October 31, 1989

Docket No. 50-382

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Mr. J. G. Dewease
Senior Vice President - Nuclear Operations
Louisiana Power and Light Company
Post Office Box 60340
New Orleans, Louisiana 70160

Dear Mr. Dewease:

SUBJECT: ISSUANCE OF AMENDMENT NO. 58 TO FACILITY OPERATING LICENSE NPF-38 - WATERFORD STEAM ELECTRIC STATION, UNIT 3 (TAC NO. 74355)

The Commission has issued the enclosed Amendment No. 58 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 14, 1989.

The amendment changes the Appendix A Technical Specifications to allow the control element assembly drop time acceptance to be based on the average drop time rather than the slowest drop time of any assembly.

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

Sincerely,

/s/
David L. Wigginton, Project Manager
Project Directorate IV
Division of Reactor Projects - III, IV, V and Special Projects
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 58 to NPF-38
2. Safety Evaluation

cc w/enclosures:
See next page

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

October 31, 1989

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Senior Vice President - Nuclear Operations
Louisiana Power and Light Company
Post Office Box 60340
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David L. Wigginton, Project Manager
Project Directorate IV
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Office of Nuclear Reactor Regulation

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1. Amendment No. 58 to NPF-38
2. Safety Evaluation

cc w/enclosures:
See next page

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

LOUISIANA POWER AND LIGHT COMPANY

DOCKET NO. 50-382

WATERFORD STEAM ELECTRIC STATION, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 58
License No. NPF-38

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Louisiana Power and Light Company (the licensee) dated August 14, 1989, 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. 58 , 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

Frederick J. Hebdon, Director
Project Directorate IV
Division of Reactor Projects - III,
IV, V and Special Projects
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: October 31, 1989

ATTACHMENT TO LICENSE AMENDMENT NO. 58

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 | Insert |
|---|---|
| 3/4 1-23 | 3/4 1-23 |
| B 3/4 1-5 | B 3/4 1-5 |
| - | B 3/4 1-6 |

## CEA DROP TIME

### LIMITING CONDITION FOR OPERATION

3.1.3.4 The arithmetic average of the CEA drop times of all full-length CEAs from a fully withdrawn position, shall be less than or equal to 3.0 seconds; and the individual full length (shutdown and regulating) CEA drop time, from a fully withdrawn position, shall be less than or equal to 3.2 seconds from when the electrical power is interrupted to the CEA drive mechanism until the CEA reaches the 90% insertion position with:

a. $T_{avg}$ greater than or equal to 520°F, and

b. All reactor coolant pumps operating.

APPLICABILITY: MODES 1 and 2.

ACTION:

a. With either the average CEA drop time or any individual CEA drop time of any full length CEA determined to exceed the above limits, restore the CEA drop time to within the above limits before proceeding to MODE 1 or 2.

b. With the CEA drop times within limits but determined at less than full reactor coolant flow, operation may proceed provided THERMAL POWER is restricted to less than or equal to the maximum THERMAL POWER level allowable for the reactor coolant pump combination operating at the time of CEA drop time determination.

### SURVEILLANCE REQUIREMENTS

4.1.3.4 The CEA drop time of full-length CEAs shall be demonstrated through measurement prior to reactor criticality:

a. For all CEAs following each removal and reinstallation of the reactor vessel head,

b. For specifically affected individuals CEAs following any maintenance on or modification to the CEA drive system which could affect the drop time of those specific CEAs, and

c. At each refueling outage.

REACTIVITY CONTROL SYSTEMS

SHUTDOWN CEA INSERTION LIMIT

LIMITING CONDITION FOR OPERATION

3.1.3.5 All shutdown CEAs shall be withdrawn to greater than or equal to 145 inches.

APPLICABILITY: MODES 1 and 2*#**.

ACTION:

With a maximum of one shutdown CEA withdrawn to less than 145 inches withdrawn, within 1 hour either:

a. Withdraw the CEA to greater than or equal to 145 inches, or

b. Declare the CEA inoperable and 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.

SURVEILLANCE REQUIREMENTS

4.1.3.5 Each shutdown CEA shall be determined to be withdrawn to greater than or equal to 145 inches withdrawn:

a. Within 15 minutes prior to withdrawal of any CEAs in regulating groups during an approach to reactor criticality, and

b. At least once per 12 hours thereafter.

---

*See Special Test Exception 3.10.2.

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

**Except for surveillance testing pursuant to Specification 4.1.3.1.2.

MOVABLE CONTROL ASSEMBLIES (Continued)

continued operations when the positions of CEAs with inoperable position indicators can be verified by the "Full In" or "Full Out" limits.

