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Docket No. 50-331

*7/17/80*

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

Dear Mr. Arnold:

The Commission has issued the enclosed Amendment No. *61* to Facility License No. DPR-49 for the Duane Arnold Energy Center. This amendment consists of changes to the Technical Specifications in response to your application dated June 28, 1980. Your application was processed as an emergency authorization request. Amendment No. *61* was authorized by telephonic conversation between Iowa Electric Light & Power Company (L. Root) and the staff (R. Reid) on June 28, 1980 and was confirmed by our letter dated June 30, 1980.

This amendment changes the Technical Specifications to permit interim operation with one recirculation loop out of service from June 28, 1980 to July 2, 1980.

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

Sincerely,

Thomas A. Ippolito, Chief  
Operating Reactors Branch #2  
Division of Licensing

Enclosures:

1. Amendment No. *61*
2. Safety Evaluation
3. Notice

cc w/enclosures:  
See next page

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*AAO to form of Amendment  
w/ another copy  
CP*

*SD*

|         |                          |                       |                        |                            |                              |
|---------|--------------------------|-----------------------|------------------------|----------------------------|------------------------------|
| OFFICE  | ORB #2<br><i>SNorris</i> | ORB #2<br><i>TKey</i> | AD:DL<br><i>TNovak</i> | OELD<br><i>Zw. D. Palm</i> | ORB #2<br><i>T. Ippolito</i> |
| SURNAME | SNorris                  | TKey                  | TNovak                 | Zw. D. Palm                | T. Ippolito                  |
| DATE    | 7/7/80                   | 7/6/80                | 7/7/80                 | 7/9/80                     | 7/16/80                      |

Mr. Duane Arnold  
Iowa Electric Light & Power Company - 2 -

July 17, 1980

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

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

Director, Technical Assessment Division  
Office of Radiation Programs (AW-459)  
US EPA  
Crystal Mall #2  
Arlington, Virginia 20460

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

Cedar Rapids Public Library  
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Cedar Rapids, Iowa 52401

U. S. Nuclear Regulatory Commission  
Resident Inspectors Office  
Rural Route #1  
Palo, Iowa 52324



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

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 61  
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 28, 1980, 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. 61, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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3. This license amendment is effective as of June 28, 1980.

FOR THE NUCLEAR REGULATORY COMMISSION



Thomas A. Ippolito, Chief  
Operating Reactors Branch #2  
Division of Licensing

**Attachment:**  
Changes to the Technical  
Specifications

**Date of Issuance:** July 17, 1980

ATTACHMENT TO LICENSE AMENDMENT NO. 61

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

1.1-2  
1.1-3  
3.2-16  
3.6-7

REPLACE

1.1-2  
1.1-3  
3.2-16  
3.6-7

SAFETY LIMIT16.C Power Transient

To ensure that the Safety Limits established in Specification 1.1.A and 1.1.B are not exceeded, each required scram shall be initiated by its primary source signal. A Safety Limit shall be assumed to be exceeded when scram is accomplished by a means other than the Primary Source Signal.

- D. With irradiated fuel in the reactor vessel, the water level shall not be less than 12 in. above the top of the normal active fuel zone. Top of the active fuel zone is defined to be 344.5 inches above vessel zero (See Bases 3.2)

LIMITING SAFETY SYSTEM SETTING

Where: S = Setting in percent of rated power (1,593 MWt)

W = Recirculation loop flow in percent of rated flow. Rated recirculation loop flow is that recirculation loop flow which corresponds to  $49 \times 10^8$  lb/hr core flow.

For a MFLPD greater than FRP, the APRM scram setpoint shall be:

$S \leq (0.66W + 54) \frac{\text{FRP}}{\text{MFLPD}}$  for two recirculation loop operation and

$S \leq (0.66W + 50.7) \frac{\text{FRP}}{\text{MFLPD}}$  for one\* recirculation loop operation.

NOTE: These settings assume operation within the basic thermal design criteria. These criteria are LHGR  $\leq$  18.5 KW/ft (7x7 array) or 13.4 KW/ft (8x8 array) and MCPR  $\geq$  values as indicated in Table 3.12-2 times  $K_f$ , where  $K_f$  is defined by Figure 3.12-1. Therefore, at full power, operation is not allowed with MFLPD greater than unity even if the scram setting is reduced. If it is determined that either of these design criteria is being violated during operation, action must be taken immediately to return to operation within these criteria.

