remaining Regulating Groups (Groups 1, 2, 3, and 4) are sequentially inserted, the Transient Insertion Limit specified in the COLR can be exceeded for up to 2 hours.

\*\*CEAs are fully withdrawn in accordance with the Transient Insertion Limit specified in the COLR when withdrawn to at least 145 inches.

\*\*\*See Special Test Exceptions 3.10.2 and 3.10.4.

#With  $K_{eff}$  greater than or equal to 1.0.

## REACTIVITY CONTROL SYSTEMS

### LIMITING CONDITION FOR OPERATION (Continued)

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#### ACTION: (Continued)

- c. With the regulating CEA groups inserted between the Long Term Steady State Insertion Limits and the Transient Insertion Limits for intervals greater than 5 EFPD per 30 EFPD interval or greater than 14 EFPD per calendar year, either:
  1. Restore the regulating groups to within the Long Term Steady State Insertion Limits within two hours, or
  2. Be in at least HOT STANDBY within 6 hours.

### SURVEILLANCE REQUIREMENTS

---

4.1.3.6 The position of each regulating CEA group shall be determined to be within the Transient Insertion Limits at least once per 12 hours except during time intervals when the PDIL Auctioneer Alarm Circuit is inoperable, then verify the individual CEA positions at least once per 4 hours. The accumulated times during which the regulating CEA groups are inserted beyond the Long Term Steady State Insertion Limits but within the Transient Insertion Limits shall be determined at least once per 24 hours.

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## REACTIVITY CONTROL SYSTEMS

### PART LENGTH CEA INSERTION LIMITS

#### LIMITING CONDITION FOR OPERATION

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3.1.3.7 The part length CEA groups shall be limited to the insertion limits specified in the COLR with PLCEA insertion between the Long Term Steady State Insertion Limit and the Transient Insertion Limit restricted to:

- a.  $\leq 7$  EFPD per 30 EFPD interval, and
- b.  $\leq 14$  EFPD per calendar year.

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

#### ACTION:

- a. With the part length CEA groups inserted beyond the Transient Insertion Limit, except for surveillance testing pursuant to Specification 4.1.3.1.2, within two hours, either:
  1. Restore the part length CEA group to within the limits, or
  2. Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the PLCEA group position as specified in the COLR.
- b. With the part length CEA groups inserted between the Long Term Steady State Insertion Limit and the Transient Insertion Limit for intervals  $> 7$  EFPD per 30 EFPD interval or  $> 14$  EFPD per calendar year, either:
  1. Restore the part length group within the Long Term Steady State Insertion Limits within two hours, or
  2. Be in at least HOT STANDBY within 6 hours.

#### SURVEILLANCE REQUIREMENTS

---

4.1.3.7 The position of the part length CEA group shall be determined to be within the Transient Insertion Limit at least once per 12 hours.

\*See Special Test Exception 3.10.2.

## 3/4.2 POWER DISTRIBUTION LIMITS

### 3/4 2.1 LINEAR HEAT RATE

#### LIMITING CONDITION FOR OPERATION

---

3.2.1 The linear heat rate limit, specified in the COLR, shall be maintained by one of the following methods as applicable:

- a. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on linear heat rate (when COLSS is in service); or
- b. Operating within the region of acceptable operation specified in the COLR using any operable CPC channel (when COLSS is out of service).

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

#### ACTION:

- a. With the linear heat rate limit not being maintained as indicated by COLSS calculated core power exceeding the COLSS calculated core power operating limit based on linear heat rate, within 15 minutes initiate corrective action to reduce the linear heat rate to within the limit and either:
  1. Restore the linear heat rate to within its limits within 1 hour, or
  2. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER within the next 6 hours.
- b. With the linear heat rate limit not being maintained as indicated by operation outside the region of acceptable operation specified in the COLR with COLSS out of service, either:
  1. Restore COLSS to service within 2 hours, or
  2. Restore the linear heat rate to within its limits within the next 2 hours, or
  3. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER within the next 6 hours.

#### SURVEILLANCE REQUIREMENTS

---

4.2.1.1 The provisions of Specification 4.0.4 are not applicable.

4.2.1.2 The linear heat rate shall be determined to be within its limits when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System

## POWER DISTRIBUTION LIMITS

### LIMITING CONDITION FOR OPERATION

---

(COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the linear heat rate, as indicated on any OPERABLE Local Power Density channel, is within the limits specified in the COLR.

