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

February 18, 1977

Mr. Dennis L. Ziemann, Chief
Operating Reactors - Branch 2
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Dresden Station Units 2 and 3
Quad-Cities Station Units 1 and 2
Reduction in MAPLHGR Limits and
Reevaluation of ECCS Performance
NRC Docket Nos. 50-237/249 and 50/254/265

Reference: Paul W. O'Connor (NRC) Telephone Call to
M. S. Turbak (CECo) of February 14, 1977.

Dear Mr. Ziemann:

Commonwealth Edison Company (CECo) agrees to submit a re-evaluation of the ECCS performance for Dresden Station Units 2 and 3 and Quad-Cities Station Units 1 and 2 with the General Electric Company (GE) input errors corrected. The reevaluation will be performed in accordance with an approved GE evaluation model which incorporates certain ECCS model revisions currently under review by the NRC Staff.

The above nuclear units reduced their MAPLHGR limits in accordance with the revised MAPLHGR table per the February 14, 1977 GE letter to the NRC. In addition, we request that the NRC reduce our limits to the values in the revised MAPLHGR table per the above letter.

Included are bases for the new MAPLHGR limits. These bases specify which errors were corrected and the cumulative effects of these errors, which benefits due to model improvements have been assumed and the cumulative effects of these improvements. The enclosed Plant Designation is A, B, C, and D for Dresden Units 2 and 3 and Quad-Cities Units 1 and 2, respectively.

Please direct any additional questions on this matter to this office.

One (1) signed original and 59 copies are included for your use.

Very truly yours,

M. S. Turbak

2131

M. S. Turbak
Nuclear Licensing Administrator

DESCRIPTION OF ECCS REEVALUATION

The attached table contains the results of all emergency core cooling system (ECCS) input and model changes that have been identified and indicates those which are applicable to the plant. These changes have been divided into two groups, and the cumulative effects on maximum planar linear heat generation rate (MAPLHGR) of each group conservatively estimated. The total effect on MAPLHGR has then been determined. The groupings and a description of the individual changes are given below. The references identified following each change description provide further amplification of the change.

1. ECCS Input Changes and Detrimental Model Changes

   a. New Suction Break Area in the SAFE Calculation - This item refers to a new recirculation suction line break area if it has changed from previous analyses.

   b. Vaporization Calculation - The calculation of the steam generation in the REFLOOD code has been made consistent with the approved ECCS evaluation model. In previous analyses, the vapor generation was underestimated which provided a reduced effect on counter current flow limiting (CCFL). A lower value of CCFL gives shorter reflood time and lower values of peak clad temperature (PCT).

   c. Eliminate Structural Absorption Double Credit - In the original calculation, double credit was taken for the effects of structural absorption in the decay heat calculation.

   d. Credit for Suction Line Friction - The approved ECCS evaluation model allows for reduction of blowdown due to piping friction. In the previous analyses on plants incorporating the low pressure coolant injection system (LPCI) modification, no credit was taken for friction in the recirculation system suction line for the discharge break calculations.

   e. Others

      i. Reactor Internals Thermal Characteristics - In the REFLOOD code, the reactor internals are modeled as heat sources which increase steam generation. Since the magnitude of these sources has been revised, there will be an effect on CCFL and reflood time.

ii. Bypass Area Adjustment - The bypass area provides a path for core spray flow around as opposed to through the fuel assembly. For a larger bypass area, there is a reduced CCFL effect on spray water entering the bypass region. More precise bypass area calculations have been completed and used for REFLOOD code inputs.

iii. Discharge Valve Closure Assumption - For LPCI modified plants, the effective pipe break area is dependent on whether or not the discharge valve is assumed to close. It is conservative to assume no valve closure since this maximizes the break area for a discharge break. In previous analyses, it was assumed that the valve closed.

f. Pressure Rule - In the SAFE code, there is a non-conservative spike in pressure when the reflooding flow recovers the bottom of the active fuel. In previous analyses, the calculated pressure before the spike was assumed to remain constant for duration of the event. As a result of a discussion with the NRC, it was agreed to use the lower of the SAFE calculated value or constant pressure calculation.

g. Increased CCFL Differential Pressure - Some experimental evidence exists that the differential pressure in a fuel assembly during periods of CCFL may be higher than previously assumed. This could cause a delay in reflood time.