## 2. APRM High Flux Scram

When in the REFUEL or STARTUP and HOT STANDBY MODE. The APRM scram shall be set at less than or equal to 15 percent of rated power.

\*Effective June 28 through July 1, 1980.

**SAFETY LIMIT****LIMITING SAFETY SYSTEM SETTING****3. APRM Rod Block When in Run Mode.**

For operation with MFLPD less than or equal to FRP the APRM Control Rod Block setpoint shall be as shown on Fig. 2.1-1 and shall be:

$$S \leq (0.66W + 42)$$

The definitions used above for the APRM scram trip apply.

For a MFLPD greater than FRP, the APRM Control Rod Block setpoint shall be:

$$S \leq (0.66W + 42) \frac{FRP}{MFLPD} \text{ for two recirculation loop operation, and}$$

$$S \leq (0.66W + 38.7) \frac{FRP}{MFLPD} \text{ for * one recirculation loop operation.}$$

- 4. IRM - the IRM scram shall be set at less than or equal to 120/125 of full scale.**
- B. Scram and Isolation on reactor low water level**  $\geq$  513.5 inches above vessel zero (+12" on level instruments)
- C. Scram - turbine stop valve closure**  $\leq$  10 percent valve closure
- D. Turbine control valve fast closure shall occur within 30 milliseconds of the start of turbine control valve fast closure.**

\*Effective June 28 through July 1, 1980

TABLE 3.2-C

| Minimum No. of Operable Instrument Channels Per Trip System | Instrument                           | Trip Level Setting                                                         | Number of Instrument Channels Provided by Design | Action |
|-------------------------------------------------------------|--------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|--------|
| 2                                                           | APRM Upscale (Flow Biased)           | for 2 recirc loop operation<br>$\leq (0.66W + 42) \frac{FRP}{MFLPD}$ (2)   | 6 Inst. Channels                                 | (1)    |
|                                                             |                                      | for 1 recirc loop operation<br>$\leq (0.66W + 38.7) \frac{FRP}{MFLPD}$ (2) |                                                  |        |
| 2                                                           | APRM Upscale (Not in Run Mode)       | $\leq 12$ indicated on scale                                               | 6 Inst. Channels                                 | (1)    |
| 2                                                           | APRM Downscale                       | $\geq 5$ indicated on scale                                                | 6 Inst. Channels                                 | (1)    |
| 1 (7)                                                       | Rod Block Monitor (Flow Biased)      | for 2 recirc loop operation<br>$\leq (0.66W + 39) \frac{FRP}{MFLPD}$ (2)   | 2 Inst. Channels                                 | (1)    |
|                                                             |                                      | for 1 recirc loop operation<br>$\leq (0.66W + 35.7) \frac{FRP}{MFLPD}$ (2) |                                                  | *      |
| 1 (7)                                                       | Rod Block Monitor Downscale          | $\geq 5$ indicated on scale                                                | 2 Inst. Channels                                 | (1)    |
| 2                                                           | IRM Downscale (3)                    | $\geq 5/125$ full scale                                                    | 6 Inst. Channels                                 | (1)    |
| 2                                                           | IRM Detector not in Startup Position | (8)                                                                        | 6 Inst. Channels                                 | (1)    |
| 2                                                           | IRM Upscale                          | $\leq 108/125$                                                             | 6 Inst. Channels                                 | (1)    |
| 2 (5)                                                       | SRM Detector not in Startup Position | (4)                                                                        | 4 Inst. Channels                                 | (1)    |
| 2 (5) (6)                                                   | SRM Upscale                          | $\leq 10^5$ counts/sec.                                                    | 4 Inst. Channels                                 | (1)    |

\*Effective June 28 through July 1, 1980.

- b. The indicated value of core flow rate varies from the value derived from loop flow measurements by more than 10%.
- c. The diffuser to lower plenum differential pressure reading on an individual jet pump varies from the mean of all jet pump differential pressures by more than 10%.
- 2. Whenever there is recirculation flow with the reactor in the Startup or Run mode, and one recirculation pump is operating, the diffuser to lower plenum differential pressure shall be checked daily and the differential pressure of an individual jet pump in a loop shall not vary from the mean of all jet pump differential pressures in that loop by more than 10%.

