DMB 016

December 3, 1984

Docket No. 50-278

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

Dear Mr. Bauer:

SUBJECT: TECHNICAL SPECIFICATION AMENDMENT PERTAINING TO THE OPERATING LIMIT MINIMUM CRITICAL POWER RATIO AND THE THERMAL-HYDRAULIC STABILITY FOR PEACH BOTTOM, UNIT 3

The Commission has issued the enclosed Amendment No. 107 to Facility Operating License No. DPR-56 for the Peach Bottom Atomic Power Station, Unit 3. This amendment consists of Technical Specification (TS) changes to the operating Limit Minimum Critical Power Ratio, added restrictions to operation in regions of potential thermal-hydraulic instability and new surveillance requirements and corrective actions for neutron flux noise and core plate differential pressure noise. These changes were proposed in your amendment application dated May 30, 1984, as amended by letters dated August 24, 1984, and September 27, 1984.

This amendment will permit operation with increased core flows and decreased feedwater temperatures during the remainder of Cycle 6 operation for Unit 3. This amendment will also provide restrictions in operation in regions of potential core thermal-hydraulic instability and provide surveillance and corrective actions under conditions of marginal stability. Peach Bottom Atomic Power Station, Unit 3, presently is restricted from single loop operation at thermal power greater than 50% of the rated thermal power. This amendment will permit the removal of this restriction after the enclosed thermal-hydraulic TSs are implemented.

A copy of the Safety Evaluation is enclosed. Notice of Issuance will be included in the Commission's next monthly Federal Register notice.

Sincerely,

"ORIGINAL SIGNED BY:"

Gerald E. Gears, Project Manager
Operating Reactors Branch #4
Division of Licensing

Enclosures:
1. Amendment No. 107
2. Safety Evaluation

cc w/enclosures:
See next page

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RIngram	GGears;cf	JStolz	JKudrick	LPhillips	D. GRAY
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Philadelphia Electric Company

cc w/enclosure(s):

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

PHILADELPHIA ELECTRIC COMPANY
PUBLIC SERVICE ELECTRIC AND GAS COMPANY
DELMARVA POWER AND LIGHT COMPANY
ATLANTIC CITY ELECTRIC COMPANY

DOCKET NO. 50-278

PEACH BOTTOM ATOMIC POWER STATION, UNIT NO. 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 107
License No. DPR-56

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Philadelphia Electric Company, et al. (the licensee) dated May 30, 1984, as supplemented by letters dated August 24, 1984, and September 27, 1984, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-56 is hereby amended to read as follows:

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Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 107, are hereby incorporated in the license. PECO shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

John F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: December 3, 1984

ATTACHMENT TO LICENSE AMENDMENT NO. 107

FACILITY OPERATING LICENSE NO. DPR-56

DOCKET NO. 50-278

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages. The revised pages are identified by Amendment number and contain a vertical line indicating the area of change.

Remove	Insert
iv	iv
10	10
133d	133d
133e	133e
142a	142a
149	149
--	149a
--	149b
--	149c
160	160
--	164d

LIST OF FIGURES

2.1.A (Cont'd)

In the event of the operation with a maximum fraction of limiting power density (MFLPD) greater than the fraction of rated power (FRP), the setting shall be modified as follows.

$$S \leq (0.66\,W + 54\% - 0.66\,\Delta W)\left(\frac{FRP}{MFLPD}\right)$$

where,

FRP = fraction of rated thermal power (3293 MWt)

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

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--When the reactor mode switch is in the STARTUP position, the APRM scram shall be set at less than or equal to 15 percent of rated power.

3. IRM--The IRM scram shall be set at less than or equal to 120/125 of full scale.

Table 3.5.K.2

OPERATING LIMIT MCPR VALUES
FOR VARIOUS CORE EXPOSURES*

Fuel Type	MCPR Operating Limit For Incremental Cycle Core Average Exposure**	
	BOC to 2000 MWD/t Before EOC	2000 MWD/t before EOC To EOC
PTA & P8X8R	1.26	1.28
LTA	1.26	1.28

* If requirement 4.5.K.2.a is met.

