Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

October 3, 1980

Mr. Darrell G. Eisenhut, Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Dresden Station Units 2 and 3
Quad Cities Station Units 1 and 2
Setdown Factor for APRM Trip Setpoints
on Operating BWRs
NRC Docket Nos. 50-237/249 and 50-254/265

References (a): T. A. Ippolito letter to D. L. Peoples dated March 20, 1980

(b): T. A. Ippolito letter to D. L. Peoples dated April 16, 1980

(c): R. F. Janecek letter to Director of Nuclear Reactor Regulation dated September 2, 1980

Dear Mr. Eisenhut:

Commonwealth Edison Co. has been informed by General Electric Co. of an NRC concern with the adequacy of using total peaking factor as a setdown factor for APRM scram and rod block setpoints on BWRs using reload fuel types with different active fuel lengths. The generic implications were originally discussed between R. Gridley (GE) and W. Mills (NRC).

The recommendations received from General Electric are enclosed as Enclosure 1. No immediate action is required, however, on CECo. BWRs for the reasons described below.

Quad Cities Unit 2 and Dresden Unit 3

The GE recommended method of using FRP/MFLPD as the setdown factor has already been implemented both procedurally and in the Technical Specifications for Quad Cities 2 and Dresden 3 as part of changes approved in March, 1980 (Reference 1) and April, 1980 (Reference 2), respectively.

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Quad Cities Unit 1

Technical Specificaton changes for Quad Cities 1 incorporating the recommended setdown method were submitted September 2, 1980 (Reference 3). The unit has been shutdown for EOC5 refueling since August 31, 1980 and related procedure revisions will be made prior to Cycle 6 operation.

Dresden Unit 2

Because the process computer nuclear software calculates slightly conservative MFLPD's, the Dresden 2 procedures were revised to use FRP/MFLPD as a setdown factor in April, 1980 for consistency with the Dresden 3 changes implemented at that time. Although the unit is currently in an all-rods-out coastdown mode with low peaking factors, corresponding revisions to the Technical Specifications are being prepared. Since the new procedure has already been implemented and will be continued for the remaining three months of EOC7 coastdown, there is no need for revised Technical Specifications prior to Cycle 8 operation in 1981.

It should be noted that the difference in active fuel length for reload fuel types used at Dresden and Quad Cities is less than 1%. The effect on the setdown factor is even less since the process computer equation for total peaking factor is affected in both the numerator and denominator. That is,

$$TPF = \frac{P}{PSEGAV} \times FLOP$$

where:
TPF = core maximum total peaking factor
P = nodal power in MW_t per 6" node
PSEGAV = average power in MW_t per 6" node
FLOP = local peaking factor.

Because the Limiting Total Peaking Factor (LTPF) was specified by Edison to include the actual value of active fuel length for each type, the old setdown factor of LTPF/TPF (or "A/MTPF" in Attachment 1) is only affected by the process computer's use of a 6 inch nodal distribution for retrofit fuel rather than 145/24 or 6.05 inches per node.

The effect on surveillances performed prior to the use of

FRP/MFLPD is therefore extremely small and well within the accuracy of the calculations. Furthermore, the scram and rod block settings are at least 3% conservative at both Dresden and Quad Cities to account for potential instrument drift.

Please contact this office should you have any questions concerning this matter.

One (1) signed original and fifty-nine (59) copies of his transmittal are provided for your use.

Very truly yours,

Robert F. Janecek

Robert F. Janecek
Nuclear Licensing Administrator
Boiling Water Reactors

Attachment
cc: RIII Inspector - Dresden
RIII Inspector - Quad Cities

7134A

Enclosure 1

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, 2015 SPRING ROAD, OAK BROOK, ILL. 60521
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ADV-80-148

Mr. W. M. Kiefer, Director
Nuclear Fuel Services
Commonwealth Edison Company
One First National Plaza
P.O. Box 767
Chicago, IL 60690

September 23, 1980

SUBJECT: Flow Biased APRM Scram Setdown

Dear Mr. Kiefer:

Attached is a General Electric recommendation for changes in the Dresden 2 and Quad Cities 1 plant technical specifications for the Flow Biased APRM Scram and Rod Block setdown. As Mr. R. T. Hill (General Electric) discussed with Mr. J. A. Silady of your organization, the plant process computers assume an active fuel length of 144 inches for calculation of Maximum Total Peaking Factor (MTPF), while the technical specifications for design total peaking are based on actual fuel lengths. This discrepancy may cause a slightly non-conservative calculation of the scram and rod block setdown requirements.

As noted in the attached recommendation, General Electric does not believe that this discrepancy represents a safety problem. However, the use of the ratio of Maximum Fraction of Limiting Power Density (MFLPD) to Fraction of Rated Power (FRP) does provide an improved basis for APRM scram setdown. Approximately 14 U.S. operating plants have previously converted to the recommended FRP/MFLPD basis.

One U.S. plant filed a License Event Report on this subject on July 25, 1980. As part of the ensuing discussions with the NRC (IE) staff, we have agreed to provide the NRC with a copy of our recommendations. If you have any questions, please give me a call.

Sincerely,

A. F. De Vita

A. F. De Vita-PROJECT APPLICATION ENGINEER
MECHANICAL & NUCLEAR SERVICE

ADV:pf

Attachment

ATTACHMENT

General Electric Recommendations
For Flow Biased APRM Trip Setdowns

This memorandum recommends a change to plant technical specifications which will eliminate some minor discrepancies in the administration of APRM scram and rod block set downs. These discrepancies have, in one case, caused a slightly non-conservative calculation of the set down.

