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

September 24, 1987

Dockets Nos. 50-277/278

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

Dear Mr. Bauer:

SUBJECT: GENERIC LETTER 86-02, THERMAL-HYDRAULIC STABILITY
(TAC NOS. 64539 AND 64541)

RE: PEACH BOTTOM ATOMIC POWER STATION, UNIT NOS. 2 AND 3

The Commission has issued the enclosed Amendments Nos. 125 and 128 to Facility Operating License Nos. DPR-44 and DPR-56 for the Peach Bottom Atomic Power Station, Unit Nos. 2 and 3. These amendments consist of changes to the Technical Specifications in response to your application dated January 12, 1987.

These amendments revise the Technical Specifications relating to (1) reactor core thermal hydraulic stability and (2) operation with jet pump flow indication failures and jet pump operability surveillance requirements. When we issued Amendment Nos. 78 and 77 to the above licenses on May 15, 1981, the transmittal letter contained a statement restricting the Peach Bottom units from operating at more than 50% of rated thermal power while in the single loop mode of operation pending resolution of postulated concerns about thermal hydraulic instability under high power-low flow conditions. This restriction was removed for Peach Bottom Unit 3 via the transmittal letter for Amendment No. 107 issued December 3, 1984. With issuance of the enclosed Amendments, the restriction of limiting Peach Bottom Unit 2 to 50% of rated thermal power while in the single loop mode is hereby rescinded as being unnecessary. Implementation of the enclosed Technical Specifications will fully resolve generic issues B-19 (Thermal Hydraulic Stability) and B-59 (Single Loop Operation) for Peach Bottom, Units 2 and 3, as discussed in generic letters 86-02 and 86-09 issued January 23, 1986 and March 31, 1986, respectively.

A copy of the Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's Bi-Weekly Federal Register Notice.

Sincerely,

Richard J. Clark

Richard J. Clark, Project Manager
Project Directorate I-2
Division of Reactor Projects I/II

Enclosures:
1. Amendment No. 125 to DPR-44
2. Amendment No. 128 to DPR-56
3. Safety Evaluation

cc w/enclosures:
See next page

50-277/278



A copy of the Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's Bi-Weekly Federal Register Notice.

Sincerely,

Original signed by
Richard J. Clark

Richard J. Clark, Project Manager
Project Directorate I-2
Division of Reactor Projects I/II

Enclosures:
1. Amendment No. 125 to DPR-44
2. Amendment No. 128 to DPR-56
3. Safety Evaluation

cc w/enclosures:
See next page

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7/16/87

9/23/87

Mr. E. G. Bauer, Jr.
Philadelphia Electric Company

Peach Bottom Atomic Power Station,
Units 2 and 3

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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. 50-277

PEACH BOTTOM ATOMIC POWER STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 125
License No. DPR-44

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

   A. The application for amendment by Philadelphia Electric Company, et al. (the licensee) dated January 12, 1987, 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 or 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-44 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 125, 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

/s/

Walter R. Butler, Director
Project Directorate I-2
Division of Reactor Projects I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: September 24, 1987

| PDI-2/LA | PDI-2/PM | OGC | PDI-2/D |
|---|---|---|---|
| MO'Brien | RJClark:ca | | WButler |
| 9/24/87 | 07/06/87 | 7/13/87 | 9/24/87 |

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 125, 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

Walter R. Butler

Walter R. Butler, Director
Project Directorate I-2
Division of Reactor Projects I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: September 24, 1987

ATTACHMENT TO LICENSE AMENDMENT NO. 125

FACILITY OPERATING LICENSE NO. DPR-44

DOCKET NO. 50-277

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages. The revised areas are indicated by marginal lines.

| Remove | Insert |
|---|---|
| 10 | 10 |
| 148 | 148 |
| 149 | 149 |
| - | 149a |
| - | 149b |
| 160 | 160 |
| - | 164d |

| SAFETY LIMIT | LIMITING SAFETY SYSTEM SETTING |
|---|---|

2.1.A (Cont'd)