4.2.1.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on kW/ft.

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## 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  $[F_{xy}^m/F_{xy}^c] - 1.0$  x 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

### 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. the limit specified in the COLR.

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 the limit specified in the COLR:
  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

### SURVEILLANCE REQUIREMENTS

---

4.2.3.1 The provisions of Specification 4.0.4 are not applicable.

4.2.3.2 The AZIMUTHAL POWER TILT shall be determined to be within the limit above 20% of RATED THERMAL POWER by:

- a. Continuously monitoring the tilt with COLSS when the COLSS is OPERABLE.
- b. Calculating the tilt at least once per 12 hours when the COLSS is inoperable.
- c. Verifying at least once per 31 days, that the COLSS Azimuthal Tilt Alarm is actuated at an AZIMUTHAL POWER TILT greater than the AZIMUTHAL POWER TILT Allowance used in the CPCs.
- d. Using the incore detectors at least once per 31 days to independently confirm the validity of the COLSS calculated AZIMUTHAL POWER TILT.

## POWER DISTRIBUTION LIMITS

### 3/4.2.4 DNBR MARGIN

#### LIMITING CONDITION FOR OPERATION

---

- 3.2.4 The DNBR margin shall be maintained by one of the following methods:
- a. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR (when COLSS is in service, and either one or both CEACs are operable); or
  - b. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by the amount specified in the COLR (when COLSS is in service and neither CEAC is operable); or
  - c. Operating within the region of acceptable operation specified in the COLR using any operable CPC channel (when COLSS is out of service and either one or both CEACs are operable); or
  - d. Operating within the region of acceptable operation specified in the COLR using any operable CPC channel (when COLSS is out of service and neither CEAC is operable).

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

#### ACTION:

- a. With the DNBR limit not being maintained as indicated by COLSS calculated core power exceeding the COLSS calculated core power operating limit based on DNBR, within 15 minutes initiate corrective action to reduce the DNBR to within the limits and either:
  1. Restore the DNBR to within its limits within 1 hour, or
  2. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER within the next 6 hours.
- b. With the DNBR limit not being maintained as indicated by operation outside the region of acceptable operation specified in the COLR with COLSS out of service, either:
  1. Restore COLSS to service within 2 hours, or
  2. Restore the DNBR to within its limits within the next 2 hours, or
  3. Reduce THERMAL POWER to less than or equal to 20% of RATED THERMAL POWER within the next 6 hours.

## POWER DISTRIBUTION LIMITS

### SURVEILLANCE REQUIREMENTS

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4.2.4.1 The provisions of Specification 4.0.4 are not applicable.

4.2.4.2 The DNBR shall be determined to be within its limits when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the DNBR, as indicated on any OPERABLE DNBR channel, is within the limit specified in the COLR.

4.2.4.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on DNBR.

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## POWER DISTRIBUTION LIMITS

### 3/4.2.5 RCS FLOW RATE

#### LIMITING CONDITION FOR OPERATION

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3.2.5 The actual Reactor Coolant System total flow rate shall be greater than or equal to  $148.0 \times 10^6$  lbm/h.

APPLICABILITY: MODE 1.

#### ACTION:

With the actual Reactor Coolant System total flow rate determined to be less than the above limit, reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within 4 hours.

#### SURVEILLANCE REQUIREMENTS

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4.2.5 The actual Reactor Coolant System total flow rate shall be determined to be greater than or equal to the above limit at least once per 12 hours.

## POWER DISTRIBUTION LIMITS

### 3/4.2.6 REACTOR COOLANT COLD LEG TEMPERATURE

#### LIMITING CONDITION FOR OPERATION

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3.2.6 The reactor coolant cold leg temperature ( $T_c$ ) shall be maintained between 544°F and 558°F.\*

APPLICABILITY: MODE 1 above 30% of RATED THERMAL POWER.

ACTION:

With the reactor coolant cold leg temperature exceeding its limit, restore the temperature to within its limit within 2 hours or reduce THERMAL POWER to less than 30% of RATED THERMAL POWER within the next 4 hours.

#### SURVEILLANCE REQUIREMENTS

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4.2.6 The reactor coolant cold leg temperature shall be determined to be within its limit at least once per 12 hours.

