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ENCLOSURE
PROPOSED APPLICATION FOR TECH. SPEC.CLARIFYING THE METHOD USED TO ADJUST THE APRM HIGH FLUX SCRAM(RUN MODE) AND APRM ROD BLOCK TRIP SETTING

(3 SIGNED CYS. RECEIVED)
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November 10, 1976

IE-76-1762

LEE LIU
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50-331

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U.S. NUCLEAR REGULATORY COMMISSION
Mail Section

Mr. Benard C. Rusche, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20545

Dear Mr. Rusche:

Transmitted herewith in accordance with the requirements of 10CFR50.59 and 50.90 is an application for amendment for DPR-49 (Appendix A to License) for the Duane Arnold Energy Center.

This application has been reviewed and approved by the DAEC Operations Committee and the DAEC Safety Commitee. This application does not involve a significant hazards consideration.

Three signed and notarized originals and 37 additional copies of this application are transmitted herewith. This application, consisting of the foregoing letter and enclosures hereto, is true and accurate to the best of my knowledge and belief.

Iowa Electric Light and Power Company

By [signature]
Lee Liu
Vice President-Engineering

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Subscribed and Sworn to before me on this 10th day of November, 1976.

[signature: Wendy A. Rodenhizer]
Notary Public in and for the State of Iowa.

NOTARIAL SEAL IOWA
Wendy Rodenhizer
My Commission Expires
September 30, 1979

11725

PROPOSED CHANGE RTS-77 TO DAEC TECHNICAL SPECIFICATIONS

I. Affected Technical Specifications

Appendix A of the Technical Specifications for the DAEC (DPR-49) provides as follows:

The Bases for Specifications 2.1.A.1 and 2.1.A.3 contain information pertaining to the APRM High Flux Scram (Run Mode) trip setting and the APRM Rod Block (Run Mode) trip setting as follows:

Specification 2.1.A.1 Bases (Page 1.1-17)

> "The scram trip setting must be adjusted to ensure that the LHGR transient peak is not increased for any combination of MTPF and reactor core thermal power. The scram setting is adjusted in accordance with the formula in Specification 2.1.A.1, when the maximum total peaking factor is greater than 2.61 (7 x 7 array) or 2.43 (8 x 8 array)."

Specification 2.1.A.3 Bases (Page 1.1-19, eighth line)

> "As with the APRM scram trip setting, the APRM rod block trip setting is adjusted downward if the maximum total peaking exceeds 2.62, thus preserving the APRM rod block safety margin."

II. Proposed Changes in Technical Specifications

The licensees of DPR-49 propose the following changes in the Technical Specifications set forth in I above:

In the Specification 2.1.A.1 bases delete "2.61 (7 x 7 array) or 2.43 (8 x 8 array)" and add the following:

> ". . . . the design value. This adjustment may be accomplished by increasing the APRM gain and thus reducing the slope and intercept point of the flow referenced APRM High Flux Scram Curve by the reciprocal of the APRM gain adjust."

In the Specification 2.1.A.3 bases delete "2.62" and replace with "the design value". Add "As with the scram setting, this may be accomplished by adjusting the APRM gain."

III. Justification for Proposed Change

The purpose of this proposed change is to clarify the method used to adjust the APRM High Flux Scram (Run Mode) and APRM Rod Block (Run Mode) trip settings. This clarification is required as a result of differences of opinion between the DAEC staff and the NRC Region III Office of Inspection and Enforcement concerning interpretation of the Technical Specification.

Changing the gains of the APRM amplifiers effectively changes the scram setpoints. The technical justification of this method is presented below to demonstrate that the Technical Specification requirement is satisfied exactly. To this end, a realistic set of conditions will be used as an example:

Core Power	20%
Recirculation Flow	40%
Core TPF	5

As per Specification 2.1.A.1, the scram setpoint is:

$$S = (0.66\ W + 54)\ \frac{PF}{MTPF}$$

For 7 x 7 fuel $S = \left[(.66)(40) + 54\right] \frac{2.61}{5} = 42.0$

Therefore, the core power must increase a factor of 42.0/20 = 2.1 to cause a scram. (Note that the power increase cannot be caused by a flow change or affect peaking factor to stay within the constraints of the Technical Specification.) This scram requirement is accomplished by changing the APRM gain so that the APRM indicates a factor of TPF/2.61 greater than actual core power.