In the event of 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.

$$S \leq (0.58\ W + 62\% - 0.58\ \Delta W)\frac{(FRP)}{MFLPD}$$

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 BP/P8X8R fuel and 14.4 KW/ft for GE8X8EB and LTA310 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.

| LIMITING CONDITION FOR OPERATION | SURVEILLANCE REQUIREMENTS |
|---|---|
| 3.6.E Jet Pumps | 4.6.E Jet Pumps |
| 1. Whenever the reactor is in the startup or run modes, all jet pumps shall be operable. If it is determined that a jet pump is inoperable, an orderly shutdown shall be initiated and the reactor shall be in a Cold Shutdown within 24 hours. | 1. Whenever there is recirculation flow with the reactor in the startup or run modes, jet pump operability shall be checked daily by verifying that the following conditions do not occur simultaneously: |
| 2. Flow indications from each of the 20 jet pumps during two loop operation or 10 jet pumps during single loop operation shall be verified prior to initiation of reactor startup from a cold shutdown condition. | a) The two recirculation loops have a flow imbalance of 15% or more when the pumps are operated at the same speed.<br>b) The indicated value of core flow rate varies from the value derived from loop flow measurements by more than 10%. |
| 3. The indicated core flow is the sum of the flow indication from each of the 20 jet pumps. Flow indication from no more than one jet pump shall be unavailable during two loop operation. If two or more jet pump flow indication failures occur during two loop operation, an orderly shutdown shall be initiated within 12 hours and the reactor shall be in cold shutdown condition within the following 24 hours. | c) During two loop operation, the diffuser to lower plenum differential pressure reading on an individual jet pump varies from the mean of all jet pump differential pressures by more than 10%.<br>d) During single loop operation, diffuser to lower plenum differential pressure reading on an individual jet pump in the operating loop varies from the mean of all jet pump differential pressures in the operating loop by more than 10%. |
| 4. During single loop operation, no jet pump flow indication failures in the operating loop are permissible. If a jet pump flow indication failure occurs during single loop operation, an orderly shutdown shall be initiated within 12 hours and the reactor shall be in cold shutdown condition within the following 24 hours. | 2. Additionally when operating with one recirculation pump with the equalizer valves closed, the diffuser to lower plenum differential pressure shall be checked daily and the differential pressure of any jet pump in the idle loop shall not vary by more than 10% from established pattern.<br>3. The baseline data required to evaluate the conditions in specification 4.6.E.1 and 4.6.E.2 will be obtained each operating cycle. |

| 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 by Line A in Figure 3.6.5 for the region for which monitoring is required (Specification 3.6.F.5, REGIONS 1 and 2) 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 initiated within 6 hours following the removal of one recirculation loop from service, or the unit placed in Hot Shutdown condition within the following 6 hours. | |
| 3. Whenever the reactor is in the startup or run modes, two reactor coolant system recirculation loops shall be in operation and the reactor shall not be operated in REGIONS 1 or 2 of Figure 3.6.5 (defined below), except as specified in 3.6.F.4 and 3.6.F.5<br>a. REGION 1 - Total core flow less than 39% of rated and Thermal Power greater than the limit specified by Line A in Figure 3.6.5.<br>b. REGION 2 - Total core flow greater than or equal to 39% of rated, but less than or equal to 45% of rated and Thermal Power greater than the limit specified by Line A in Figure 3.6.5. | |
| 4. With only one reactor coolant system recirculation loop operating, immediately initiate action to avoid operation in REGION 1. Thermal Power shall be reduced and be below the limit specified by Line A in Figure 3.6.5 within 4 hours or core flow shall be increased to greater than or equal to 39% of rated core flow within 4 hours. | |