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\*Following a reactor power cutback in which (1) Regulating Groups 5 and/or 6 are dropped or (2) Regulating Groups 5 and/or 6 are dropped and the remaining Regulating Groups (Groups 1, 2, 3, and 4) are sequentially inserted, the upper limit on  $T_c$  may increase to 568°F for up to 30 minutes.

## POWER DISTRIBUTION LIMITS

### 3/4.2.7 AXIAL SHAPE INDEX

#### LIMITING CONDITION FOR OPERATION

---

3.2.7 The AXIAL SHAPE INDEX (ASI) shall be maintained within the limits specified in the COLR.

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

ACTION:

With the AXIAL SHAPE INDEX outside the limits specified in the COLR, restore the AXIAL SHAPE INDEX to within its limit within 2 hours or reduce THERMAL POWER to less than 20% of RATED THERMAL POWER within the next 4 hours.

#### SURVEILLANCE REQUIREMENTS

---

4.2.7 The AXIAL SHAPE INDEX shall be determined to be within its limit at least once per 12 hours using the COLSS or any OPERABLE Core Protection Calculator channel.

\*See Special Test Exception 3.10.2.



### 3/4.9 REFUELING OPERATIONS

#### 3/4.9.1 BORON CONCENTRATION

##### LIMITING CONDITION FOR OPERATION

3.9.1 With the reactor vessel head closure bolts less than fully tensioned or with the head removed, the boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and sufficient to ensure that the more restrictive of the reactivity conditions specified in the COLR is met.

APPLICABILITY: MODE 6\*.

##### ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at greater than or equal to 40 gpm of a solution containing at least 1720 ppm boron or its equivalent until  $K_{eff}$  is reduced to less than or equal to the value specified in the COLR or the boron concentration is restored to greater than or equal to the value specified in the COLR, whichever is the more restrictive.

##### SURVEILLANCE REQUIREMENTS

4.9.1.1 The more restrictive of the above two reactivity conditions shall be determined prior to:

- a. Removing or unbolting the reactor vessel head, and
- b. Withdrawal of any full-length CEA in excess of 3 feet from its fully inserted position within the reactor pressure vessel.

4.9.1.2 The boron concentration of the Reactor Coolant System and the refueling canal shall be determined by chemical analysis at least once per 72 hours.

\*The reactor shall be maintained in MODE 6 whenever fuel is in the reactor vessel with the reactor vessel head closure bolts less than fully tensioned or with the head removed.

## REFUELING OPERATIONS

### 3/4.9.2 INSTRUMENTATION

#### LIMITING CONDITION FOR OPERATION

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3.9.2 As a minimum, two source range neutron flux monitors shall be OPERABLE and operating, each with continuous visual indication in the control room and one with audible indication in the containment and control room.

APPLICABILITY: MODE 6.

ACTION:

- a. With one of the above required monitors inoperable or not operating, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes.
- b. With both of the above required monitors inoperable or not operating, determine the boron concentration of the Reactor Coolant System at least once per 12 hours.

#### SURVEILLANCE REQUIREMENTS

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4.9.2 Each source range neutron flux monitor shall be demonstrated OPERABLE by performance of:

- a. A CHANNEL CHECK at least once per 12 hours,
- b. A CHANNEL FUNCTIONAL TEST within 8 hours prior to the initial start of CORE ALTERATIONS, and
- c. A CHANNEL FUNCTIONAL TEST at least once per 7 days.

## REACTIVITY CONTROL SYSTEMS

### BASES

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#### BORATION SYSTEMS (Continued)

The contained water volume limits include allowance for water not available because of discharge line location, instrument tolerances, and other physical characteristics.

The OPERABILITY of one boron injection system during REFUELING ensures that this system is available for reactivity control while in MODE 6.

The lower limit on the contained water volume, the specified boron concentration, and the physical size (approximately 600,000 gallons) of the RWSP also ensure a pH value of between 7.0 and 11.0 for the solution recirculated within containment after a LOCA. This pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

The maximum limit on the RWSP temperature ensures that the assumptions used in the containment pressure analysis under design base accident conditions remain valid and avoids the possibility of containment overpressure. The minimum limit on the RWSP temperature is required to prevent freezing and/or boron precipitation in the RWSP.

