

MAR 1 1 1977

Docket No. 50-278

Philadelphia Electric Company
ATTN: Mr. Edward G. Bauer, Jr., Esquire
Vice President and General Counsel
2301 Market Street
Philadelphia, Pennsylvania 19101

Gentlemen:

RE: PEACH BOTTOM ATOMIC POWER STATION UNIT NO. 3

DISTRIBUTION

Docket
NRC PDR
Local PDR
ORB #3 Reading
BRusche
ECase
KRGoller
TJCarter
DLZiemann
GLear
KParrish
TVerdery
DJAffe
OELD
OI&E (3)
BJones
BScharf (10)
DEisenhut
OPA - Clare Miles
JRBuchanan
TBAbernathy
ACRS (16)
WMcDonald

The enclosed Exemption pertains to Facility Operating License No. DPR-56 issued for Peach Bottom Atomic Power Station Unit No. 3. The Exemption identifies errors and proposed 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 is conservative and no reduction of plant operating limits is required to accommodate the presence of the errors.

This Exemption confirms the appropriateness of Philadelphia Electric's voluntary action of agreeing to submit, on a timely basis, an ECCS re-evaluation using a General Electric ECCS evaluation model approved by the staff, and permits operation of the facility during the interim period while the required calculations are carried out.

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

Sincerely,

Original signed by

George Lear, Chief
Operating Reactors Branch #3
Division of Operating Reactors

NOTE: SEE ATTACHED YELLOW FOR
PREVIOUS CONCURRENCES.

Enclosure:
Exemption

cc w/enclosure:

See next page

DOR:AD/OT
VStello
3/11/77

DOR:AD/OT
DEisenhut
3/11/77

NRR:D/DIR
ECase
3/11/77

NRR:D/DIR
BRusche
3/11/77

OFFICE >	DOR:ORB #3	DOR:ORB #3	DOR:ORB #2	OELD	DOR:ORB #3	DOR:AD/OR
SURNAME >	CParrish	TVerdery	PO'Connor	<i>[Signature]</i>	GLear	KRGoller
DATE >	3/11/77	3/11/77	3/10/77	3/11/77	3/11/77	3/10/77

Docket No. 50-278

Philadelphia Electric Company
ATTN: Mr. Edward G. Bauer, Jr., Esquire
Vice President and General Counsel
2301 Market Street
Philadelphia, Pennsylvania 19101

Gentlemen:

RE: PEACH BOTTOM ATOMIC POWER STATION UNIT NO. 3

DISTRIBUTION

Docket	BScharf (10)
NRC PDR	DEisenhut
Local PDR	OPA-Clare Miles
ORB #3 Reading	JRBuchanan
BRusche	TBAbernathy
EGCase	ACRS (16)
KRGoller	WMcDonald, MIPC
TJCarter	
GLear	
KParrish	
JVerdery	
DJAffett	
OELD	
OI&E (5)	
BJones	

The enclosed Exemption pertains to Facility Operating License No. DPR-66 issued for Peach Bottom Atomic Power Station Unit No. 3. The Exemption identifies errors and proposed 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 is conservative and no reduction of plant operating limits is required to accomodate the presence of the errors.

This Exemption confirms the appropriateness of Philadelphia Electric's voluntary action of agreeing to submit, on a timely basis, an ECCS re-evaluation using a General Electric ECCS evaluation model approved by the staff, and permits operation of the facility during the interim period while the required calculations are carried out.

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

Sincerely,

Original signed by

George Lear, Chief
Operating Reactors Branch #3
Division of Operating Reactors

Enclosure:
Exemption

cc w/enclosure:
See next page

DOR:AD/OT
DEisenhut
NRR:DIR
BRusche
3/ 177

OFFICE	DOR:ORB #3	DOR:ORB #3	OELD	DOR:AD/OR	DOR:DIR	NRR:D/DIR
SURNAME	JVerdery:rg	GLear G		KRGoller	VStello	EGCase
DATE	3/17/77	3/10/77	3/ 177	3/ 177	3/10/77	3/ 177

Philadelphia Electric Company

- 2 -

cc:w/enclosure:

Eugene J. Bradley
Philadelphia Electric Company
Assistant General Counsel
2301 Market Street
Philadelphia, Pennsylvania 19101

Troy B. Conner, Jr.
1747 Pennsylvania Avenue, N. W.
Washington, D. C. 20006

Raymond L. Hovis, Esquire
35 South Duke Street
York, Pennsylvania 17401

Warren K. Rich, Esquire
Assistant Attorney General
Department of Natural Resources
Annapolis, Maryland 21401

Philadelphia Electric Company
ATTN: Mr. W. T. Ullrich
Peach Bottom Atomic
Power Station
Delta, Pennsylvania 17314

Mr. R. A. Heiss, Coordinator
Pennsylvania State Clearinghouse
Governor's Office of State Planning
and Development
P. O. Box 1323
Harrisburg, Pennsylvania 17120

Albert R. Steel, Chairman
Board of Supervisors
Peach Bottom Township
R. D. #1
Delta, Pennsylvania 17314

Chief, Energy Systems Analysis Branch (AW-459)
Office of Radiation Programs
U. S. Environmental Protection Agency
Room 645, East Tower
401 M Street, S. W.
Washington, D. C. 20460

U. S. Environmental Protection Agency
Region III Office
ATTN: EIS COORDINATOR
Curtis Building (Sixth Floor)
6th and Walnut Streets
Philadelphia, Pennsylvania 19106

Martin Memorial Library
159 E. Market Street
York, Pennsylvania 17401

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)

Philadelphia Electric Company)

Peach Bottom Atomic Power Station)
Unit No. 3)

Docket No. 50-278

EXEMPTION

I.