| LIMITING CONDITION FOR OPERATION | SURVEILLANCE REQUIREMENTS |
|---|---|
| 3.6.F RECIRCULATION PUMPS | 4.6.F RECIRCULATION PUMPS |
| 5. During operation in REGIONS 1 or 2 of Figure 3.6.5: | |
| a. The surveillance requirements of 4.6.F.2 and 4.6.F.3 must be satisfied. | 2. After entering the region for which monitoring is required, determine APRM and LPRM noise levels within one hour and at least once per 8 hours, and<br>3. After the completion of a Thermal Power increase of at least 5% of Rated Thermal Power, determine APRM and LPRM noise levels within 1 hour. |
| b. With the APRM or LPRM neutron flux noise levels greater than 4% and three times their established baseline noise levels, immediately initiate corrective action to restore the noise levels to within the required limits within 2 hours, or begin an orderly shutdown and be in Hot Shutdown 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. | |
| 6. With no reactor coolant system recirculation loops in operation and the mode switch in STARTUP or RUN, immediately initiate action to reduce Thermal Power to less than or equal to the limit specified by Line A in Figure 3.6.5, and place the reactor in at least Hot Shutdown within 6 hours. | |

| LIMITING CONDITION FOR OPERATION | SURVEILLANCE REQUIREMENTS |
|---|---|
| 3.6.G STRUCTURAL INTEGRITY | 4.6.G STRUCTURAL INTEGRITY |
| The structural integrity 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

Jet Pump Flow Mismatch, Flow Indication and Thermal Hydraulic Stability

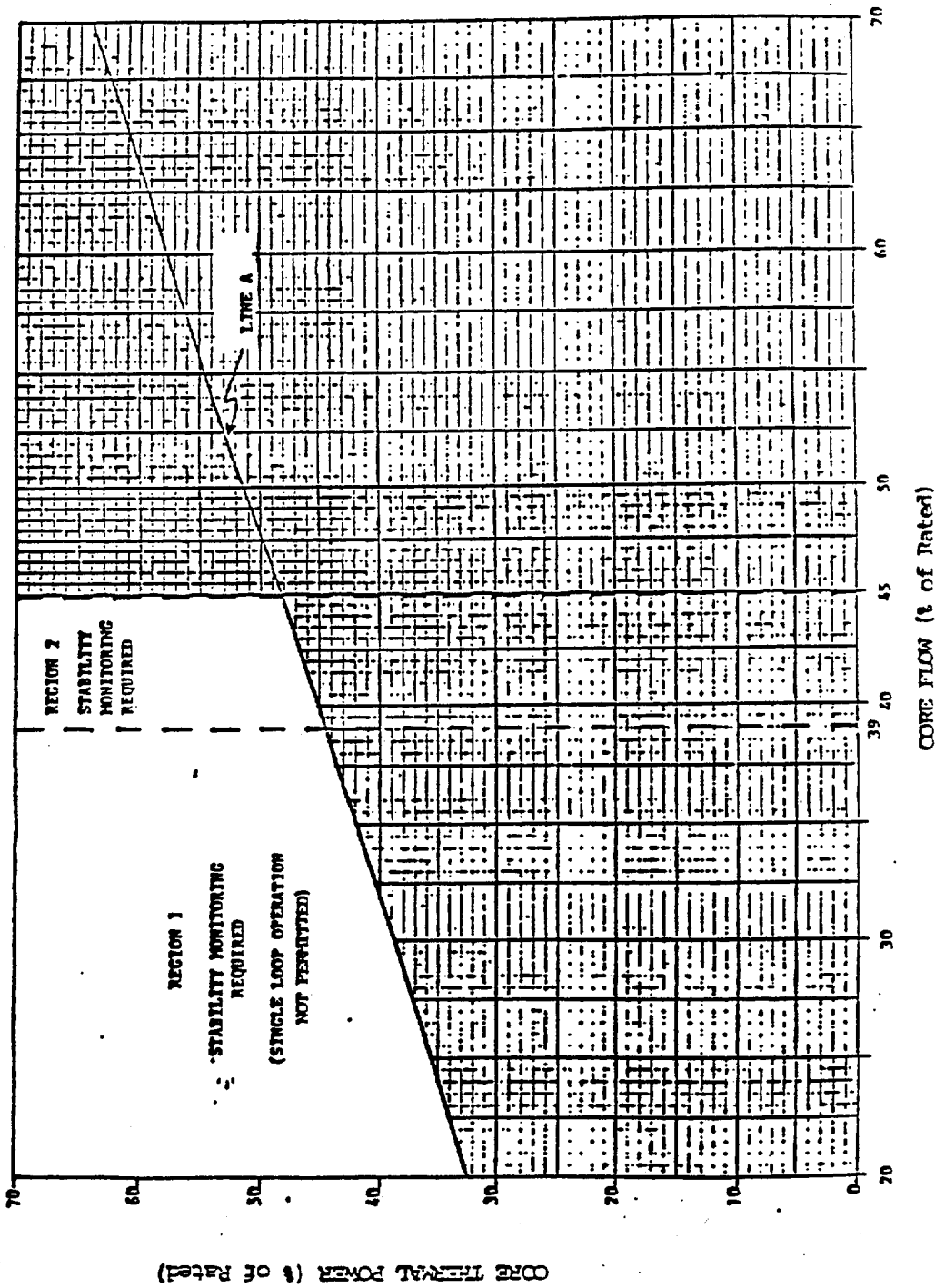
Requiring the discharge valve of the lower speed loop to remain closed until the speed of faster pump is below 50% of its rated speed provides assurance when going from one to two pump operation that excessive vibration of the jet pump risers will not occur.