** These values shall be increased by 0.01 for single loop operation.

Table 3.5.K.3

OPERATING LIMIT MCPR VALUES
FOR VARIOUS CORE EXPOSURES*

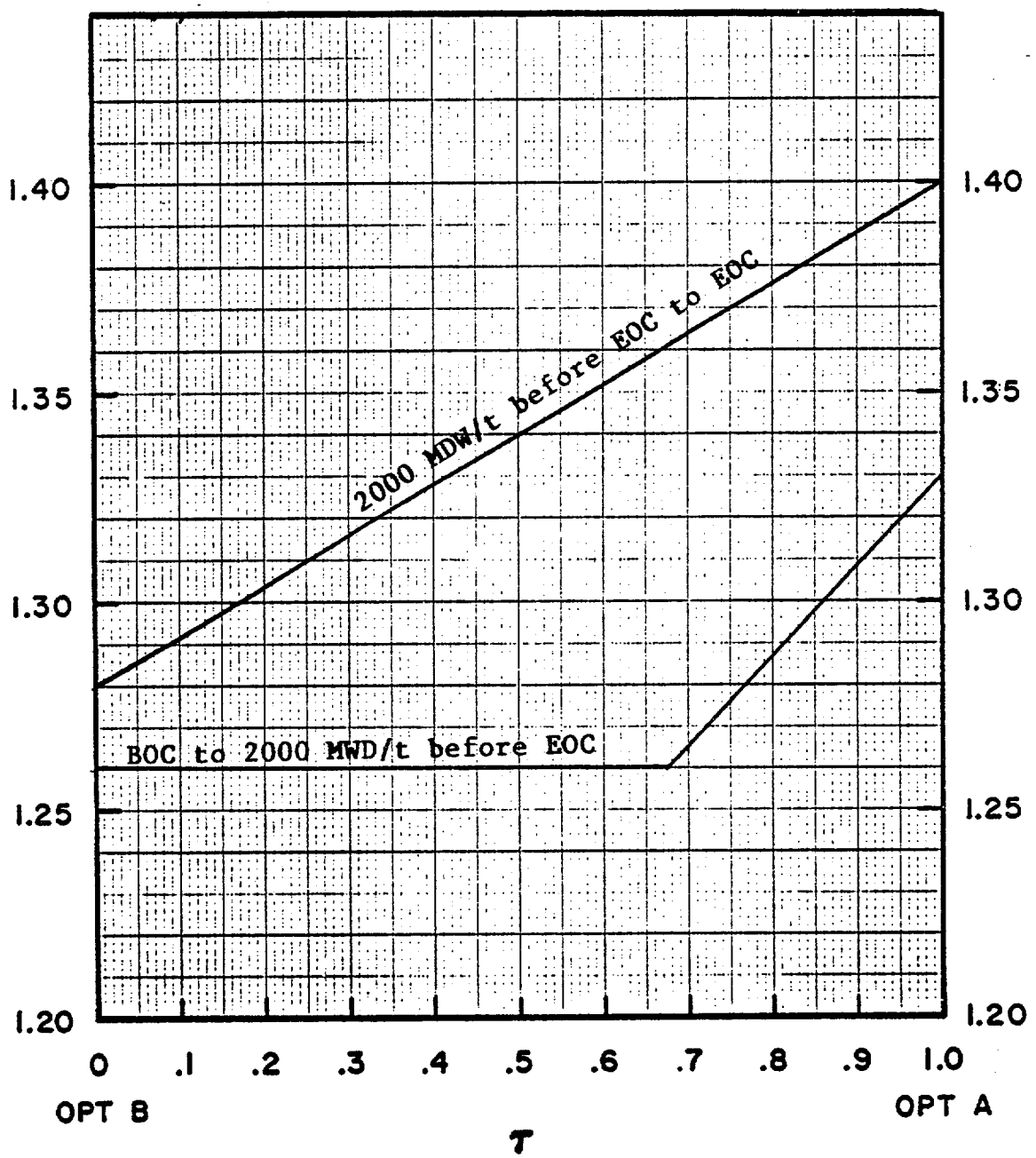
Fuel Type	MCPR Operating Limit For Incremental Cycle Core Average Exposure**	
	BOC to 2000 MWD/t Before EOC	2000 MWD/t before EOC To EOC
PTA & P8X8R	1.33	1.40
LTA	1.33	1.40

