

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

# SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

# SUPPORTING AMENDMENT NO. 59 TO LICENSE NO. DPR-49

# IOWA ELECTRIC LIGHT & POWER COMPANY CENTRAL IOWA POWER COOPERATIVE CORN BELT POWER COOPERATIVE

#### DOCKET NO. 50-331

#### DUANE ARNOLD ENERGY CENTER

#### 1.0 Introduction

By letter dated January 22, 1980, (Reference 1) Iowa Electric Light and Power Company (the licensee) requested an amendment to the Technical Specifications for the Duane Arnold Energy Center (DAEC). The submittal documented the bases for refueling of the core for cycle 5 operation, revising operating limit minimum critical power ratios, and making several administrative changes. Reference 1 included proposed Technical Specification changes and was supported by the GE BWR supplemental licensing submittal (Reference 2).

This reload involves loading of prepressurized GE 8-9 retrofit (P8x8R) fuel. The description of the nuclear and mechanical designs of P8x8R fuel is contained in Reference 3. The use and safety implications of prepressurized fuel are presented in Reference 3 and have been found acceptable per Reference 4 (enclosed in Appendix C of Reference 3).

Values for plant-specific data such as steady state operating pressure, core flow, safety and safety/relief valve setpoints, rated thermal power, rated steam flow, and other design parameters are provided in Reference 3. Additional plant and cycle dependent information is provided in the reload application (Reference 2) which closely follows the outline of Appendix A of Reference 3. Reference 4 includes a description of the staff's review, approval, and conditions of approval for the plant-specific data. The abovementioned plant-specific data have been used in the transient and accident analysis provided with the reload application in compliance with Reference 4.

Our safety evaluation of the GE generic reload licensing topical report has also concluded that the nuclear and mechanical design of the 8x8R and P8x8R fuels, and GE's analytical methods for nuclear and thermal-hydraulic calculations as applied to mixed cores containing 7x7, 8x8, 8x8R and P8x8R fuels, are acceptable. Approval of the application of the analytical methods did not include plants incorporating a prompt recirculation pump trip (RPT). The licensee has incorporated the RPT feature in this reload 00

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analysis and our discussion of an acceptable basis for RPT credit is contained in the section of Transient Analysis Methods of this report.

Because of our review of a large number of generic considerations related to use of 8x8R and P8x8R fuels in mixed loadings, and on the basis of the evaluations which have been presented in Reference 3, only a limited number of additional areas of review have been included in this safety evaluation report. For evaluations of areas not specifically addressed in this safety evaluation report, the reader is referred to Reference 3.

2.0 EVALUATION

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#### 2.1 Nuclear Characteristics

For cycle 5 operation, 88 fresh P8x8R fuel bundles of type P8DPB289 will be loaded into the core (Reference 2). The remainder of the 368 fuel bundles in the core will be previously irradiated bundles as indicated in Reference 2. Based on the data provided in Reference 2 both the control rod system and the standby liquid control system will have acceptable shutdown capability during this cycle.

2.2 Thermal Hydraulics

#### 2.2.1 Fuel Cladding Integrity Safety Limit MCPR

As stated in Reference 3, for BWR cores which reload with GE's retrofit 8x8 fuel, the safety limit minimum critical power ratio (SLMCPR) resulting from either core-wide or localized abnormal operational transients is equal to 1.07. When meeting this SLMCPR during a transient, at least 99.9% of the fuel rods in the core are expected to avoid boiling transition. The 1.07 SLMCPR is incorporated into the Technical Specifications. This is acceptable per Reference 3.

#### 2.2.2 Operating Limit MCPR

Various transient events can reduce the MCPR from its normal operating level. To assure that the fuel cladding integrity SLMCPR will not be violated during any abnormal operational transient, the most limiting transients have been reanalyzed for this reload by the licensee, in order to determine which event results in the largest reduction in the minimum critical power ratio. Addition of the largest reductions in critical power ratio to the SLMCPR establishes the operating limits for each fuel type.