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. Also, single loop operation with any jet pump flow indication failures is an unanalyzed condition and, therefore, warrants a shutdown. One jet pump flow indication failure during two-loop operation is acceptable, but more than one failure has not been analyzed and, therefore, warrants a shutdown.

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 and 3.6.F.5



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. 128
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 January 12, 1987, 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 or 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:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 128, 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

/s/

Walter R. Butler, Director
Project Directorate I-2
Division of Reactor Projects I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: September 24, 1987

| PDI-2/LA | PDI-2/PM | OGC | PDI-2/D |
|---|---|---|---|
| MO'Brien | RJClark:ca | | WButler |
| 9/24/87 | 07/06/87 | 7/2/87 | 9/24/87 |

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 128, 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

Walter R. Butler

Walter R. Butler, Director
Project Directorate I-2
Division of Reactor Projects I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: September 24, 1987

ATTACHMENT TO LICENSE AMENDMENT NO. 128

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 areas are indicated by marginal lines.

| Remove | Insert |
|---|---|
| 148 | 148 |
| 149 | 149 |
| 149a | 149a |
| 149b | 149b |
| 149c | - |
| 160 | 160 |
| 164d | 164d |

| LIMITING CONDITION FOR OPERATION | SURVEILLANCE REQUIREMENTS |
|---|---|
| 3.6.E Jet Pumps | 4.6.E Jet Pumps |
| 1. Whenever the reactor is in the startup or run modes, all jet pumps shall be operable. If it is determined that a jet pump is inoperable, an orderly shutdown shall be initiated and the reactor shall be in a Cold Shutdown within 24 hours. | 1. Whenever there is recirculation flow with the reactor in the startup or run modes, jet pump operability shall be checked daily by verifying that the following conditions do not occur simultaneously: |
| 2. Flow indications from each of the 20 jet pumps during two loop operation or 10 jet pumps during single loop operation shall be verified prior to initiation of reactor startup from a cold shutdown condition. | a) The two recirculation loops have a flow imbalance of 15% or more when the pumps are operated at the same speed.<br>b) The indicated value of core flow rate varies from the value derived from loop flow measurements by more than 10%. |
| 3. The indicated core flow is the sum of the flow indication from each of the 20 jet pumps. Flow indication from no more than one jet pump shall be unavailable during two loop operation. If two or more jet pump flow indication failures occur during two loop operation, an orderly shutdown shall be initiated within 12 hours and the reactor shall be in cold shutdown condition within the following 24 hours. | c) During two loop operation, the diffuser to lower plenum differential pressure reading on an individual jet pump varies from the mean of all jet pump differential pressures by more than 10%.<br>d) During single loop operation, diffuser to lower plenum differential pressure reading on an individual jet pump in the operating loop varies from the mean of all jet pump differential presures in the operating loop by more than 10%. |