* If surveillance requirement of section 4.5.K.2 is not performed.

** These values shall be increased by 0.01 for single loop operation.

FIGURE 3.5.K.2 MCPR OPERATING LIMIT vs τ

FUEL TYPE PTA & P8X8R



LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.6.F RECIRCULATION PUMPS	4.6.F RECIRCULATION PUMPS
1. Following one-pump operation, the discharge valve of the low speed pump may not be opened unless the speed of the faster pump is less than 50% of its rated speed.	1. Establish baseline APRM and LPRM neutron flux noise values for each operating mode at or below the thermal power specified in Figure 3.6.5 (Line A) for the regions for which monitoring is required (Specification 3.6.F.6, Regions 1,2 or 4) within 2 hours of entering the region for which monitoring is required unless baselining has previously been performed since the last refueling outage.
2. The requirements applicable to single loop operation as identified in sections 1.1.A, 2.1.A, 2.1.B, 3.5.I & 3.5.K shall be in effect within 24 hours following the removal of one recirculation loop from service, or the unit placed in the Hot Shutdown conditions.	2. Establish a baseline core plate differential pressure noise value at or below the thermal power specified in Figure 3.6.5 (Line A) and at a total core flow less than or equal to 45% of rated core flow for the regions for which monitoring is required (Specification 3.6.F.7, Regions 2 or 3) within 2 hours of entering the region for which monitoring is required unless baselining has previously been performed since the last refueling outage.
3. Whenever the reactor is in the startup or run modes, two reactor coolant system recirculation loops shall be in operation, except as specified in 3.6.F.4, 3.6.F.5, 3.6.F.6, and 3.6.F.7 below, with: a. Total core flow greater than or equal to 45% of rated core flow, or b. Thermal Power less than or equal to the limit specified in Figure 3.6.5 (Line A).	
4. With only one reactor coolant system recirculation loop operating, immediately initiate action to reduce thermal power and be below the limit specified in Figure 3.6.5 (Line A) or increase core flow to greater than or equal to 45% of rated core flow.	

LIMITING CONDITION FOR OPERATION

3.6.F RECIRCULATION PUMPS

5. With no reactor coolant system recirculation loops in operation, immediately initiate action to reduce Thermal Power to less than or equal to the limit specified in Figure 3.6.5 (Line A) and if a recirculation loop cannot be returned to service initiate measures to place the unit in Hot Shutdown within the next 12 hours.

6. With two reactor coolant system recirculation loops in operation and total core flow less than 45% of rated core flow and Thermal Power greater than the limit specified in Figure 3.6.5 (Line A) (Region 1), or with only one reactor coolant system recirculation loop operating and the Thermal Power greater than the limit specified in Figure 3.6.5 (Line A) (Regions 1 or 2) or total core flow less than 45% of rated core flow with Thermal Power greater than 35% of Rated Thermal Power (Regions 1 or 4):

   a. Determine the APRM and LPRM noise levels:

      1) Within 1 hour after entering the region for which monitoring is required and at least once per 24 hours, and

      2) Within 1 hour after the completion of a Thermal Power increase of at least 5% of Rated Thermal Power.

   b. With the APRM or LPRM neutron flux noise levels greater than 5% and three times their established baseline noise levels, immediately initiate corrective action to restore the noise levels to within

SURVEILLANCE REQUIREMENTS

4.6.F RECIRCULATION PUMPS

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.6.F RECIRCULATION PUMPS	4.6.F RECIRCULATION PUMPS

the required limits within 2 hours, or reduce thermal power at a rate which would bring the reactor to the hot shutdown condition within the next 12 hours, unless the noise levels are restored within the required limits during this period. Detector levels A and C of one LPRM string per core octant plus detectors A and C of one LPRM string in the center of the core should be monitored.

