



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

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