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Docket No: 50-331

Iowa Electric Light & Power Company
ATTN: Mr. Duane Arnold, President
P. O. Box 351
Cedar Rapids, Iowa 52406

Gentlemen:

RE: DUANE ARNOLD ENERGY CENTER - OLMCPR

The Commission has issued the enclosed Amendment No. 40 to Facility License No. DPR-49 for the Duane Arnold Energy Center. This amendment consists of changes to the Technical Specifications and is in response to your application dated December 14, 1977.

This amendment will provide a new, less restrictive operating limit minimum critical power ratio (OLMCPR) specification between 1000 and 500 megawatt days/tonne exposure before end of the present cycle 3. This amendment will not result in any change in the present safety limit MCPR of 1.06 which has been previously reviewed and approved.

Copies of the related Safety Evaluation and the FEDERAL REGISTER Notice are also enclosed.

Sincerely,

Richard J Clark for

George Lear, Chief
Operating Reactors Branch #3
Division of Operating Reactors

Enclosures:
1. Amendment No. 40
2. Safety Evaluation
3. FEDERAL REGISTER Notice

cc w/enclosures:
see next page

Cont. 1

GD

*SEE PREVIOUS YELLOW FOR CONCURRENCES

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SURNAME➤	*CParrish	*RClark	*WPaton	RClark for George Lear	*RBaer	
DATE➤	12/30/77	12/30/77	12/30/77	12/30/77	12/30/77	

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Cedar Rapids, Iowa 52406

Gentlemen:

RE: DUANE ARNOLD ENERGY CENTER - OLMCPR

The Commission has issued the enclosed Amendment No. to Facility License No. DPR-49 for the Duane Arnold Energy Center. This amendment consists of changes to the Technical Specifications and is in response to your application dated December 14, 1977.

This amendment will provide a new, less restrictive operating limit minimum critical power ratio (OLMCPR) specification at 500 megawatt days/tonne exposure before end of the present cycle 3. This amendment will not result in any change in the present safety limit MCPR of 1.06 which has been previously reviewed and approved.

Copies of the related Safety Evaluation and the FEDERAL REGISTER Notice are also enclosed.

Sincerely,

George Lear, Chief
Operating Reactors Branch #3
Division of Operating Reactors

Enclosures:
1. Amendment No.
2. Safety Evaluation
3. FEDERAL REGISTER Notice

cc w/enclosures:
see next page

OFFICE ➤	ORB#3	ORB#3	OELD	ORB#3	OT/RSB	
SURNAME ➤	CParrish	RClark:acr	W D Paton	GLear	R Baer	
DATE ➤	12/30/77	12/30/77	12/30/77	12/30/77	12/30/77	

cc:

Mr. Robert Lowenstein, Esquire
Harold F. Reis, Esquire
Lowenstein, Newman, Reis and Axelrad
1025 Connecticut Avenue, N. W.
Washington, D. C. 20036

Office for Planning and Programming
523 East 12th Street
Des Moines, Iowa 50319

Chairman, Linn County
Board of Supervisors
Cedar Rapids, Iowa 52406

Iowa Electric Light & Power Company
ATTN: Ellery L. Hammond
P. O. Box 351
Cedar Rapids, Iowa 52406

Chief, Energy Systems Analysis Branch (AW-459)
Office of Radiation Programs
U. S. Environmental Protection Agency
Room 645, East Tower
401 M Street, S. W.
Washington, D. C. 20460

U. S. Environmental Protection Agency
Region VII
ATTN: EIS COORDINATOR
1735 Baltimore Avenue
Kansas City, Missouri 64108

Cedar Rapids Public Library
426 Third Avenue, S. E.
Cedar Rapids, Iowa 52401

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

IOWA ELECTRIC LIGHT AND POWER COMPANY
CENTRAL IOWA POWER COOPERATIVE
CORN BELT POWER COOPERATIVE

DOCKET NO. 50-331

DUANE ARNOLD ENERGY CENTER

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 40
License No. DPR-49

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

   A. The application for amendment by Iowa Electric Light and Power Company, Central Iowa Power Cooperative, and Corn Belt Power Cooperative, (the licensees) dated December 14, 1977, complies with the standards and the requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as 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. DPR-49 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 40, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Richard J Clark for

George Lear, Chief
Operating Reactors Branch #3
Division of Operating Reactors

Attachment:
Changes to the Technical
Specifications

Date of Issuance: December 30, 1977

ATTACHMENT TO LICENSE AMENDMENT NO. 40

TO THE TECHNICAL SPECIFICATIONS

FACILITY OPERATING LICENSE NO. DPR-49

DOCKET NO. 50-331

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change.