2. Beneficial Model Improvements

a. REFLOOD 04 - In the approved ECCS evaluation model (REFLOOD 03) for certain conditions, the steam split between the jet pumps and the fuel was incorrectly calculated. REFLOOD 04 revises this calculation.

b. Partial Drill - For plants with plugged bypass flow holes and some but not all fuel assembly lower tie plates drilled, no credit has been given for the reflood flow through these holes. The partial drill change to the ECCS model conservatively accounts for this change.

c. CHASTE 05 - In the approved ECCS evaluation model (CHASTE 04), there is a very conservative treatment of radiation and conduction heat transfer. In CHASTE 05, the heat transfer effects are treated more consistent with the actual phenomena and experimental data.

1. ECCS Input Changes and Detrimental Model Changes

a.	New Suction Break Area (4.11 ft^2)	A
b.	Vaporization Calculation	A
c.	Eliminate Structural Absorbtion Double Credit	A
d.	Credit for Suction Line Friction	N/A
e.	Others	
	i. Reactor Internals Thermal Characteristics	A
	ii. Bypass Area Adjustment	A
	iii. Discharge Valve Closure Assumption	N/A
f.	Pressure Rule	A
g.	Increased CCFL Differential Pressure	A
	Estimated Effect on MAPLHGR	-8%

2. Beneficial Model Improvements

a.	Reflood 04	A
b.	Partial Drill	N/A
c.	Chaste 05	A

Estimated Effect on MAPLHGR	
7x7 (Exposure ≤ 12500 MWd/t)	+1%
7x7 (Exposure > 12500 MWd/t)	+4%
8x8 (All Exposures)	+1%

Total Effect on MAPLHGR	
7x7 (Exposure ≤ 12500 MWd/t)	-7%
7x7 (Exposure > 12500 MWd/t)	-4%
8x8 (All Exposures)	-7%

QUAD CITIES 1/2

1. ECCS Input Changes and Detrimental Model Changes

a.	New Suction Break Area (4.18 ft^2)	A
b.	Vaporization Calculation	A
c.	Eliminate Structural Absorbtion Double Credit	A
d.	Credit for Suction Line Friction	N/A
e.	Others	
	i. Reactor Internals Thermal Characteristics	A
	ii. Bypass Area Adjustment	A
	iii. Discharge Valve Closure Assumption	N/A
f.	Pressure Rule	A
g.	Increased CCFL Differential Pressure	A
	Estimated Effect on MAPLHGR	-8%

2. Beneficial Model Improvements

a.	Reflood 04	A
b.	Partial Drill	N/A
c.	Chaste 05	A

Estimated Effect on MAPLHGR	
7x7 (Exposure ≤ 12500 MWd/t)	+1%
7x7 (Exposure > 12500 MWd/t)	+4%
8x8 (All Exposures)	+1%

Total Effect on MAPLHGR	
7x7 (Exposure ≤ 12500 MWd/t)	-7%
7x7 (Exposure > 12500 MWd/t)	-4%
8x8 (All Exposures)	-7%

PLANT: A

FUEL TYPE: Initial (7x7)
MAPLHGR ADJUSTMENT: INPUT CHANGES (-6%)

PCT ADJUSTMENT: 20°F=1% POWER
MODEL CHANGES (+1%≤12.5GWd/t(+4%>12.5GWd/t)
CCFL-ΔP (-2%)

EXPOSURE MWD/T	CURRENT MAPLHGR	T/S PCT	INPUT CHANGES + CCFL (ΔP) + MODEL CHANGES MAPLHGR	PCT
200	13.4	2200	12.4	2200
1000	13.8	2200	12.8	2200
5000	14.4	2200	13.3	2200
10000	14.5	2200	13.4	2200
15000	13.5	2200	12.9	2200
25000	13.2	2200	12.6	2200
30000	12.1	1950	12.1	2030

FUEL TYPE: 7D230
MAPLHGR ADJUSTMENT: INPUT CHANGES (-6%)

PCT ADJUSTMENT: 20°F=1% POWER
MODEL CHANGES (+1%≤12.5GWd/t)(+4%>12.5GWd/t)
CCFL-ΔP (-2%)

EXPOSURE MWD/T	CURRENT MAPLHGR	T/S PCT	INPUT CHANGES + CCFL (ΔP)+ MODEL CHANGES MAPLHGR	PCT
200	13.8	2200	12.8	2200
1000	14.0	2200	13.0	2200
5000	14.4	2200	13.3	2200
10000	14.3	2200	13.2	2200
15000	13.0	2200	12.4	2200
20000	12.7	2200	12.1	2200
25000	12.6	2200	12.0	2200
30000	12.7	2200	12.1	2200

PLANT: A (Cont.)

