AUG 1 1977

Distribution
Docket
ORB #3
Local PDR
NRC PDR
VStello
KGoller
GLear
CParrish
RClark
Attorney, OELD
OI&E (5)
BJones (4)
BScharf (10)
JMcGough
DEisenhut
ACRS (16)
OPA (Clare Miles)
DRoss
TBAbernathy
JRBuchanan

Docket No. 50-331

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

Gentlemen:

The Commission has issued the enclosed Amendment No. 38 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 June 17, 1977, as supplemented by letters dated July 6, 1977 and July 11, 1977.

This amendment will reduce DAEC's operating limit Minimum Critical Power Ratio (MCPR), allowing an increase of up to 5% power. The proposed changes 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,

Original signed by

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

Enclosures:
1. Amendment No. 38
2. Safety Evaluation
3. FEDERAL REGISTER Notice

cc w/enclosures:
See next page

Concur. 1
GD

OFFICE	ORB #3	ORB #3	OELD	ORB #3	RSB:OT	
SURNAME	CParrish	RClark:mff		GLear	R. Baer	
DATE	7/28/77	7/28/77	7/29/77	8/1/77	8/1/77	

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. 38
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 June 17, 1977, as supplemented by letters dated July 6, 1977 and July 11, 1977, 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. 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. 38, 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

George Lear

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

Attachment:
Changes to the Technical
Specifications

Date of Issuance: August 1, 1977

ATTACHMENT TO LICENSE AMENDMENT NO. 38

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
1.1-11	1.1-11
3.12-9a	3.12-9a

TABLE 1.1-2

NOMINAL VALUES OF PARAMETERS USED IN

THE STATISTICAL ANALYSIS OF FUEL CLADDING INTEGRITY SAFETY LIMIT

Core Thermal Power	3,293 MW
Core Flow	102.5 Mlb/hr
Dome Pressure	1010.4 psig
Channel Flow Area	0.1078 ft^2
R-Factor	1.100 (7 x 7 Array) 1.098 (8 x 8 Array)

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 E.O.C.
7 x 7	1.27	1.29
8 x 8	1.27	1.37

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 38 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 June 17, 1977,(1) supplemented by letters dated July 6, 1977 and July 11, 1977, 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 would reduce DAEC's operating limit Minimum Critical Power Ratio (MCPR), allowing an increase of up to 5% power. The power increase resulting from this license amendment is separate from the power increase sought by the licensees in their submittal of June 24, 1977 as a result of a modified ECCS analysis. This latter licensing action was noticed in the Federal Register on July 28, 1977 (42 FR 38442). The proposed changes will not result in any change in the present safety limit MCPR of 1.06 which has been previously reviewed and approved

Discussion

By their submittal of June 17, 1977, the licensee submitted a revised thermal-hydraulic and safety analysis for the DAEC. The purpose of the revised analysis was to incorporate into the Technical Specifications MCPR operating limits which reflect (1) that two bypass flow holes were drilled in the lower tie plate of an additional 100 fuel bundles during the March - May 1977 refueling outage of DAEC, (2) a typographical error in R-factor values in a previous submittal and (3) an improved fuel bundle loading error analysis.

1. Additional Drilled Bundles

Drilling of bypass holes in the fuel bundle lower tie plates started as part of the correction of incore vibrations in some General Electric (GE) Boiling Water Reactors (BWR). This drilling process has been reviewed(2) and the staff has found that operation with both a completely drilled and completely plugged core is acceptable. For the partially drilled configuration each reactor must be reviewed on an individual basis, as was done for DAEC.

DAEC was previously authorized for operation with at least 100 drilled fuel bundles[3]. The DAEC safety analyses[4] showed that the drilling of more than 100 fuel bundles generally increased the safety margins. For those analyses where margins decreased, appropriate justification as a conservative analysis with no drilled fuel bundles was presented. DAEC has actually drilled bypass flow holes in 200 fuel bundles. For the proposed change in the Technical Specifications, DAEC conservatively assumed 184 drilled assemblies and established operating limit MCPR's on this assumption.

The previous review of DAEC considered transient, accident and normal operation. As previously stated, this review found operation with 100 or more bundles drilled to be acceptable. Therefore, the only point which needs to be addressed here is the change to operating limit MCPR.

The change to operating limit MCPR arises from the reduced ΔCPR for abnormal operational transients. From the beginning of cycle (BOC) to 1000 megawatt days per ton (MWD/T) before end of cycle (EOC) ΔCPR's decreased from 0.30 to 0.16 for the 8x8 fuel type and from 0.28 to 0.15 for the 7x7 fuel type. The ΔCPR's decreased from 0.37 to 0.31 for 8x8 and from 0.29 to 0.23 for the 7x7 from 1000 MWD/T before EOC to EOC. These decreases in ΔCPR's are due to the less negative void coefficient and the greater scram worth. These parameters changed because of decreased bypass voiding due to the increased bypass flow from drilling. Thus, the ΔCPR for the limiting abnormal operating transients decreased. The licensee considered all transients and found the turbine trip without bypass and the loss of a feedwater heater ($100^{o}F$ decrease in feedwater temperature) to have the largest ΔCPR.

The turbine trip with failure of the bypass valves produces the most severe reactor isolation. It's primary characteristic is a pressure increase due to the obstruction of steam flow by the turbine stop valves. The pressure increase causes a significant void reduction which yields a pronounced positive void reactivity effect. The net reactivity is sharply positive and causes a rapid increase in neutron flux until the net reactivity is forced negative, by a combination of a scram initiated from switches on the turbine stop valves when these are less than 90% open and an increase in voids after the safety/relief valves have automatically opened on high pressure. The parameter of concern is the peak average surface heat flux as correlated to MCPR. Neutron flux, the precursor of heat flux, and the resulting CPR determine the design basis operating critical power ratio.