CEA positions and OPERABILITY of the CEA position indicators are required to be verified on a nominal basis of once per 12 hours with more frequent verifications required if an automatic monitoring channel is inoperable. These verification frequencies are adequate for assuring that the applicable LCO's are satisfied.

The arithmetic average CEA drop time restriction is consistent with the assumed CEA drop time used in the safety analyses. The maximum CEA drop time restriction limits the CEA drop time distribution about the average to that used to support the safety analyses. Measurement with $T_{avg}$ greater than or equal to 520°F and with all reactor coolant pumps operating ensures that the meausured drop times will be representative of insertion times experienced during a reactor trip at operating conditions. The CEA drop time restriction is representative of the design and operating conditions for Cycle 3 and reverification may be required for (1) any fuel management change that significantly affects the core wide axial or radial power profiles, and (2) any mechanical, flow, control, or CEA location changes that would significantly affect the CEA drop time distribution.

The establishment of LSSS and LCOs requires that the expected long and short-term behavior of the radial peaking factors be determined. The long term behavior relates to the variation of the steady-state radial peaking factors with core burnup and is affected by the amount of CEA insertion assumed, the portion of a burnup cycle over which such insertion is assumed, and the expected power level variation throughout the cycle. The short term behavior relates to transient perturbations to the steady-state radial peaks due to radial xenon redistribution. The magnitudes of such perturbations depend upon the expected use of the CEAs during anticipated power reductions and load maneuvering. Analyses are performed based on the expected mode of operation of the NSSS (base loaded, or load maneuvering) and from these analyses CEA insertions are determined and a consistent set of radial peaking factors defined. The Long Term Steady State and Short Term Insertion Limits are determined based upon the assumed mode of operation used in the analyses and provide a means of preserving the assumptions on CEA insertions used. The limits specified serve to limit the behavior of the radial peaking factors within the bounds determined from analysis. The actions specified serve to limit the extent of radial xenon redistribution effects to those accommodated in the analyses. The Long and Short Term Insertion Limits of Specification 3.1.3.6 are specified for the plant which has been designed for primarily base loaded operation but which has the ability to accommodate a limited amount of load maneuvering.

The Transient Insertion Limits of Specification 3.1.3.6 and the Shutdown CEA Insertion Limits of Specification 3.1.3.5 ensure that (1) the minimum SHUTDOWN MARGIN is maintained, and (2) the potential effects of a CEA ejection accident are limited to acceptable levels. Long-term operation at the Transient Insertion Limits is not permitted since such operation could have effects on the core power distribution which could invalidate assumptions used to determine the behavior of the radial peaking factors. Insertion of Reg. Groups 5 and 6 is permitted to be essentially tip-to-tip within the limits imposed by the

MOVABLE CONTROL ASSEMBLIES (Continued)

Transient Insertion Limit Line. This method of insertion is protected from sequence errors by the Core Protection Calculators.

The Part Length CEA Insertion Limits of Specification 3.1.3.7 ensure that adverse power shapes and rapid local power changes which affect radial peaking factors and DNB considerations do not occur as a result of a part-length CEA group covering the same axial segment of the fuel assemblies for an extended period of time during operation.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 58 TO

FACILITY OPERATING LICENSE NO. NPF-38

LOUISIANA POWER AND LIGHT COMPANY

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

## 1.0 INTRODUCTION

By letter dated August 14, 1989, Louisiana Power and Light Company (LP&L), the licensee, requested changes to the Technical Specification (Appendix A to Facility Operating License No. NPF-38) revising the control element assembly (CEA) drop time limits for Waterford Steam Electric Station, Unit No. 3 (WSES-3). Specifically, the proposed amendment would expand Technical Specification 3.1.3.4 to include the average drop time of all full length CEAs, which must be no greater than the 3.0 second limit currently applied to individual CEAs. The maximum CEA drop time for any individual full length CEA would be changed from 3.0 seconds to 3.2 seconds.

The reason for these changes is due to the results of the WSES-3 Cycle 3 startup testing where the maximum drop time for some individual CEAs indicated very little margin exists to the maximum value given in the Technical Specifications. This adverse change in the measured CEA drop times was revealed by a new measurement methodology. The testing method used previously for measuring CEA drop times involved interrupting the power to the control element drive mechanism (CEDM) from each individual CEDM breaker. The new test method, which is consistent with the actual CEA scram sequence, involved interrupting the power to all the CEDMs simultaneously via the main trip breakers. The additional delay time is associated with the difference between the electromagnetic decay time of multiple CEDM coils and the decay time of an individual coil.