F. Jet Pump Flow Mismatch

- 1. Recirculation pump speeds shall be checked and logged at least once per day.

F. Jet Pump Flow Mismatch

- 1. When both recirculation pumps are in steady state operation, the speed of the faster pump may not exceed 122% of the speed of the slower pump when core power is 80% or more of rated power or 135% of the speed of the slower pump when core power is below 80% of rated power.
- 2. \* If specification 3.6.F.1 cannot be met, one recirculation pump shall be tripped. The reactor may be started and operated with one recirculation loop out of service provided that:
  - a. A MAPLHGR multiplier of 0.65 is applied.
  - b. The power level is limited to a maximum of 50% of licensed power.
  - c. The idle loop is isolated (suction valve closed and electrically disconnected).

\*Effective 6/28 thru 7/2/80

Amendment No. 60, 61



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 61 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

1.0 Introduction

By letter dated June 28, 1980, Iowa Electric Light and Power Company (the licensee) requested reinstatement of Amendment No. 60 to Facility Operating License No. DPR-49 for the Duane Arnold Energy Center (DAEC). The request would permit the DAEC to operate at up to 50% of rated power with one recirculation loop out of service from June 28, 1980 to July 2, 1980.

In April 1980, an equipment malfunction requiring extensive repairs caused one recirculation pump to be taken out of service. The Technical Specifications in effect at that time required a plant shutdown unless the pump was returned to service within 24 hours. The licensee submitted an amendment application to permit interim plant operation at reduced power until repairs could be effected. Amendment No. 60 (transmitted by NRC letter dated May 6, 1980, from T. Ippolito to Duane Arnold) modified the DAEC Technical Specifications to permit plant startup and operation with one recirculation loop out of service during the requested period necessary to effect repairs. The power level was limited to 50% of rated power. Amendment No. 60 was applicable only for the period required to effect the necessary repairs.

On June 27, 1980, an equipment malfunction, unrelated to the aforementioned, caused one recirculation pump to again be taken out of service. Repairs were necessary which could not be effected within 24 hours. The licensee requested the provisions of Amendment No. 60 to be reinstated until July 2, 1980.

2.0 Evaluation

2.1 Accidents (Other than LOCA) and Transients Affected by One Recirculation Loop out of Service

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### 2.1.1 One Pump Seizure Accident

The licensee has qualitatively compared the consequences of a pump seizure accident during single loop operation with the consequences of a LOCA during full power operation with both loops in service. Previous analyses have demonstrated that the pump seizure accident is not as severe as a LOCA for two pump operation. The same conclusion can be made for the one pump case by analyzing the two events. In both events, the recirculation driving loop flow is lost instantaneously, in the seizure because of pump stoppage, in the LOCA because of a line severance. In the seizure event, natural circulation flow continues, water level is maintained, and the core remains submerged; thus a continuous core cooling mechanism is provided. However, for a LOCA complete flow stoppage occurs and the water level decreases, resulting in core uncover and subsequent fuel rod cladding overheating. In addition, the reactor pressure does not decrease for a pump seizure event, whereas complete depressurization occurs for the LOCA. Since the potential effects of a pump seizure accident are bounded by the effects of a LOCA, the licensee has taken the position that specific pump seizure analyses for one loop operation are not necessary. Although this gives some assurance of acceptability of the pump seizure event, the staff notes that the acceptance criteria for pump seizure are more stringent than the criteria for a LOCA. Standard Review Plan 15.3.3 (Reactor Coolant Pump Rotor Seizure, and Reactor Coolant Pump Shaft Break) requires that for the pump seizure accident, the release of radioactivity should be a fraction of 10 CFR 100 guidelines. Only limited amounts of fuel failures are acceptable for pump seizures, whereas significantly more failures are acceptable for LOCA.

The licensee, however, will limit reactor power during single loop operation to 50% of rated power. As indicated on the DAEC power/flow operating map, the natural circulation line intersects the 100% flow control line at 53% power. Thus, with power limited to 50%, reactor power is at a value where no fuel damage will occur even if pump seizure should occur.

The staff finds the power limit of 50% to be acceptable on the basis that the power limit will assure no significant fuel damage will result should the pump seizure event occur during one loop operation at DAEC.