7. With one reactor coolant system recirculation loop in operation and total core flow greater than 45% of rated core flow (Regions 2 or 3):

   a. Determine the core plate differential pressure noise level:

      1) At least once per 24 hours, and

      2) Within one hour after completion of a core flow increase of at least 5% of rated core flow.

   b. With the core plate differential pressure noise level greater than 1 psi and 1.5 times the established baseline noise level, immediately initiate corrective action to restore the noise level to within the required limits within 2 hours or reduce core flow to less than 45% of rated core flow.

LIMITING CONDITION R OPERATION	SURVEILLA E REQUIREMENTS
3.6.G STRUCTURAL INTEGRITY	4.6.G STRUCTURAL INTEGRITY
The structural integrity of of the primary system boundary shall be maintained at the level required by the original acceptance standards throughout the life of the station. The reactor shall be maintained in a Cold Shutdown condition until each indication of a defect has been investigated and evaluated.	The non-destructive inspections listed in Table 4.6.1 shall be performed as specified. The results obtained from compliance with the specification will be evaluated after 5 years and the conclusions of this evaluation will be reviewed with the NRC.

3.6.F & 4.6.F BASES

Requiring the discharge valve of the lower speed loop to remain closed until the speed of faster pump is below 50% of its rated speed provides assurance when going from one to two pump operation that excessive vibration of the jet pump risers will not occur.

Operation with one recirculation loop in service is permitted. In such instances, the designated adjustments for APRM rod block and scram setpoints, RBM setpoint, MCPR fuel cladding integrity safety limit, MCPR operating limits, and MAPLHGR limits are required.

Thermal power and core flow limitations are prescribed in accordance with General Electric Service Information Letter No. 380, rev. 1, "BWR Core Thermal Hydraulic Stability," dated 2/10/84.