A loss of a feedwater heater transient can be caused when a steam extraction line to the heater is shut and the heat supply to the heater is removed, producing a gradual cooling of the heater tubes. The reactor will receive cooler feedwater flow which will produce an increase in core inlet subcooling and, due to the negative void reactivity coefficient, an increase in core power. The delay in the flow from the tripped feedwater heater to the feedwater sparger is ignored, thereby adding conservatism to the analysis. These analyses for the tubine trip without bypass and the loss of a feedwater heater were performed using the same methods as previously found acceptable in Reference 3 (based on there being 184 drilled fuel bundles instead of 100 drilled bundles used in the previous evaluation).

Based on analyses and documentation as discussed above, we find the proposed change to the Technical Specifications on the operating limit MCPR, to be acceptable for the period from 1000 MWD/T before EOC to EOC.

2. R-Factors Error

The R-Factor values for 7x7 and 8x8 fuel were interchanged due to an error in Table 4-2 of NEDO-21082-02[5]. The June 17, 1977 submittal provides the correct R-Factor values.

3. Fuel Loading Error

A new fuel loading error analysis has been submitted. It includes a reanalysis with exposure-dependent values versus the previous maximum values throughout fuel exposure lifetime for the fuel mislocation analysis.

For the fuel mislocation analysis, exposure-dependent values on the R-Factors are used. These values are calculated by the generically approved methods of Reference 6. Actual DAEC fuel design parameters (i.e., geometry, enrichment, fuel density, and fuel rod position in assembly), were used to generate the R-factor values for the current cycle. These exposure-dependent values were used in the fuel mislocation analysis rather than using the maximum value for all exposure time.[4] Therefore, rather than the maximum power mismatch and the maximum R-factor for all exposures, the maximum power mismatch with anticipated exposure dependent R-factor was used for the fuel loading error. This analysis resulted in a MCPR of 1.06 which is equal to the safety limit MCPR.

In the June 17, 1977 submittal, [1] the analysis of the misoriented bundle yielded a MCPR of 1.07 from an operating limit MCPR of 1.22. This submittal used a method of analysis for the rotated bundle which NRC is evaluating but has not approved. Therefore, the licensee has presented the results of a previous analysis with a previously approved analysis method.[7] With the same initial operating limit MCPR and the previously applied procedure, the rotated bundle analysis would result in a MCPR of 1.01, which is less than the safety limit MCPR of 1.06.

The fuel loading error is being generically reviewed by the NRC staff and generic resolution is anticipated. In the interim, the licensee has agreed to increase the operating limit MCPR to 1.27 for the 7x7 and 8x8 fuel from the beginning of the present fuel cycle (BOC) to 1000 MWD/T before EOC. This ensures that the safety limit MCPR of 1.06 will not be violated by possible fuel misorientation. This will keep the rod bundle from boiling transition during steady-state operation even if the worst misloading error should occur. Accordingly, we have revised the proposed MCPR limits in Table 3.12-2 of the licensee's submittal of June 17, 1977 from 1.21 and 1.22 for 7x7 and 8x8 fuel, respectively, to 1.27. Thus, the MCPR limits will be specified as set forth in the enclosed Table 3.12-2. That is, from BOC to 1000 MWD/T before EOC the operating limit MCPR shall be 1.27 for both fuel types and from 1000 MWD/T before EOC to EOC the operating limit MCPR shall be 1.29 for the 7x7 and 1.37 for the 8x8.

Environmental Consideration

The environmental impacts associated with the Duane Arnold facility have been previously examined in the Final Environmental Statement issued on March 1973. That environmental review was based upon plant operations at a power level of 1658 MW thermal. The power level increase associated with this amendment will limit plant operations to a power level of 1593 MW thermal, a level below that examined in the FES. Thus this amendment does not authorize a change in effluent types or total amounts from those which have previously been examined and found acceptable.

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: August 1, 1977

REFERENCES

1. L. Liu (Iowa Electric Light and Power Company), letter to E. G. Case (NRC), dated June 17, 1977, #IE-77-1192.

2. Safety Evaluation Report on the Reactor Modification to Eliminate Significant In-Core Vibration in Operating Reactors with 1-inch Bypass Holes in Core Support Plates, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, February, 1976.

3. G. Lear (NRC) letter to D. Arnold (Iowa Electric Light and Power Company) dated May 6, 1977.

4. L. Liu (Iowa Electric Light and Power Company), letter to B. C. Rusche (NRC), dated March 10, 1977, #IE-77-551.

5. L. Liu (Iowa Electric Light and Power Company), letter to B. C. Rusche (NRC), dated January 31, 1977, #IE-77-220.

6. General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Application, NEDO-10958, 73NED9, Class 1, November 1973.

7. L. Liu (Iowa Electric Light and Power Company), letter to E. G. Case (NRC), dated July 11, 1977, #IE-77-1322.

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. 38 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 its date of issuance.

The amendment consists of changes to the Technical Specifications which will reduce DAEC's operating limit Minimum Critical Power Ratio (MCPR), allowing an increase of up to 5% power. The power increase resulting from this license amendment is separate from the power increase sought by the licensees in their submittal of June 24, 1977 as a result of a modified ECCS analysis. This latter licensing action was noticed in the Federal Register on July 28, 1977 (42 FR 38442). The proposed changes will not result in any change in the present safety limit MCPR of 1.06 which has been previously reviewed and approved.

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 was 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 June 17, 1977, as supplemented by letters dated July 6, 1977 and July 11, 1977, (2) Amendment No. 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

FOR THE NUCLEAR REGULATORY COMMISSION

George Lear

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