#### 3/4.1.2.9 BORON DILUTION

This specification is provided to prevent a boron dilution event, and to prevent a loss of SHUTDOWN MARGIN should an inadvertent boron dilution event occur. Due to boron concentration requirements for the RWSP and boric acid makeup tanks, the only possible boron dilution that would remain undetected by the operator occurs from the primary makeup water through the CVCS system. Isolating this potential dilution path or the OPERABILITY of the startup channel high neutron flux alarms, which alert the operator with sufficient time available to take corrective action, ensures that no loss of SHUTDOWN MARGIN and unanticipated criticality occur.

The ACTION requirements specified in the event startup channel high neutron flux alarms are inoperable provide an alternate means to detect boron dilution by monitoring the RCS boron concentration to detect any changes. The frequencies specified in the COLR provide the operator sufficient time to recognize a decrease in boron concentration and take appropriate corrective action without loss of SHUTDOWN MARGIN. More frequent checks are required with more charging pumps in operation due to the higher potential boron dilution rate.

The surveillance requirements specified provide assurance that the startup channel high neutron flux alarms remain OPERABLE and that required valve and electrical lineups remain in effect.

#### 3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is

## 3/4.2 POWER DISTRIBUTION LIMITS

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#### 3/4.2.1 LINEAR HEAT RATE

The limitation on linear heat rate ensures that in the event of a LOCA, the peak temperature of the fuel cladding will not exceed 2200°F.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the Local Power Density channels in the Core Protection Calculators (CPCs), provides adequate monitoring of the core power distribution and is capable of verifying that the linear heat rate does not exceed its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core power operating limit corresponding to the allowable peak linear heat rate. Reactor operation at or below this calculated power level assures that the limit specified in the COLR is not exceeded.

The COLSS calculated core power and the COLSS calculated core power operating limits based on linear heat rate are continuously monitored and displayed to the operator. A COLSS alarm is annunciated in the event that the core power exceeds the core power operating limit. This provides adequate margin to the linear heat rate operating limit for normal steady-state operation. Normal reactor power transients or equipment failures which do not require a reactor trip may result in this core power operating limit being exceeded. In the event this occurs, COLSS alarms will be annunciated. If the event which causes the COLSS limit to be exceeded results in conditions which approach the core safety limits, a reactor trip will be initiated by the Reactor Protective Instrumentation. The COLSS calculation of the linear heat rate limit includes appropriate uncertainty and penalty factors necessary to provide a 95/95 confidence level that the maximum linear heat rate calculated by COLSS is greater than or equal to that existing in the core. To ensure that the design margin to safety is maintained, the COLSS computer program includes an  $F_{xy}$  measurement uncertainty factor of 1.053, an engineering uncertainty factor of 1.03, a THERMAL POWER measurement uncertainty factor of 1.02 and appropriate penalty factors for rod bow.

Parameters required to maintain the operating limit power level based on linear heat rate, margin to DNB and total core power are also monitored by the CPCs (assuming 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. Therefore, in the event that the COLSS is not being used, operation within the limits specified in the COLR can be maintained by utilizing a predetermined local power density margin and a total core power limit in the CPC trip channels. The above listed uncertainty and penalty factors are also included in the CPCs.

These penalty factors are determined from uncertainties associated with planar radial peaking measurements, engineering heat flux uncertainty, axial densification, software algorithm modelling, computer processing, rod bow, and core power measurement.

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The additional uncertainty terms included in the CPC's for transient protection are credited in the limits specified in the COLR since this curve is intended to monitor the LCO only during steady state operation.

## POWER DISTRIBUTION LIMITS

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#### 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 requires the maximum azimuthal tilt during normal steady state power operation to be less than or equal to that specified in the COLR. With AZIMUTHAL POWER TILT greater than the limit specified in the COLR, 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 or equal to the limit specified in the COLR 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 the limit specified in the COLR. 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 COLR 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 the limit specified in the COLR 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:

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

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

$\theta_o$  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 specified in the COLR 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.B 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.



## 3/4.9 REFUELING OPERATIONS

### BASES

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#### 3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: (1) the reactor will remain subcritical during CORE ALTERATIONS, and (2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the safety analyses. The  $K_{eff}$  value specified in the COLR includes a 1% delta k/k conservative allowance for uncertainties. Similarly, the boron concentration value specified in the COLR also includes a conservative uncertainty allowance of 50 ppm boron.