# 2.3 Accident Analysis

## 2.3.1 ECCS Appendix K Analysis

In our safety evaluation of Reference 3, we concluded that the continued application of the present GE ECCS-LOCA ("Appendix K") models to the 8x8 retrofit reload fuel is generically acceptable and in our Reference 4 evaluation we extended that conclusion to prepressurized fuel. On this basis, the proposed MAPLHGR limits for the new prepressurized fuel are acceptable.

#### 2.3.2 Control Rod Drop Accident

The significant parameters in the rod drop analysis satisfy the requirements for the bounding analyses described in Reference 3. Therefore, the results of this analysis are well below the acceptance criterion of 280 calories per gram.

#### 2.3.3 Fuel Loading Error

The GE method for analysis of misoriented and misloaded bundles has been reviewed and approved by the staff and is part of the Reference 3 methodology. Potential fuel loading errors involving misoriented bundles and bundles loaded into incorrect positions have been analyzed by this methodology and the results have been incorporated into the specification for operating limit MCPR. This assures that SLMCPR is not violated for any potential fuel loading error.

# 2.3.4 Overpressure Analysis

The overpressure analysis for the MSIV closure with high flux scram, which is the limiting overpressure event, has been performed in accordance with the requirements of Reference 3. We agree that there is sufficient margin between the peak calculated vessel pressure and the design limit pressure. Therefore, the limiting overpressure event as analyzed by the licensee is considered acceptable.

#### 2.4 Thermal Hydraulic Stability

The result of the thermal hydraulic stability analysis (Reference 3) shows that the channel hydrodynamic and reactor core decay ratios at the natural circulation - 105% rod line intersection (which is the least stable physically attainable point of operation) are below the stability limit. Because operation in the natural circulation mode will be restricted by Technical Specifications, there will be added margin to the stability limit and this is acceptable.

# 2.5 Startup Test Program

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The licensee has not changed his startup test program from that approved for the previous cycle. This program therefore remains acceptable.

#### 2.6 Technical Specifications

Additional Proposed Technical Specification changes are as follows:

The change in formulation from total peaking factor to a ratio of fraction of rated power and fraction of limiting power density to account for power peaking in the rod withdrawal block and flow biased APRM scram setpoints has been previously found acceptable (e.g., Reference 6). These two formulations are identical in their results but the proposed formulation eliminates the need for different peaking factors for different types of fuel. This change is acceptable.

Because the new fuel has an increased active fuel length, the licensee has proposed a revised definition of top of active fuel which refers to vessel zero and corresponds to the value used in the original fuel and FSAR. This is acceptable.

The remaining Technical Specification changes are administrative in nature. We have reviewed these modifications and find them acceptable.

#### 3.0 SUMMARY

We have concluded that the proposed modifications are acceptable.

## 4.0 ENVIRONMENTAL CONSIDERATIONS

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact, and pursuant to 10 CFR Section 51.5(d)(4) that an environmental impact statement, or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of the amendment.

## 5.0 CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Dated: April 10, 1980

## References

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- Letter, L. D. Root (Iowa Electric Light and Power Company), to H. R. Denton (NRC), dated January 22, 1980, LDR-80-31.
- "Supplemental Reload Licensing Submittal for Duane Arnold Atomic Energy Center, Reload 4," NEDO-24234, January 1980.
- "General Electric Boiling Water Reactor Generic Reload Application," <u>NEDE-24011-P-A</u>, August 1979.
- Letter, T. A. Ippolito (USNRC) to R. Gridley (GE), April 16, 1979 and enclosed SER.
- 5. Letter, T. A. Ippolito (USNRC), to H. G. Parris (TVA) dated February 8, 1979 and enclosed SER.
- Letter, T. A. Ippolito (USNRC) to G. T. Berry (PASNY) dated October 24, 1979 and enclosed SER.