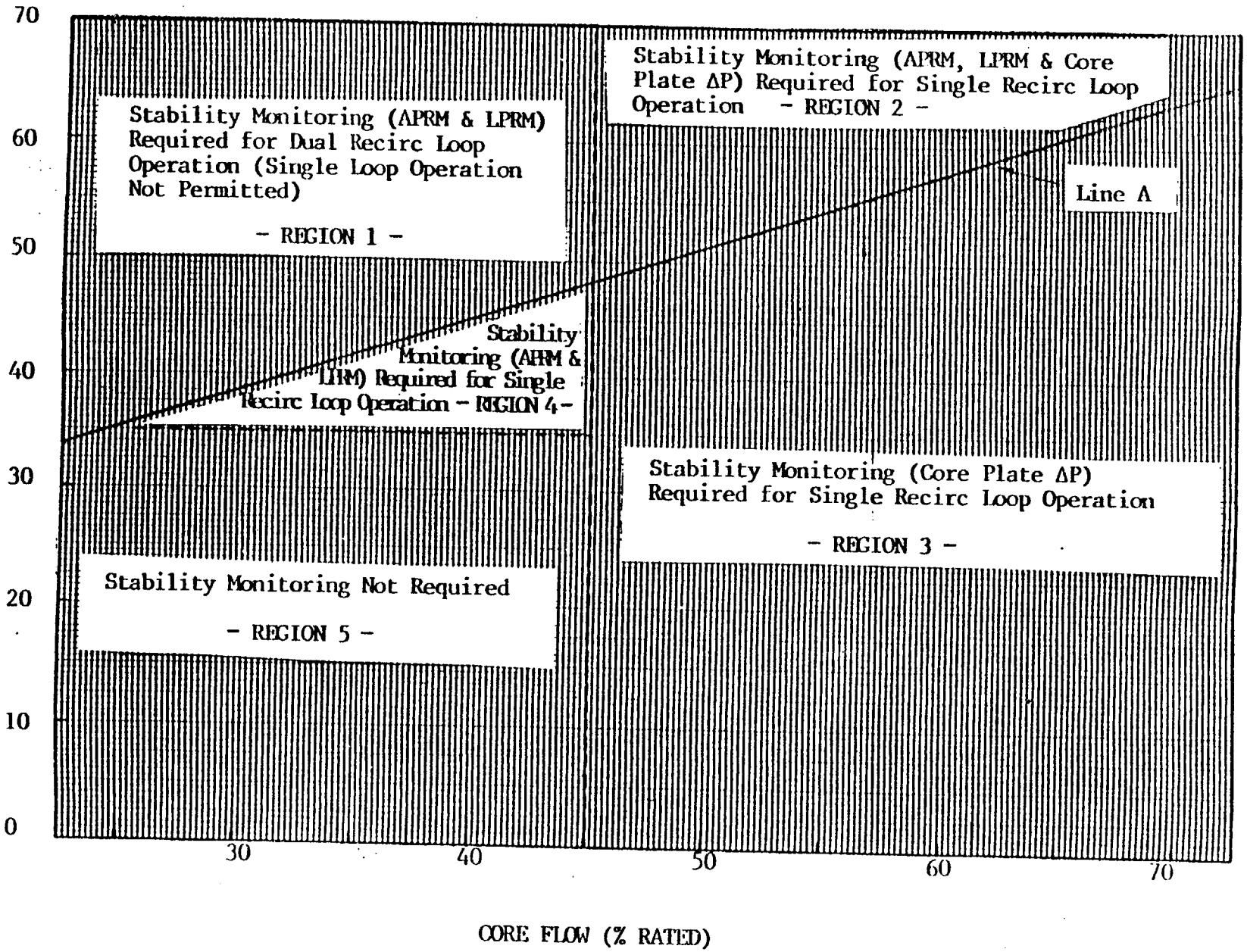
Neutron flux noise limits are established to ensure early detection of limit cycle neutron flux oscillations. BWR cores typically operate with neutron flux noise caused by random boiling and flow noise. Typical neutron flux noise levels of 1 to 12% of rated power (peak-to-peak) have been reported for the range of low to high recirculation loop flow during both single and dual recirculation loop operation. Neutron flux noise levels significantly larger than these values are considered in the thermal/mechanical fuel design and are found to be of negligible consequence, and in compliance with stability licensing criteria. In addition, stability tests at operating BWR's have demonstrated that when stability related neutron flux limit cycle oscillations occur they result in peak-to-peak neutron flux limit cycles 5 to 10 times the typical values. Therefore, actions taken to reduce neutron flux noise levels exceeding three (3) times the typical value are sufficient to ensure early detection of limit cycle neutron flux oscillations.

Data to establish baseline APRM and LPRM neutron flux noise values is obtained at or below the power specified in Figure 3.6.5 for use in monitoring noise levels during operation in the region for which monitoring is required.

