Docket Nos. 50-237, 50-249

MAR 11 1977

Commonwealth Edison Company
ATTN: Mr. R. L. Bolger
Assistant Vice President
Post Office Box 767
Chicago, Illinois 60690

Gentlemen:

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RE: DRESDEN NUCLEAR POWER STATION UNIT NOS. 2 AND 3

The enclosed Order of Modification pertains to Facility Operating License Nos. DPR-19 and DPR-25 issued for Dresden Nuclear Power Station Unit Nos. 2 and 3. The Order corrects errors and reflects changes in the methods of analysis in the ECCS performance evaluation submitted in accordance with 10 CFR § 50.46.

The errors detected were of the nature of inputs to computer codes used in the analyses or were due to numerical errors in the calculations performed. The total impact of the errors and model changes requires that the maximum average planar linear heat generation rate (MAPLHGR) be reduced by approximately 7% for 7 x 7 fuel at burnups less than 12,500 megawatt days per ton, 4% for 7 x 7 fuel at burnups greater than 12,500 megawatt days per ton, and 7% for 8 x 8 fuel at all burnups.

This Order confirms the appropriateness of the reduction in MAPLHGR limits instituted by Commonwealth Edison on February 14, 1977, for Dresden Unit Nos. 2 and 3, when informed of these errors by NRC. The Order changes the Technical Specifications appended to Facility Operating License Nos. DPR-19 and DPR-25 to reflect and implement the reductions that you have previously made on a voluntarily basis and requires that you submit a re-evaluation of your ECCS performance as soon as possible with the errors corrected, using a General Electric ECCS evaluation model approved by the staff.

A copy of the Order is being filed with the Office of the Federal Register for publication.

Sincerely,

Original Signed by:

Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors

See Quad-Cities 2	See Quad-Cities 2			NRR:D/DIR	NRR:DIR
DOR:AD/OR	DOR:AD/OT	DOR:DIR		ECase	BRusche
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SURNAME	Proposed Tech Spec for Modification of License	3/10/77	3/10/77	3/10/77	3/11/77	3/ /77
DATE						

NRC FORM 318 (9-76) NRCM 0240

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—626-624

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Chicago, Illinois 60604

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
Commonwealth Edison Company	)	Docket Nos. 50-237, 50-249
	)	
Dresden Nuclear Power Station Unit Nos. 2 and 3	)	

ORDER FOR MODIFICATION OF LICENSE

I.

The Commonwealth Edison Company (the licensee), is the holder of Facility Operating License Nos. DPR-19 and DPR-25 which authorize the operation of the nuclear power reactors known as Dresden Nuclear Power Station Unit Nos. 2 and 3 (the facilities) at steady state reactor power levels not in excess of 2527 megawatts thermal (rated power). The facilities consist of a boiling water reactor (BWR) located at the licensee's site near Morris, Illinois.

II.

In conformance with evaluations of the performance of the Emergency Core Cooling System (ECCS) of the facilities submitted by the licensee on May 5, 1975, and July 1, 1975, with subsequent supplements thereto, and a supplement dated March 15, 1976, and August 23, 1976, for Unit Nos. 2 and 3, respectively, the Technical Specifications issued for the facility on October 23, 1976, limit the Average Planar Linear Heat Generation Rates to the values shown on Technical Specification Figures 3.5-1-A and 3.5-1-B for Dresden Unit No. 2 and Figures 3.5.1-1 and 3.5.1-2 for Dresden Unit No. 3. The ECCS performance evaluation submitted by the licensee was based upon

an ECCS evaluation model developed by General Electric Company (General Electric), the designer of the facility. The General Electric ECCS Evaluation model had been previously found to conform to the requirements of the Commission's ECCS Acceptance Criteria, 10 CFR Part 50 § 50.46 and Appendix K. The evaluation indicated that with the average planar linear heat generation rate limited as set forth above, and with the other limits set forth in the facilities' Technical Specifications, the ECCS cooling performance for the facilities would conform with the criteria contained in 10 CFR § 50.46(b) which govern calculated peak clad temperature, maximum cladding oxidation, maximum hydrogen generation, coolable geometry and long term cooling.

Recently, the NRC staff was informed by General Electric that several errors had been discovered in the computer codes used to calculate peak clad temperature and the clad oxidation percentage in the General Electric ECCS evaluation model. These errors have been discovered by General Electric during a continuing internal Quality Assurance (QA) audit of their LOCA evaluation model codes. The additional effort expended by the vendor to enhance the assurance of the quality of its evaluation model, the staff believes, was prudent and desirable. This audit is still under way and the errors reported reflect those found to date. Identification of additional errors of a minor nature may still develop during the ongoing QA checks. Nonetheless, the staff believes it appropriate to order the correction of those uncovered thus far. While some of these errors discussed herein have either no significant effect or a conservative effect on the evaluation results, one or more of the errors included in the Dresden ECCS evaluation leads to nonconservative values. Based on preliminary assessment, including information and supportive calculations by General Electric, the NRC staff has determined

that the combined effect of the following code errors, when corrected, could produce ECCS evaluation results which would require a reduction in operating limits for Dresden Unit Nos. 2 and 3.