#### 3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

#### 3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the safety analyses.

#### 3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

#### 3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity condition during CORE ALTERATIONS.

## REFUELING OPERATIONS

### BASES

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#### 3/4.9.6 REFUELING MACHINE

The OPERABILITY requirements for the refueling machine ensure that: (1) the refueling machine will be used for movement of CEAs and fuel assemblies, (2) each hoist has sufficient load capacity to lift a CEA or fuel assembly, and (3) the core internals and pressure vessel are protected from excessive lifting force in the event they are inadvertently engaged during lifting operations.

#### 3/4.9.7 CRANE TRAVEL - FUEL HANDLING BUILDING

The restriction on movement of loads in excess of the nominal weight of a fuel assembly, CEA, and associated handling tool over other fuel assemblies in the spent fuel pool ensures that in the event this load is dropped (1) the activity release will be limited to that contained in a single fuel assembly, and (2) any possible distortion of fuel in the storage racks will not result in a critical array. This assumption is consistent with the activity release assumed in the safety analyses.

#### 3/4.9.8 SHUTDOWN COOLING AND COOLANT CIRCULATION

The requirement that at least one shutdown cooling train be in operation ensures that (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during the REFUELING MODE, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effects of a boron dilution incident and prevent boron stratification.

The requirement to have two shutdown cooling trains OPERABLE when there is less than 23 feet of water above the reactor pressure vessel flange, ensures that a single failure of the operating shutdown cooling train will not result in a complete loss of decay heat removal capability. When there is no irradiated fuel in the reactor pressure vessel, this is not a consideration and only one shutdown cooling train is required to be OPERABLE. With the reactor vessel head removed and 23 feet of water above the reactor pressure vessel flange, a large heat sink is available for core cooling, thus in the event of a failure of the operating shutdown cooling train, adequate time is provided to initiate emergency procedures to cool the core.

#### 3/4.9.9 CONTAINMENT PURGE VALVE ISOLATION SYSTEM

The OPERABILITY of this system ensures that the containment purge valves will be automatically isolated upon detection of high radiation levels within the containment. The OPERABILITY of this system is required to restrict the release of radioactive material from the containment atmosphere to the environment.

## ADMINISTRATIVE CONTROLS

### ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

6.9.1.8 The Annual Radioactive Effluent Release Report covering the operation of the unit during the previous 12 months of operation shall be submitted within 60 days after January 1 of each year. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be (1) consistent with the objectives outlined in the ODCM and PCP and (2) in conformance with 10 CFR 50.36a and Section IV.B.1 of Appendix I to 10 CFR Part 50.

## ADMINISTRATIVE CONTROLS

### INDUSTRIAL SURVEY OF TOXIC OR HAZARDOUS CHEMICALS REPORT

6.9.1.9 Surveys and analyses of major industries in the vicinity of Waterford 3 which could have significant inventories of toxic chemicals onsite to determine impact on safety shall be performed and submitted to the Commission at least once every 4 years.

6.9.1.10 A survey of major pipelines ( $\geq 4$  inches) within a 2-mile radius of Waterford 3, which contain explosive or flammable materials and may represent a hazard to Waterford 3, including scaled engineering drawings or maps which indicate the pipeline locations, shall be performed and submitted to the Commission at least once every 4 years.

### CORE OPERATING LIMITS REPORT COLR

6.9.1.11 Core operating limits shall be established and documented in the CORE OPERATING LIMITS REPORT prior to each reload cycle or any remaining part of a reload cycle.