FIGURE 3.6.5

THERMAL POWER AND CORE FLOW LIMITS OF

SPECIFICATIONS 3.6.F.3, 3.6.F.4, 3.6.F.5, 3.6.F.6 and 3.6.F.7



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION SUPPORTING

AMENDMENT NO. 107 TO FACILITY OPERATING LICENSE NO. DPR-56

PHILADELPHIA ELECTRIC COMPANY
PUBLIC SERVICE ELECTRIC AND GAS COMPANY
DELMARVA POWER AND LIGHT COMPANY
ATLANTIC CITY ELECTRIC COMPANY

PEACH BOTTOM ATOMIC POWER STATION, UNIT NO. 3

DOCKET NO. 50-278

1. INTRODUCTION

By Reference 1, Philadelphia Electric Company, et al. (the licensee) proposed Technical Specification changes for Peach Bottom Unit No. 3, Cycle 6 operation. The submittal proposes a revision to the Technical Specifications to allow operation in the region of the operating map bounded by the constant recirculation pump speed line between 100% power, 105% core flow and 70% power, 110% core flow with or without the last-stage feedwater heater valves out of service. The purpose of the Technical Specification changes is to improve operating flexibility during Cycle 6 operation. The evaluation of the related safety analysis in Reference 2 is discussed below.

In the core-related areas of fuel design and safety analysis, thermal-hydraulic design and safety analysis, nuclear design including power distributions and reactivity analyses as well as safety analyses of postulated BWR accidents and transients, the licensee has relied on the results presented in the approved General Electric (GE) topical report NEDE-24011, "General Electric Standard Application for Reactor Fuel", or GESTAR-II (Ref. 3).

In addition, the licensee submitted a supplemental licensing document (Ref. 2) which provides results of analyses necessary to justify Cycle 6 operation but not included in GESTAR-II.

2. DISCUSSION AND EVALUATION

THERMAL-HYDRAULIC DESIGN

The objective of the review is to confirm that the thermal-hydraulic design of the reactor core has been accomplished using acceptable methods, to provide an acceptable margin of safety from conditions which could lead to fuel damage during normal operation and anticipated transients, and to confirm that the core is not susceptible to thermal-hydraulic instability.

The review included the following subjects: (1) safety limit minimum critical power ratio (MCPR), (2) operating limit minimum critical power ratio (OLMCPR) and (3) thermal-hydraulic stability.

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2.1. Safety Limit MCPR

A safety limit MCPR has been imposed to assure that 99.9% of the fuel rods in the core will not experience boiling transition during normal operation and anticipated operational transients. As stated in Reference 3, the approved safety limit MCPR is 1.07. We have confirmed that a safety limit of 1.07 was used for the Cycle 6 analyses.

2.2. Operating Limit MCPR (OLMCPR)

To assure that the fuel cladding integrity safety limit MCPR will not be violated during any abnormal transient, the most limiting events have been reanalyzed for this cycle (Ref. 2) by the licensee in order to determine which event results in the largest reduction in the minimum critical power ratio. The operating limits were then determined by adding the largest reduction and uncertainties associated with the calculational methods in the minimum critical power ratio to the safety limit MCPR.

We find that since approved methods (Ref. 3) were used and the results show an acceptable margin of safety from conditions which could lead to fuel damage during any anticipated operational transient, the thermal-hydraulic design is acceptable for operation with increased core flows and decreased feedwater temperature during the remainder of Cycle 6. The Technical Specification changes in Table 3.5.K.2 and Figure 3.5.K.2 for the operating MCPR limits are also acceptable since they are consistent with the results of the safety analysis in Reference 2.

2.3 Thermal-Hydraulic Stability

GE recently presented the NRC staff with stability test data which demonstrated the occurrence of limit cycle neutron flux oscillations at natural circulation and several percent above the rated rod line.

The oscillations were observable on the average power range monitors (APRMs) and were suppressed with control rod insertion. It was predicted that limit cycle oscillations would occur at the operating condition tested; however, the characteristics of the observed oscillations were different than those previously observed during other stability tests. Namely, the test data show that some local power range monitor (LPRM) indications oscillated out of phase with the APRM signal and at an amplitude as great as six times the core average. GE has prepared and released a service information letter, SIL-380, to alert the BWR owners of these new data and to recommend actions to avoid and control abnormal neutron flux oscillations.