For this example, after the APRM's have been adjusted, they will have a scale factor of 0.524.

$$APRM = (\text{Actual Core Power}) \times \frac{TPF}{2.61}$$

$$= (20\%)\frac{(5)}{(2.61)} = 38.3$$

Scram occurs when APRM indicates:

$$APRM = .66\ (40) + 54 = 80.4\%$$

Therefore, power must increase a factor of 80.4/38.3 = 2.1 to cause a scram exactly satisfying Technical Specification requirements.

The actual value of the peaking factors for 7 x 7 fuel and 8 x 8 fuel was removed and replaced with "the design value" to save future Technical Specification changes of the bases as these values change.

IV. Review Procedure

This proposed change has been reviewed by the DAEC Operations Committee and Safety Committee which have found that this proposed change does not involve a significant hazards consideration.

during operation. Reducing this operating margin would increase the frequency of spurious scrams which have an adverse effect on reactor safety because of the resulting thermal stresses. Thus, the APRM scram trip setting was selected because it provides adequate margin for the fuel cladding integrity Safety Limit yet allows operating margin that reduces the possibility of unnecessary scrams.

The scram trip setting must be adjusted to ensure that the LHGR transient peak is not increased for any combination of MTPF and reactor core thermal power. The scram setting is adjusted in accordance with the formula in Specification 2.1.A.1, when the maximum total peaking factor is greater than the design value. This adjustment may be accomplished by increasing the APRM gain and thus reducing the slope and intercept point of the flow referenced APRM High Flux Scram Curve by the reciprocal of the APRM gain change.

Analyses of the limiting transients show that no scram adjustment is required to assure MCPR $\geq$ 1.07 when the transient is initiated from MCPR $\geq$ values as indicated in Table 3.12.2.

2. APRM High Flux Scram (Refuel or Startup & Hot Standby Mode).

For operation in these modes the APRM scram setting of 15 percent of rated power and the IRM High Flux Scram provide adequate thermal margin between the setpoint and the safety limit, 25 percent of rated. The margin is adequate to accommodate anticipated maneuvers associated with power plant startup. Effects of increasing pressure at zero or low void content are minor, cold water from sources available during startup is not much colder than that already in the system, temperature coefficients are small, and control rod patterns are constrained to be uniform by operating procedures backed up by the rod as the flow decreases for the specified trip setting versus flow relationship; therefore the worst case MCPR which could occur during steady-state operation is at 108% of rated thermal power because of the APRM rod block trip setting. The actual power distribution in the core is established by specified control rod sequences and is monitored continuously by the in-core LPRM system. As with the APRM scram trip setting, the APRM rod block trip setting is adjusted downward if the maximum total peaking factor exceeds the design value, thus preserving the APRM rod block safety margin. As with the scram setting, this may be accomplished by adjusting the APRM gain.

4. IRM

The IRM system consists of 6 chambers, 3 in each of the reactor protection system logic channels. The IRM is a 5-decade instrument which covers the range of power level between that covered by the SRM and the APRM. The 5 decades are covered by the IRM by means of a range switch and the 5 decades are broken down into 10 ranges, each being one-half of a decade in size. The IRM scram trip setting of 120 divisions is active in each range of the IRM. For example, if the instrument were on range 1, the scram setting would be 120 divisions for that range; likewise, if the instrument were on range 5, the scram would be 120 divisions on that range. Thus, as the IRM is ranged up to accommodate the increase in power level, the scram trip setting is also ranged up. The most significant sources of reactivity change during the power increase are due to control rod withdrawal. For insequence control rod withdrawal, the rate of change of power is slow enough due to the physical limitation of withdrawing control rods that the heat flux is in equilibrium with the neutron flux, and an IRM scram would result in a reactor shutdown well before any Safety Limit is exceeded.