(1) Pressure Rule

The LAMB code is used to calculate system pressure during the LOCA. This calculated pressure is then used as an input to the REFLOOD code which calculates the water level vs time relationship in the core. General Electric used an approximation of the pressure response of the LAMB code that was thought, at the time of approval, to be an acceptable representation of the physical phenomena involved. Later application of this approximation to certain cases showed it to be non-conservative. General Electric proposes to correct this nonconservatism by utilizing a conservative approximation to the pressure rule for input into REFLOOD. This correction increases reflood time by 0 to 50 seconds and decreases MAPLHGR by 0 to 5%.

(2) Bundle Vaporization

General Electric has used incorrect coefficients in the calculation of the amount of vaporization occurring during core spray. The vapor formation in the bundle is a prime determinant of the amount of spray water that can get through the upper tie plate and reflood the core. The vapor formation was under-calculated by approximately 4% resulting in a 20-second increase in reflooding time and about a 2% decrease in the MAPLHGR.

(3) Discharge Break Modeling

General Electric proposes to take credit for an approved model for suction line friction (from the vessel nozzle to the discharge side of the

recirculation pump) that improves reflooding time for the discharge break by approximately 15 seconds. This increases the MAPLHGR for discharge break limited plants by about 1.5%.

(4) Structural Absorption of Gamma Heat

General Electric has erroneously taken double credit for power generation in non-fuel structural material. Correction of this error results in approximately a 4% decrease in the MAPLHGR for Dresden Unit Nos. 2 and 3.

(5) Increased Counter Current Flow Limiting (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. Correction of this error reduces the Dresden MAPLHGR by 2%.

(6) Others

Several small changes of inputs to the evaluation codes were identified as being necessary to correct errors. They included:

(a) The use of actual plant specific break areas for the LOCA;

(b) A reduced core plate weight;

(c) An increase in the peripheral bypass area used in the counter current flooding calculations;

(d) The correction of a decimal point error in the assumed guide tube thickness; and

(e) Credit is no longer assumed for recirculation loop discharge valve closure during blowdown.

Due to the above errors in the ECCS analysis currently approved by NRC for Dresden Station Unit Nos. 2 and 3, the staff requested the licensee

to submit an estimate of the impact of these errors on the peak clad temperature that would result from the worst break, if the errors were corrected. The revised ECCS calculations indicated that the MAPLHGR should be reduced by approximately 8% to accommodate the cumulative effect of these errors. On the other hand, the NRC staff is currently reviewing General Electric's most recent ECCS model revisions some of which have effects offsetting such a reduction. These revisions included:

(1) CHASTE 04 Computer Code Change

The CHASTE code has been modified to incorporate an improved conduction solution for the calculation of fuel rod temperatures and more detailed evaluation of view factors for calculation of rod to rod radiation of heat.

(2) Reflood 05 Computer Code Revision

The REFLOOD code was modified to correct a logic error in the evaluation of the flow split between the core and the jet pumps. This logic error only occurred for certain plant calculations and determined the fraction of steam used to evaluate the counter current flow limiting phenomenon which limits the penetration of spray cooling water into the lower plenum and therefore increase the reflood time for the core.

(3) Partially Drilled Core Credit

The partial drilling correction gives credit for additional flow paths provided by drilling holes in the bottom nozzle of the fuel assemblies. This additional flow area enhances the refill of the lower plenum by spray cooling water following the postulated Loss-of-Coolant Accident and results in a faster core reflood which reduces peak clad temperatures.

Although the entire group of model changes is still under review, the staff has completed its review of the CHASTE and REFLOOD changes and has concluded that they may be used in GE's ECCS performance evaluation model. While revised computer runs incorporating these changes in the model as a whole have not yet been run for a spectrum of break for all plants, the parametric studies performed by GE to determine the effect of these changes demonstrate that they will in turn result in changes of at least a 1% MAPLHGR increase for 7 x 7 fuel assemblies up to 12,500 MWD/T, a 4% increase for 7 x 7 fuel assembly at fuel burnups greater than 12,500 MWD/T, and a 1% MAPLHGR increase for 8 x 8 fuel assemblies at all burnups. These values may be used to offset the reductions discussed above.