As a result of the Cycle 3 drop time testing, the margin between the slowest CEA and Technical Specification CEA drop time was comparable to expected cycle-to-cycle variations. Since failure to pass the CEA drop time test precludes entering the startup operational mode, LP&L would like to increase this margin before the Cycle 4 startup. The proposed method for increasing the time between the measured CEA drop time and the Technical Specification drop time of 3.0 seconds is to credit the measured spatial distribution of CEAs about an average position as opposed to the present safety analysis assumption that all CEAs drop at the same speed and therefore are at the same axial height as the slowest CEA. This proposed analysis method is evaluated below.

## 2.0 EVALUATION

The current WSES-3 safety analyses assume that all CEAs drop into the core at the same time and at the same rate following a reactor trip. Therefore, every CEA is at the same axial height at any time during a trip. The drop time is assumed to be governed by the slowest CEA, which is limited to no longer than 3.0 seconds. Therefore, current Technical Specifications require that all CEAs fall within the 3.0 second drop time.

The reactivity worth of a CEA is a function of the power or neutron flux environment surrounding the CEA. During a reactor trip, the faster CEAs will be in higher flux regions sooner and will therefore make a greater relative contribution to the net negative reactivity insertion than the slower CEAs. Therefore, the licensee contends that the negative reactivity insertion for any reasonable distribution of CEAs is more directly correlated to, and can be represented by, the average CEA insertion rather than by the slowest.

Based on WSES-3 measured CEA drop patterns presented by the licensee, the CEAs do not fall at the same time and at the same rate during a reactor trip. The staff concurs that the WSES-3 measured CEA drop time test data shows the CEAs have a predictable spatial distribution about the average during a reactor trip.

Combustion Engineering (CE) has performed a set of three-dimensional space-time calculations using the NRC-approved HERMITE computer program. The staff has reviewed the initial conditions assumed in the HERMITE calculations and finds that they adequately cover the range of operating conditions and the limits of the as-measured CEA distributions. These calculations show that essentially the same reactivity will be inserted by CEAs falling in a reasonable distribution about an average CEA position as the reactivity inserted by all CEAs falling at the same average position, the so-called "window shade" case. This is true for any reasonable family of CEA distributions similar to those measured at WSES-3. However, if the distance between the fastest and slowest CEAs becomes too large or the distribution of CEAs deviates significantly from that modeled by CE in this study, then the average CEA position (window shade) may not be representative of the time dependent reactivity insertion. Therefore, a limit will be placed on the CEA drop time distribution. This will be expressed as a maximum drop time limit on the slowest CEA in the revised Technical Specification. The staff concurs that this will ensure that the safety analyses remain valid for the average CEA drop time Technical Specification and finds the proposed Technical Specification changes acceptable.

The staff has reviewed the proposed WSES-3 Technical Specification changes which would include an average drop time of all CEAs of no greater than 3.0 seconds and a maximum drop time for any individual CEA of 3.2 seconds. Based on the WSES-3 CEA drop test data and the results of the CE calculations which were submitted to the staff, the time dependent reactivity insertion of a window shade scram at the average CEA drop time will provide the same reactivity insertion as the more realistic distributed case about the same average. The staff therefore finds the proposed Technical Specification changes acceptable for WSES-3 with the following conditions:

(1) Any fuel management change that significantly affects the core wide axial or radial power profiles, such as axial blankets or ultra-low leakage fuel management, may necessitate reverification of the average CEA drop time analysis.

(2) Changes that would significantly affect the CEA drop time distribution, such as changes to the CEDM circuits, large increases in the core flow pressure drop, changes in the total drop weight of the CEAs or changes in the location of the CEAs, may also require reverification of the average CEA drop time concept.

Barring these type of changes or failure to meet the new Technical Specification limits, reverification of the average drop time analysis will not be required on a cycle-by-cycle basis. The potential for reverification has been added to the basis for the CEA Technical Specifications. This has been discussed with the licensees and they agree.

## 3.0 CONTACT WITH STATE OFFICIAL

The NRC staff has advised the Administrator, Nuclear Energy Division, Office of Environmental Affairs, State of Louisiana of the proposed determination of no significant hazards consideration. No comments were received.

## 4.0 ENVIRONMENTAL CONSIDERATION

The amendment relates to changes in installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts and no significant change in the types of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. 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 this amendment.

## 5.0 CONCLUSION

Based upon its evaluation of the proposed changes to the Waterford 3 Technical Specifications, the staff has concluded that: there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and such activities will be conducted in compliance with the Commission's regulations and the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public. The staff, therefore, concludes that the proposed changes are acceptable, and are hereby incorporated into the Waterford 3 Technical Specifications.

Dated: October 31, 1989

Principal Contributor: L. Kopp