### 2.1.2 Abnormal Transients

### 2.1.2.1 Idle Loop Startup

The idle loop startup transient was analyzed, in the DAEC FSAR, with an initial power of 55%. The licensee has committed to operate at no greater than 50% power with one loop out of service. Additionally, the Technical Specifications are being modified to require that, during single loop operation, the suction valve in the idle loop be shut and electrically disconnected. These measures are being taken to preclude startup of an idle loop.

### 2.1.2.2 Flow Increase

The Minimum Critical Power Ratios (MCPRs) in the present Technical Specifications for operation at full power have previously been reviewed and found to be acceptable. A large inadvertent flow increase could cause the MCPR to decrease below the Safety Limit MCPR for a low initial MCPR at reduced flow conditions. Therefore, the required MCPR must be increased at reduced core flow by a flow factor,  $K_f$ . The  $K_f$  factors are derived assuming both recirculation loops increase speed to the maximum permitted by the scoop tube position set screws. This condition maximizes the power increase and hence the  $\Delta$ MCPR for transients initiated from less than rated conditions. When operating on one loop the flow and power increase will be less than with two pumps increasing speed, therefore the  $K_f$  factors derived from the two-pump assumption are conservative for one loop operation.

### 2.1.2.3 Rod Withdrawal Error

The rod withdrawal error at rated power analysis indicated that the rod block monitor (RBM) will stop rod withdrawal at a critical power ratio (CPR) which is higher than the safety limit. The minimum critical power ratio (MCPR) requirement for one loop operation will be equal to that for two loop operation because the nuclear characteristics are independent of whether core flow is attained by one or two pump operation, if flow asymmetries are not incurred with one-loop operation. Tests at Quad Cities have shown that flow is uniform across the core for one pump operation with the equalizer valve closed. The results of these tests are considered applicable and acceptable for DAEC.

One-pump operation results in backflow through 8 of the 16 jet pumps while flow is being supplied to the lower plenum from the active jet pumps. Because of this backflow through the inactive jet pumps the present rod-block equation and APRM settings must be modified. The licensee has modified the two-pump rod block equation and APRM settings that exist in the Technical Specification, for one-pump operation and the staff has found them acceptable.

The staff finds that one loop transients and accidents other than LOCA, which is discussed below, are bounded by the two loop operation analysis and are therefore acceptable.

## 2.2 Loss of Coolant Accident (LOCA)

The licensee has contracted General Electric Co. (GE) to perform single loop operation analysis for DAEC LOCA. The licensee states that preliminary evaluation of these calculations (that are performed according to the procedure outlined in NEDO-20566-2, Rev. 1) indicates that a multiplier of 0.86 should be applied to the MAPLHGR limits for single loop operation of the DAEC. The licensee asserts further that GE has performed a large number of single loop analyses for similar plants; and, in no case has a multiplier of less than 0.70 been required. Additionally, because DAEC does not have the LPCI modification and because the limiting LOCA break is a suction line break, the single loop MAPLHGR multiplier is expected to be significantly larger than for most other BWRs. However, the licensee has proposed that, until the GE calculations can be verified, a multiplier of 0.65 be utilized.

The staff's evaluation finds that value of MAPLHGR reduction factor to be conservative and, therefore, acceptable.

## 3.0 Summary

For the reasons previously discussed, the staff finds acceptable the proposed single loop operation until July 2, 1980. Power is limited to no greater than 50% of rated power.

## 4.0 Environmental Considerations

We have determined that this 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, negative declaration, or environmental impact appraisal need not be prepared in connection with the issuance of this 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:

UNITED STATES NUCLEAR REGULATORY COMMISSIONDOCKET NO. 50-331IOWA ELECTRIC LIGHT AND POWER COMPANY, ET AL.NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY  
OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 61 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 revises the Technical Specifications for operation of the Duane Arnold Energy Center, located in Linn County, Iowa. The amendment was effective from June 28, 1980 to July 2, 1980.

The amendment modifies the Technical Specifications to permit interim operation with one recirculation loop out of service from June 28, 1980 to July 2, 1980.

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 28, 1980, (2) Amendment No. 61 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 Licensing.

Dated at Bethesda, Maryland this 17th day of July, 1980

FOR THE NUCLEAR REGULATORY COMMISSION

  
Thomas A. Ippolito, Chief  
Operating Reactors Branch #2  
Division of Licensing