FUEL TYPE: CD250
MAPLHGR ADJUSTMENT: INPUT CHANGES (-6%)

PCT ADJUSTMENT: 20°F=1% POWER
MODEL CHANGES +1%
CCFL-ΔP (-2%)

EXPOSURE MWD/T	CURRENT MAPLHGR	T/S PCT	INPUT CHANGES + CCFL (ΔP) + MODEL CHANGES MAPLHGR	PCT
200	11.1	2170	10.4	2200
1400	11.3	2200	10.5	2200
5000	11.7	2200	10.8	2200
11200	12.0	2200	11.1	2200
15000	11.9	2200	11.0	2200
25000	11.6	2200	10.7	2200
30000	11.0	2100	10.7	2200

FUEL TYPE: BD262
MAPLHGR ADJUSTMENT: INPUT CHANGES (-6%)

PCT ADJUSTMENT: 20°F=1% POWER
MODEL CHANGES (+1%)
CCFL-ΔP (-2%)

EXPOSURE MWD/T	CURRENT MAPLHGR	T/S PCT	INPUT CHANGES + CCFL (ΔP)+ MODEL CHANGES MAPLHGR	PCT
200	11.1	2060	11.1	2200
2000	11.4	2200	10.6	2200
5000	11.7	2200	10.8	2200
11200	12.0	2200	11.1	2200
15000	12.0	2200	11.1	2200
25000	11.6	2200	10.7	2200
30000	10.5	2030	10.5	2170

PLANT: B

FUEL TYPE: Initial (7x7)
MAPLHGR ADJUSTMENT: INPUT CHANGES (-6%)

PCT ADJUSTMENT: 20°F=1% POWER
MODEL CHANGES (+1%<12.5GWd/t)(+4%>12.5GWd/t)
CCFL-ΔP (-2%)

EXPOSURE MWD/T	CURRENT MAPLHGR	T/S PCT	INPUT CHANGES + CCFL (ΔP) + MODEL CHANGES MAPLHGR	PCT
0	13.5	2200	12.5	2200
5000	14.6	2200	13.5	2200
12500	14.1	2200	13.1	2200
22500	13.2	2200	12.6	2200
30000	12.5	2120	12.5	2200

FUEL TYPE: 7D230, 8D250, 8D262
MAPLHGR ADJUSTMENT: INPUT CHANGES

PCT ADJUSTMENT: 20°F=1% POWER
MODEL CHANGES
CCFL-ΔP

EXPOSURE MWD/T	CURRENT MAPLHGR	T/S PCT	INPUT CHANGES + CCFL (ΔP) + MODEL CHANGES MAPLHGR	PCT

7D230, 8D250, 8D262

Same as Plant A

PLANT: C

FUEL TYPE: EEI-Pu (7x7)
MAPLHGR ADJUSTMENT: INPUT CHANGES (-6%)

PCT ADJUSTMENT: 20°F=1% POWER
MODEL CHANGES (+1%<12.5GWd/t)(+4%>12.5GWd/t)
CCFL-ΔP (-2%)

EXPOSURE MWD/T	CURRENT MAPLHGR	T/S PCT	INPUT CHANGES + CCFL (ΔP) + MODEL CHANGES MAPLHGR	PCT
200	13.5	2200	12.5	2200
1000	13.8	2200	12.8	2200
5000	14.2	2200	13.2	2200
10000	12.9	2200	11.9	2200
15000	12.1	2200	11.6	2200
20000	11.9	2200	11.4	2200
25000	11.8	2200	11.3	2200
30000	11.9	2200	11.4	2200

FUEL TYPE: Initial, 7D230, 8D250, 8D262
MAPLHGR ADJUSTMENT: INPUT CHANGES

PCT ADJUSTMENT: 20°F=1% POWER
MODEL CHANGES
CCFL-ΔP

EXPOSURE MWD/T	CURRENT MAPLHGR	T/S PCT	INPUT CHANGES + CCFL (ΔP)+ MODEL CHANGES MAPLHGR	PCT

Initial, 7D230, 8D250, 8D262

Same as Plant A

PLANT: D

FUEL TYPE: All
MAPLHGR ADJUSTMENT: INPUT CHANGES (-6%)

PCT ADJUSTMENT: 20°F=1% POWER
MODEL CHANGES (+1%≤12.5GWd/t)(+4%>12.5GWd/t)
CCFL-ΔP (-2%)

EXPOSURE MWD/T	CURRENT MAPLHGR	T/S PCT	INPUT CHANGES + CCFL (ΔP) + MODEL CHANGES MAPLHGR	PCT
Initial, 8D250, 8D262				
Same as Plant A				