Remove	Replace
3.12-9a	3.12-9a
3.12-11	3.12-11

TABLE 3.12-2

MCPR LIMITS

Fuel Type	Exposure Remaining to End of Cycle		
	B.O.C. to >1000 MWD/T	≤ 1000 MWD/T to >500 MWD/T	≤ 500 MWD/T to E.O.C.
7 x 7	1.27	1.27	1.29
8 x 8	1.27	1.32	1.37

3.12 REFERENCES

1. Duane Arnold Energy Center Loss-of-Coolant Accident Analysis Report, NEDO-21082-02-1A, Class I, July 1977, Appendix A.

2. General Electric BWR Generic Reload Application for 8 x 8 Fuel, NEDO-20360, Revision 1, November 1975.

3. "Fuel Densification Effects on General Electric Boiling Water Reactor Fuel", Supplements 6, 7 and 8, NEDM-19735, August 1973.

4. Supplement 1 to Technical Reports on Densifications of General Electric Reactor Fuels, December 14, 1973 (AEC Regulatory Staff).

5. Communication: V. A. Moore to I. S. Mitchell, "Modified GE Model for Fuel Densification", Docket 50-321, March 27, 1974.

6. R. B. Linford, Analytical Methods of Plant Transient Evaluations for the GE BWR, February 1973 (NEDO-10802).

7. General Electric Company Analytical Model for Loss-of-Coolant Analysis in Accordance with 10 CFR Part 50, Appendix K, NEDE-20566 (Draft), August 1974.

8. Duane Arnold Energy Center Reload Number Two Licensing Submittal, NEDO-21082-02, Class I, January 1977.

9. Duane Arnold Energy Center Reload Number Two Licensing Submittal, Supplement 1, Partially Drilled Core, NEDO-21082-02-01, Class I, June 1977.

10. Duane Arnold Energy Center Loss-of-Coolant Accident Analysis Report, NEDO-21082-02-1A, Class I, July 1977, Appendix A, Revision 1.

11. Duane Arnold Energy Center Reload Number Two Licensing Submittal, Supplement 2, Additional MCPR Point, NEDO-21082-02-2, Class I, December 1977.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 40 TO LICENSE NO. DPR-49

IOWA ELECTRIC LIGHT AND POWER COMPANY
CENTRAL IOWA POWER COOPERATIVE
CORN BELT POWER COOPERATIVE

DOCKET NO. 50-331

DUANE ARNOLD ENERGY CENTER

Introduction

By letter dated December 14, 1977,(1) Iowa Electric Light and Power Company (the licensee) requested changes to the Technical Specifications (Appendix A) appended to Facility Operating License No. DPR-49 for the Duane Arnold Energy Center (DAEC). The proposed amendment and revised Technical Specifications would provide a different exposure-dependent operating limit minimum critical power ratio (OLMCPR) specification for 7x7 and 8x8 fuel.

Discussion

Based on previously submitted and approved analyses, DAEC has exposure dependent minimum critical power ratio operating limits for two exposure intervals. The exposure intervals are (1) from beginning of cycle (BOC) to 1000 megawatt days per tonne (MWD/T) before end-of-cycle (EOC), and (2) from 1000 MWD/T before EOC to EOC. The present cycle (cycle 3) started May 13, 1977, when DAEC started up after the last refueling outage. Cycle 3 will end about March 15, 1978 when DAEC shuts down for another refueling. The last 1000 MWD/T exposure will be reached about December 31, 1977. At present, DAEC has an OLMPCR of 1.27 for both the 7x7 and 8x8 fuel assemblies from BOC up to 1000 MWD/T before EOC and 1.29 and 1.37 for the 7x7 and 8x8 fuel, respectively, for the last 1000 MWD/T of core life. The proposed change is to divide the last exposure interval (i.e., the 1000 MWD/T before EOC to EOC) into two equal exposure intervals and to utilize an additional OLMCPR point for both types of fuel from 1000 MWD/T to 500 MWD/T before EOC. There would be no change in the present OLMCPR

covering the BOC to 1000 MWD/T before EOC and the OLMPCR for the last 500 MWD/T of core life would stay the same as it presently is for the last 1000 MWD/T of exposure. For the interval between 1000 MWD/T before EOC and 500 MWD/T before EOC, the licensee has proposed OLMCPR's of 1.27 and 1.32 for the 7x7 and 8x8 fuel, respectively.