6.9.1.11.1 The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC as follows:

- 1) "The ROCS and DIT Computer Codes for Nuclear Design," CENPD-266-P-A, April 1983; and "C-E Methodology for Core Designs Containing Gadolinia-Urania Burnable Absorber," CENPD-275-P-A, May 1988. (Methodology for Specifications 3.1.1.1 and 3.1.1.2 for Shutdown Margins, 3.1.1.3 for MTC, 3.1.3.6 for Regulating CEA Insertion Limits, 3.1.2.9 Boron Dilution (Calculation of CBC & IBW), and 3.9.1 Boron Concentration).
- 2) "C-E Method for Control Element Assembly Ejection Analysis," CENPD-0190-A, January 1976. (Methodology for Specification 3.1.3.6 for Regulating CEA Insertion Limits and 3.2.3 for Azimuthal Power Tilt).
- 3) "Modified Statistical Combination of Uncertainties" CEN-356(V)-P-A, May 1988. (Methodology for Specification 3.2.4 for DNBR Margin and 3.2.7 for ASI).
- 4) "Calculative Methods for the C-E Large Break LOCA Calculation Model For The Analysis of C-E and W Designed NSSS," CENPD-132, Supplement 3-P-A, June 1985. (Methodology for Specification 3.1.1.3 for MTC, 3.2.1 for Linear Heat Rate, 3.2.3 for Azimuthal Power Tilt and 3.2.7 for ASI).
- 5) "Calculative Methods for the C-E Small Break LOCA Evaluation Model," CENPD-137-P, August 1974: Supplement 1, January 1977. (Methodology for Specification 3.1.1.3 for MTC, 3.2.1 for Linear Heat Rate, 3.2.3 for Azimuthal Power Tilt and 3.2.7 for ASI).
- 6) "CESEC - Digital Simulation for a Combustion Engineering Nuclear Steam Supply System," CENPD-107, December 1981. (Methodology for Specification 3.1.1.1 and 3.1.1.2 for Shutdown Margins, 3.1.1.3 for MTC, 3.1.3.1 for Movable Control Assemblies - CEA Position, 3.1.3.6 for Regulating CEA Insertion Limits, 3.1.3.7 for Part Length CEA Insertion Limits and 3.2.3 for Azimuthal Power Tilt).

## ADMINISTRATIVE CONTROLS

### CORE OPERATING LIMITS REPORT COLR (Continued)

6.9.1.11.2 The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal limits, core thermal-hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, and transient and accident analysis limits) of the safety analysis are met.

6.9.1.11.3 The CORE OPERATING LIMITS REPORT, including any mid-cycle revisions or supplements thereto, shall be provided upon issuance, for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

### SPECIAL REPORTS

6.9.2 Special reports shall be submitted to the Regional Administrator of the Regional Office of the NRC within the time period specified for each report.

### 6.10 RECORD RETENTION

6.10.1 In addition to the applicable record retention requirements of Title 10, Code of Federal Regulations, the following records shall be retained for at least the minimum period indicated.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 102 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 August 11, 1994, as supplemented by the letter dated December 2, 1994, 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 modify specifications having cycle-specific parameter limits by replacing the values of those limits with a reference to a core operating limits report (COLR) for the values of those limits. The proposed changes also include the addition of the COLR to the Definitions section and to the reporting requirements of the Administrative Controls section of the TS. Guidance on the proposed changes was developed by the NRC and provided to all power reactor licensees and applicants by Generic Letter (GL) 88-16, dated October 4, 1988.

2.0 EVALUATION

The proposed changes to the TSs are in accordance with the guidance provided by GL 88-16 and are addressed below.

- (1) The definition section of the TSs was modified to include a definition of the COLR that requires cycle/reload-specific parameter limits to be established on a unit-specific basis in accordance with NRC-approved methodologies that maintain the limits of the safety analysis. The definition notes that plant operation within these limits is addressed by individual specifications.
- (2) The following specifications were revised to replace the values of cycle-specific parameter limits with reference to the COLR that provides these limits.

- (a) Specification 3.1.1.1 and Surveillance 4.1.1.1.1

Shutdown margin limits for any full length control element assembly (CEA) withdraw for this specification ( $T_{avg} > 200^{\circ}\text{F}$  and  $T_{avg} < 200^{\circ}\text{F}$ ) are specified in the COLR.

- (b) Specification 3.1.1.2 and Surveillance 4.1.1.2.1

Shutdown margin limit as a function of cold leg temperature for all full length CEAs fully inserted for this specification is specified in the COLR.

- (c) Specification 3.1.1.3.c

The moderator temperature coefficient (MTC) limit for this specification is specified in the COLR.

- (d) Specification 3.1.2.9.b.2, Action b & c and Surveillance 4.1.2.9.5

The monitoring frequencies for backup boron dilution detection and alarm setpoint adjustment frequencies for this specification are specified in the COLR.

- (e) Specification 3.1.3.1

The core power limits for the moveable control rod assemblies - CEA position deviation for this specification are specified in the COLR.

- (f) Specifications 3.1.3.6 and 3.1.3.7

The regulating CEA insertion limits and part length CEA insertion limits for these specifications are specified in the COLR.