DISCUSSION

The majority of General Electric BWR's currently operating in the US were originally designed and licensed on a basis of Minimum Critical Heat Flux Ratio (MCHFR). The MCHFR is a local phenomenon and so long as the Limiting Condition of Operation (LCO) was defined in terms of a local phenomenon it was believed necessary to provide adjustments in trip setpoints to account for power distribution effects. This adjustment was made by setting down the APRM scram and rod block by the ratio of Maximum Total Peaking Factor (MTPF) to Design Total Peaking Factor (DTPF). In 1974 GEXL was accepted as the license basis. GEXL protects against departure from nucleate boiling by establishing limits on bundle power, rather than limits on local heat flux. This change effectively removed the technical need for this adjustment; however, the requirement was not deleted from the plant technical specifications.

As long as all bundles in a given core possess the same number of active fuel rods, have the same active fuel length and identical cladding heat flux and bypass energy deposition fractions, administration of the set down requirement on a peaking factor basis is relatively simple. With the introduction of improved fuel designs (different active fuel length and number of active rods) the administration of this requirement has become complex and tedious.

Further the different active fuel lengths also complicate the interpretation of the Technical Specifications. A strict interpretation of the wording in most plant technical specifications would require that APRM scram and rod block trips be set on the basis of the maximum total peaking factor; properly the trips should be set based on the maximum ratio of peaking factor to peaking factor "limit". While we believe all BWR Owners are interpreting and administering this section properly, it is ambiguous and should be modified to remove the abiguity.

RECOMMENDATIONS

General Electric recommends that all BWR Owners who have not already done so, make the following changes to their plant technical specifications: Replace the set down factor, A/MTPF* (which is based only on the 144" fuel), with an equivalent factor, FRP/MFLPD† (which incorporates the effect of different fuel lengths in a slightly conservative fashion). This change will correct both of the aforementioned problems.

The proposed change is illustrated for a typical plant on the following pages. The peaking factor would no longer be used to set APRM trips, but would be replaced by an equivalent expression in terms of MFLPD (maximum fraction limiting power density) and FRP (fraction of rated power). These two quantities are presently available from the process computer. The MFLPD is already a ratio to limit and can be used without any hand checking. Furthermore, it can be defined in terms of only two limiting values (13.4 and 17.5/18.5).

The NRC's Office of Inspection & Enforcement has discussed this issue with General Electric and the NRC has agreed that this change will correct the non-conservatism due to the longer fuel lengths. The NRC did request that BWR Owners not wait for final approval of the Technical Specification change, but change their method of calculation of the setdown factors to conform to this recommendation as soon as possible. General Electric concurs and recommends that a procedure change be initiated immediately.

*A is the actual peaking factor and MTPF is the maximum total peaking factor. Specific symbols may vary in individual technical specifications.

†FRP is fraction of rated power and MFLPD is maximum fraction of limiting power density.

RLR:ggo/240-1
9/11/80

PRESENT	CHANGES
2.1 LIMITING SAFETY SYSTEM SETTING	
2.1 FUEL CLADDING INTEGRITY	
Applicability:	
Applies to trip settings of the instruments and devices which are provided to prevent the reactor sytem safety limits from being exceeded.	
Objective:	
To define the level of the process variables at which automatic protective action is initiated to prevent the fuel cladding integrity safety limits from being exceeded.	
Specification:	
The limiting safety system settings shall be as specified below:	
A. Neutron Flux Scram	
1. APRM - The APRM scram trip setpoint shall be as shown in Fig. 2.1.1. and shall be:	
$S \leq (0.65W + 55\%) [\frac{A}{MTPF}]$ 2 loop	$S \leq (0.65W + 55\%)[\frac{FRP}{MFLPD}]$ 2 loop
with a maximum setpoint of 120% for core flow equal to 69 million lb/hr and greater.	
Where:	
S = Setting in percent of design power (1998 MWt)	
W = Percent of drive flow required to produce a rated core flow of 69 Mlb/hr	
A = 3.07 for 7x7 fuel 3.02 for 8x8 fuel	FRP = fraction of design power (1998 MWt)

RLR:ggo/149
9/3/80

PRESENT

CHANGES

2.1 LIMITING SAFETY SYSTEM SETTING

MTPF = The value of the existing maximum total peaking factor

MFLPD = maximum fraction of limiting power density where the limiting power density is 17.5 KW/ft for 7x7 fuel and 13.4 KW/ft for 8x8 fuel.

MTPF shall be set equal to A unless the actual operating MTPF is greater than the design value of A, in which case, the value for the actual operating MTPF will be used.

The ratio of FRP to MFLPD shall be set equal to 1.0 unless the actual operating value is less than the design value of 1.0, in which case the actual operating value will be used.

2. APRM (15%) - When the reactor mode switch is in the refuel or startup/hot standby position, the APRM scram shall be set at $\leq$ 15% of design power.

3. IRM - The IRM scram shall be set at $\leq$ 120/125 of full scale.

B. APRM Rod Block

The APRM Control Rod Block trip setpoint(s) shall be biased with flow as shown on Fig. 2.1.1 and shall be less than or equal to:

$$S \leq (0.65W + 42\%) \left[\frac{A}{MTPF}\right] \text{ 2 loops}$$

$$S \leq (0.65W + 42\%) \left[\frac{FRP}{MFLPD}\right] \text{ 2 loops}$$

The definitions used above for the APRM scram trip apply.

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9/3/80