The licensee submitted the results of the thermal-hydraulic stability analysis (Ref. 2) and showed that the maximum calculated decay ratio is 0.95 for Cycle 6 operation with increased core flow and decreased feedwater temperatures, as compared to 0.87 for the

present operating core conditions. The increase of decay ratio shows that the proposed mode of operation has a less thermal-hydraulically stable core, which is due to the increase of inlet subcooling caused by increasing core flow and decreasing feedwater temperature. As a result of our review, we requested the licensee to change the proposed Technical Specifications to be consistent with GE's recommendations in SIL-380 for protection against the potential for thermal-hydraulic instability, including a Technical Specification which will restrict operation in regions of potential instability and/or provide for surveillance and corrective action under conditions of marginal stability.

In response, the licensee has proposed changes (Ref. 4 and 5) to Peach Bottom Unit No. 3 Technical Specification 3/4.6.F. The principal changes to the Technical Specifications are the following:

1. The surveillance requirements and corrective action for the neutron flux noise

   When in two loop operation at total core flow less than 45% of rated core flow and thermal power greater than a specific limit, or in single loop operation at thermal power greater than a specific limit or at total flow less than 45% of rated core flow with thermal power greater than 35% of rated thermal power, the APRM and LPRM noise levels will be determined at specific intervals. If the APRM or LPRM neutron flux noise levels are greater than three times their established baseline levels, restore the noise level to within the required limits within 2 hours, or reduce thermal power to bring the reactor to the hot shutdown condition within 12 hours.

2. The surveillance requirements and corrective action for the core plate differential pressure noise

   When in single loop operation at total core flow rate greater than 45% of rated core flow, the core plate differential pressure noise level will be determined at a specific frequency. If the noise level is greater than 1 psi and 1.5 times the established baseline level, the noise level must be restored to within the required limits within 2 hours or core flow must be reduced to less than 45% of rated core flow.

3. The restrictions for the operation with no recirculation pumps operable

   When no recirculation pumps are in operation, the operator immediately initiates action to reduce thermal power to less than or equal to a specific limit. If a recirculation loop cannot be returned to service, the licensee will initiate measures to put the unit in Hot Shutdown within 12 hours. We have reviewed these proposed Technical Specifications and have found that they adequately restrict operation in regions of potential instability and provide for surveillance and corrective action under conditions of marginal stability. We therefore have concluded that the proposed Technical Specifications acceptably resolve the thermal-hydraulic stability concern for Peach Bottom Unit No. 3.

The basis for our review is described above. We conclude that the proposed changes to OLMCPR are acceptable for operation with increased core flows and increased feedwater temperatures during the remainder of Cycle 6 without undue risk to the health and safety of the public. This conclusion is based on the fact that acceptable methods and procedures were used to establish the operating MCPR limits for the remainder of Cycle 6 operation and that the Technical Specifications regarding OLMCPR have been correctly based on the results of that analysis. We also conclude that the Technical Specifications regarding stability are acceptable since they are prudent and adequately resolve our thermal-hydraulic stability concerns.

3. ENVIRONMENTAL CONSIDERATION

This amendment involves a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. We have determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

4. CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Dated: December 3, 1984

The following NRC personnel have contributed to this Safety Evaluation: S. Sun and G. Schwenk

REFERENCES

1. A letter from E. Bradley (Philadephia Electric Company) to H. Denton (NRC), dated May 30, 1984.

2. NEDC-30519, "Safety Review of Peach Bottom Atomic Power Station, Unit No. 3, at Core Flow Conditions above Rated Flow Throughout Cycle 6", dated March 1984.

3. NEDE-24011-P-A-6, "General Electric Boiling Water Reactor Generic Reload Fuel Applications", dated April 1983.

4. A letter from E. Bradley (Philadelphia Electric Company) to H. Denton (NRC), dated August 24, 1984.

4. A letter from E. Bradley (Philadelphia Electric Company) to H. Denton (NRC), dated September 27, 1984.