- (g) Specification 3.2.1 and Surveillance 4.2.1.1

The linear heat rate limit for this specification is specified in the COLR.

- (h) Specification 3.2.3

The maximum azimuthal power tilt limits for this specification are specified in the COLR.

- (i) Specification 3.2.4 and Surveillance 4.2.4.1

The DNBR margin related limits for this specification are specified in the COLR.

(j) Specification 3.2.7

The axial shape index limits for this specification are specified in the COLR.

(k) Specification 3.9.1

The boron concentration limits for this specification are specified in the COLR.

The Bases of affected specifications have been modified by the licensee to include appropriate reference to the COLR. Based on our review, we conclude that the changes to these Bases are acceptable.

- (3) Specification 6.9 is revised to include the COLR under the reporting requirements of the routine reports section of the TSs. This specification requires that the COLR be submitted, upon issuance, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector. The report provides the values of cycle-specific parameter limits that are applicable for the current fuel cycle. Furthermore, this specification requires that the NRC-approved methodologies be used in establishing the values of these limits for the relevant specifications and that the values be consistent with all applicable limits of the safety analysis. The approved methodologies are the following:

- (a) CENPD-266-P-A, "The ROCS and DIT Computer Codes for Nuclear Design," April 1983 and CENPD-275-P-A, "C-E Methodology for Core Designs Containing Gadolinia-Urania Burnable Absorber," May 1988. (Methodology for Specifications 3.1.1.1 and 3.1.1.2 for Shutdown Margins, 3.1.1.3 for MTC, and 3.1.3.6 for Regulating CEA Insertion Limits, 3.1.2.9 Boron Dilution (Calculation of CBC & IBW), and 3.9.1 Boron Concentration.)
- (b) CENPD-190-A, "C-E Method for Control Element Assembly Ejection Analysis," January 1976. (Methodology for Specification 3.1.3.6 for Regulating CEA Insertion Limits and 3.2.3 for Azimuthal Power Tilt.)
- (c) CEN-356(V)-P-A, "Modified Statistical Combination of Uncertainties," May 1988. (Methodology for Specification 3.2.4 for DNBR Margin and 3.2.7 for ASI.)
- (d) CENPD-132, Supplement 3-P-A, "Calculative Methods for the C-E Large Break LOCA Calculation Model for The Analysis of C-E and W Designed NSSS," June 1985. (Methodology for Specification 3.1.1.3 for MTC, 3.2.1 for Linear Heat Rate, 3.2.3 for Azimuthal Power Tilt, and 3.2.7 for ASI.)



- (e) CENPD-137-P, "Calculative Methods for the C-E Small Break LOCA Evaluation Model," August 1974 - Approved June 1975: Supplement 1, January 1977 - Approved September 1977. (Methodology for Specification 3.1.1.3 for MTC, 3.2.1 for Linear Heat Rate, 3.2.3 for Azimuthal Power Tilt, and 3.2.7 for ASI.)
- (f) CENPD-107, "CESEC-Digital Simulation of a Combustion Engineering Nuclear Steam Supply System," December 1981 - Approved March 1984. (Methodology for Specifications 3.1.1.1 and 3.1.1.2 for Shutdown Margins, 3.1.1.3 for MTC, 3.1.3.1 for Movable Control Assemblies - CEA Position, 3.1.3.6 for Regulating CEA Insertion Limits, 3.1.3.7 for Part Length CEA Insertion Limits and 3.2.3 for Azimuthal Power Tilt.)

Finally, the specification requires that all changes in cycle-specific parameter limits be documented in the COLR before each reload cycle or remaining part of a reload cycle and submitted upon issuance to NRC, prior to operation with the new parameter limits. Furthermore, the licensee should identify the applicable specifications to be relocated to the COLR under each approved methodology cited above.

On the basis of the review the NRC staff concludes that the licensee provided an acceptable response to the items in GL 88-16 on modifying cycle-specific parameter limits in TS. Because plant operation continues to be limited in accordance with the values of cycle-specific parameter limits that are established using NRC-approved methodologies, the NRC staff concludes that these changes have no impact on plant safety. Accordingly, the staff finds that the proposed changes are 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 and changes surveillance requirements. 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 65812).

The amendment also changes recordkeeping, reporting, or administrative procedures or requirements. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) and (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.

#### 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: T. Huang

Date: March 1, 1995