These parametric studies and calculational runs for typical boiling reactor models demonstrate that the reduction of the Dresden facilities MAPLHGR, as set forth in Appendix A will conservatively assure that calculated peak clad temperatures in the event of postulated loss-of-coolant accidents would not exceed 2200° F and that the other criteria of 10 CFR §§ 50.46(b) will be satisfied. Operation of the facility would nevertheless be technically in non-conformance with the requirements of § 50.46 in that specific computer runs for the particular facility employing the revised model as a complete entity will not be complete for some time. However, the limitations on MAPLHGR set forth herein will assure that the ECCS system will conform to the performance criteria of § 50.46. Accordingly, while the actual computer runs for the specific facility are carried out to achieve full compliance with 10 CFR § 50.46, operation of the facilities will not endanger life or property or the common defense and security.

Upon notification by the NRC staff on January 14, 1977, the licensee promptly modified the plant setpoints to reduce its Maximum Average Planar Linear Heat Generator Rate by 6% to accommodate the effect of the errors and changes in the General Electric evaluations. The licensee again reduced the Dresden MAPLHGRs by an additional 2% to accommodate the effect of the CCFL error on February 18, 1977. The staff believes that the licensee's action under the circumstances is appropriate and that this action should be confirmed by NRC order.

III.

Copies of the following documents are available for inspection at the Commission's Public Document Room at 1717 H Street, Washington, D. C. 20555 and are being placed in the Commission's local publiic document room at the Morris Public Library, 604 Liberty Street, Morris, Illinois 60451:

(1) Letters from General Electric to NRC dated February 14, 1977, and January 26, 1977;

(2) Letters from Commonwealth Edison Company to the Director of Nuclear Reactor Regulation dated January 19, 1977, and February 18, 1977;

(3) Letters dated May 5, 1975, and July 1, 1975, from Commonwealth Edison Company to NRC and supplements thereto dated March 15, 1976, and August 23, 1976;

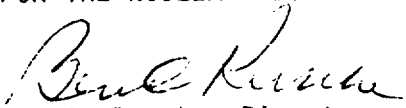
(4) This Order for Modification of License in the matter of Commonwealth Edison Company (Dresden Nuclear Power Station Unit Nos. 2 and 3).

Accordingly, pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's Rules and Regulations in 10 CFR Parts 2 and 50, IT IS ORDERED THAT Facility Operating License Nos. DPR-19 and DPR-25 are hereby amended by adding the following new provisions:

(1) As soon as possible, the licensee shall submit a re-evaluation of ECCS cooling performance calculated in accordance with General Electric Company's Evaluation Model approved by the NRC staff and corrected for the errors described herein and any other corrections in the Model of which the licensee is aware at the time the calculations are performed;

(2) Until further authorization by the Commission, the reactor shall be operated with the Maximum Average Planar Linear Heat Generation Rates specified in Appendix A to this Order.

FOR THE NUCLEAR REGULATORY COMMISSION



Ben C. Rusche, Director
Office of Nuclear Reactor Regulation

Appendix A -
Corrected MAPLHGR Values

Dated in Bethesda, Maryland
this 11th day of March, 1977.

APPENDIX A

DRESDEN STATION UNIT NO. 2

CORRECTED MAPLHGR VALUES

Fuel Type: Initial (7 x 7)

Exposure MWD/T	MAPLHGR
200	12.4
1000	12.8
5000	13.3
10000	13.4
15000	12.9
25000	12.6
30000	12.1

Fuel Type: 7D 230

Exposure MWD/T	MAPLHGR
200	12.8
1000	13.0
5000	13.3
10000	13.2
15000	12.4
20000	12.1
25000	12.0
30000	12.1

Fuel Type: 8D 250

Exposure MWD/T	MAPLHGR
200	10.4
1400	10.5
5000	10.8
11200	11.1
15000	11.0
25000	10.7
30000	10.7

Fuel Type: 8D 262

Exposure MWD/T	MAPLHGR
200	11.1
2000	10.6
5000	10.8
11200	11.1
15000	11.1
25000	10.7
30000	10.5

APPENDIX A

DRESDEN STATION UNIT NO. 3

CORRECTED MAPLHGR VALUES

Fuel Type: Initial (7 x 7)

Exposure MWD/T	MAPLHGR
0	12.5
5000	13.5
12500	13.1
22500	12.6
30000	12.5

Fuel Type: 7D 230

Exposure MWD/T	MAPLHGR
200	12.8
1000	13.0
5000	13.3
10000	13.2
15000	12.4
20000	12.1
25000	12.0
30000	12.1

Fuel Type: 8D 250

Exposure MWD/T	MAPLHGR
200	10.4
1400	10.5
5000	10.8
11200	11.1
15000	11.0
25000	10.7
30000	10.7

Fuel Type: 8D 262

Exposure MWD/T	MAPLHGR
200	11.1
2000	10.6
5000	10.8
11200	11.1
15000	11.1
25000	10.7
30000	10.5