The proposed amendment will not change the Safety Limit MCPR (SLMCPR) of 1.06. The SLMCPR is the minimum that is considered necessary to maintain fuel cladding integrity. The SLMCPR is established from a statistical analysis of reactor system and calculational uncertainties. At the SLMCPR 99.9% of the fuel rods in the core are expected to avoid boiling transition. The calculational method for this evaluation is documented in reference 2 and has been previously reviewed and approved.

To assure that the SLMCPR is not violated if an abnormal operating transient (e.g., pressure and power increase transients) should occur, the OLMCPR must exceed the SLMCPR. The difference between these two limits is ΔCPR. This ΔCPR is added to the safety limit to give a minimum operating MCPR, which, as discussed above, is 1.27 for the current part of the fuel cycle in which the DAEC facility is operating. Thus, the OLMCPR is the summation of the safety limit minimum critical power ratio (SLMCPR) and the most limiting change in critical ratio (ΔCPR) from the abnormal operating transient analyses.

Evaluation

The method of analysis in reference 2 conservatively established the uncertainties for the entire reactor cycle, and therefore, is applicable to the period of time covered by the proposed change. The change in exposure intervals does not affect the statistical method or uncertainties and the SLMCPR is not changed.

The change does affect the ΔCPR evaluation. The ΔCPR is the change in CPR which results from an abnormal operating transient. The transient analysis and ΔCPR evaluation vary with exposure. Therefore an evaluation for the proposed exposure interval has been submitted (1).

All transients which are the basis of the existing license were reviewed. The transients, which have been limiting in the past with respect to ΔCPR and which are significantly sensitive to the core transient parameter deviations, were reanalyzed. The turbine trip without bypass transient continues to be the most limiting (i.e., largest ΔCPR). If this transient were to occur with the proposed OLMCPR specification, it would not result in a minimum critical power ratio less than the SLMCPR.

This variation in transient analyses results with exposure is due to the change in transient input parameters (e.g., dynamic void coefficient, Doppler coefficient, scram worth, and scram reactivity). The scram reactivity curves are the major cause of the variation with exposure. Towards EOC, the control rods tend to be positioned out of the core. Thus, the scram reactivity insertion rate toward the end of cycle is slower because the control rods do not get into the core as rapidly as earlier in the cycle. Therefore, with increasing cycle burnup the ΔCPR necessary to accommodate various transients is increased. The resulting changes in ΔCPR and OLMCPR have been presented in the licensee's submittal.

We have reviewed the licensee's submittal. In this review we found that the licensee has used the same methods for the transient analysis and the ΔCPR evaluation as previously reviewed and approved for DAEC. The use of exposure-dependent OLMCPR has also been reviewed and approved for DAEC. On this basis we find the proposed change in Technical Specification acceptable.

Environmental Consideration

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 signficant 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 §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 this amendment.

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: December 30, 1977

Reference

1. Letter from L. Lee (DAEC) to E. G. Case (NRC) dated December 14, 1977.

2. General Electric Thermal Analysis Basis (GETAB): Data Correlation and Design Application, General Electric Company BWR Systems Department, November 1973 (NEDE-10958, Class III).

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NO. 50-331

IOWA ELECTRIC LIGHT AND POWER COMPANY
CENTRAL IOWA POWER COOPERATIVE
CORN BELT POWER COOPERATIVE

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 40 to Facility Operating License No. DPR-49 issued to Iowa Electric Light and Power Company, Central Iowa Power Cooperative, and Corn Belt Power Cooperative, which revised Technical Specifications for operation of the Duane Arnold Energy Center, located in Linn County, Iowa. The amendment is effective as of the date of issuance.

The amendment consists of changes to the Technical Specifications to provide a new, less restrictive, operating limit minimum critical power ratio specification between 1000 and 500 megawatt days/tonne exposure before the end of the present fuel cycle.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of this amendment is not required since the amendment does not involve a significant hazards consideration.

The Commission has determined that the issuance of this amendment will not result in any significant environmental impact and that pursuant

to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of this amendment.

For further details with respect to this action, see (1) the application for amendment dated December 14, 1977, (2) Amendment No. 40 to License No. DPR-49, and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N. W., Washington, D. C. and at the Cedar Rapids Public Library, 426 Third Avenue, S. E., Cedar Rapids, Iowa 52401. A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 30 day of December 1977.

FOR THE NUCLEAR REGULATORY COMMISSION

Richard J. Clark

Richard J. Clark, Acting Chief
Operating Reactors Branch #3
Division of Operating Reactors