The Philadelphia Electric Company (the licensee), is the holder of Facility Operating License No. DPR-56 which authorize the operation of the nuclear power reactor known as Peach Bottom Atomic Power Station Unit No. 3 (the facility) at steady state reactor power levels not in excess of 3253 megawatts thermal (rated power). The facility consists of a boiling water reactor (BWR) located at the licensee's site in Peach Bottom, York County, Pennsylvania.

II.

In accordance with the requirements of the Commission's ECCS Acceptance Criteria 10 CFR § 50.46, the licensee has submitted on November 16, 1976, an ECCS evaluation for proposed operation with a reload containing certain new fuel elements. This evaluation included limits on Average Planar Linear Heat Generation Rates in proposed Technical Specification Figures 3.5-1C and 3.5-1D. 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 s 50.46 and Appendix K. The evaluation indicated that with the average planar linear heat generation rate limited as set forth in the evaluation, and with other limits set forth in the facility's technical specifications, the ECCS cooling performance for the facility 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 mode. These errors have been discovered by General Electric during a continuing internal Quality Assurance 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 be uncovered during the ongoing QA checks.

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 Peach Bottom Unit No. 3 ECCS evaluation leads to nonconservative values. Based on a 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 Peach Bottom Unit No. 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 reduces reflood time by 0 to 50 seconds and increases MAPLHGR by 0 - 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. This error does not apply to Peach Bottom Unit No. 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 Peach Bottom Unit No. 3 MAPLHGR by 1%.

(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 Peach Bottom Unit No. 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 6% 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 breaks for all plants, the parametric studies performed by GE for the effect of these changes demonstrates that they will in turn, when added to the decreases caused by the error corrections, result in no change in the existing MAPLHGR for 7 x 7 fuel assemblies up to 10,500 MWD/ton, and 2% increase for 7 x 7 fuel assemblies at fuel burnups greater than 10,500 MWD/ton, and no change for 8 x 8 fuel assemblies at all burnups.

These parametric studies and calculational runs for typical boiling reactor models demonstrate that the operation with the Peach Bottom facility MAPLHGR, as set forth in the licensee's application dated November 17, 1976, will conservatively assure that calculated peak clad temperatures in the event of postulated cooling 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, operation as proposed in the licensee's application dated November 17, 1976, 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 facility will not endanger life or property or the common defense and security.

In the absence of any safety problem associated with operation of the facility during the period until the computer computations are completed, there appears to be no public interest consideration favoring restriction of the operation of the captioned facility. Accordingly, the Commission had determined that an exemption in accordance with 10 CFR § 50.12 is appropriate. The specific exemption is limited to the period of time necessary to complete computer calculations.

The operating limitations set forth in the licensee's submittal in accordance with 10 CFR § 50.46(a)(iv) are no longer effective. Since that submittal on July 9, 1975, a new core has been proposed for operation having different fuel thermal and hydraulic characteristics, which have necessitated a revised ECCS performance evaluation, and revised ECCS based operating limitations discussed above. Consequently, the procedural requirements of 10 CFR § 50.46(a)(vi) are not applicable to such exemption authorization.

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 public document room at the Martin Memorial Library, 159 E. Market Street, York, Pennsylvania 17401:

- (1) Letters from General Electric to NRC dated February 14, 1977, and January 26, 1977;
- (2) Letters from Philadelphia Electric Company to Mr. George Lear, Operating Reactors Branch #3, dated January 28, 1977, and February 18, 1977;

- (3) Letters dated July 9, 1975, from Philadelphia Electric Company to NRC and supplements thereto dated September 10, 1975, October 1, 24 and 30, 1975, November 18 and 20, 1975, and December 29, 1975; and
- (4) This Exemption in the matter of Philadelphia Electric Company (Peach Bottom Atomic Power Station Unit No. 3).

Wherefore, in accordance with the Commission's regulations as set forth in 10 CFR Part 50, the licensee is hereby granted an exemption from the requirements of 10 CFR § 50.46(a)(i) that ECCS performance be calculated in accordance with an acceptable calculational model which conforms to the provisions in Appendix K, without the errors discussed herein. This exemption is conditioned as follows:

- (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.

FOR THE NUCLEAR REGULATORY COMMISSION

Ben C. Rusche, Director
Office of Nuclear Reactor Regulation

Dated in Bethesda, Maryland
this