| 4. During single loop operation, no jet pump flow indication failures in the operating loop are permissible. If a jet pump flow indication failure occurs during single loop operation, an orderly shutdown shall be initiated within 12 hours and the reactor shall be in cold shutdown condition within the following 24 hours. | 2. Additionally when operating with one recirculation pump with the equalizer valves closed, the diffuser to lower plenum differential pressure shall be checked daily and the differential pressure of any jet pump in the idle loop shall not vary by more than 10% from established pattern.<br>3. The baseline data required to evaluate the conditions in specification 4.6.E.1 and 4.6.E.2 will be obtained each operating cycle. |

| 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 by Line A in Figure 3.6.5 for the region for which monitoring is required (Specification 3.6.F.5, REGIONS 1 and 2) 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 initiated within 6 hours following the removal of one recirculation loop from service, or the unit placed in Hot Shutdown condition within the following 6 hours. | |
| 3. Whenever the reactor is in the startup or run modes, two reactor coolant system recirculation loops shall be in operation and the reactor shall not be operated in REGIONS 1 or 2 of Figure 3.6.5 (defined below), except as specified in 3.6.F.4 and 3.6.F.5 | |
| a. REGION 1 - Total core flow less than 39% of rated and Thermal Power greater than the limit specified by Line A in Figure 3.6.5. | |
| b. REGION 2 - Total core flow greater than or equal to 39% of rated, but less than or equal to 45% of rated and Thermal Power greater than the limit specified by Line A in Figure 3.6.5. | |
| 4. With only one reactor coolant system recirculation loop operating, immediately initiate action to avoid operation in REGION 1. Thermal Power shall be reduced and be below the limit specified by Line A in Figure 3.6.5 within 4 hours or core flow shall be increased to greater than or equal to 39% of rated core flow within 4 hours. | |

| LIMITING CONDITION FOR OPERATION | SURVEILLANCE REQUIREMENTS |
|---|---|
| 3.6.F RECIRCULATION PUMPS | 4.6.F RECIRCULATION PUMPS |
| 5. During operation in REGIONS 1 or 2 of Figure 3.6.5: | |
| a. The surveillance requirements of 4.6.F.2 and 4.6.F.3 must be satisfied. | 2. After entering the region for which monitoring is required, determine APRM and LPRM noise levels within one hour and at least once per 8 hours, and<br>3. After the completion of a Thermal Power increase of at least 5% of Rated Thermal Power, determine APRM and LPRM noise levels within 1 hour. |
| b. With the APRM or LPRM neutron flux noise levels greater than 4% and three times their established baseline noise levels, immediately initiate corrective action to restore the noise levels to within the required limits within 2 hours, or begin an orderly shutdown and be in Hot Shutdown 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. | |
| 6. With no reactor coolant system recirculation loops in operation and the mode switch in STARTUP or RUN, immediately initiate action to reduce Thermal Power to less than or equal to the limit specified by Line A in Figure 3.6.5, and place the reactor in at least Hot Shutdown within 6 hours. | |

| LIMITING CONDITION FOR OPERATION | SURVEILLANCE REQUIREMENTS |
|---|---|
| 3.6.G STRUCTURAL INTEGRITY | 4.6.G STRUCTURAL INTEGRITY |
| The structural integrity 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

Jet Pump Flow Mismatch, Flow Indication and Thermal Hydraulic Stability

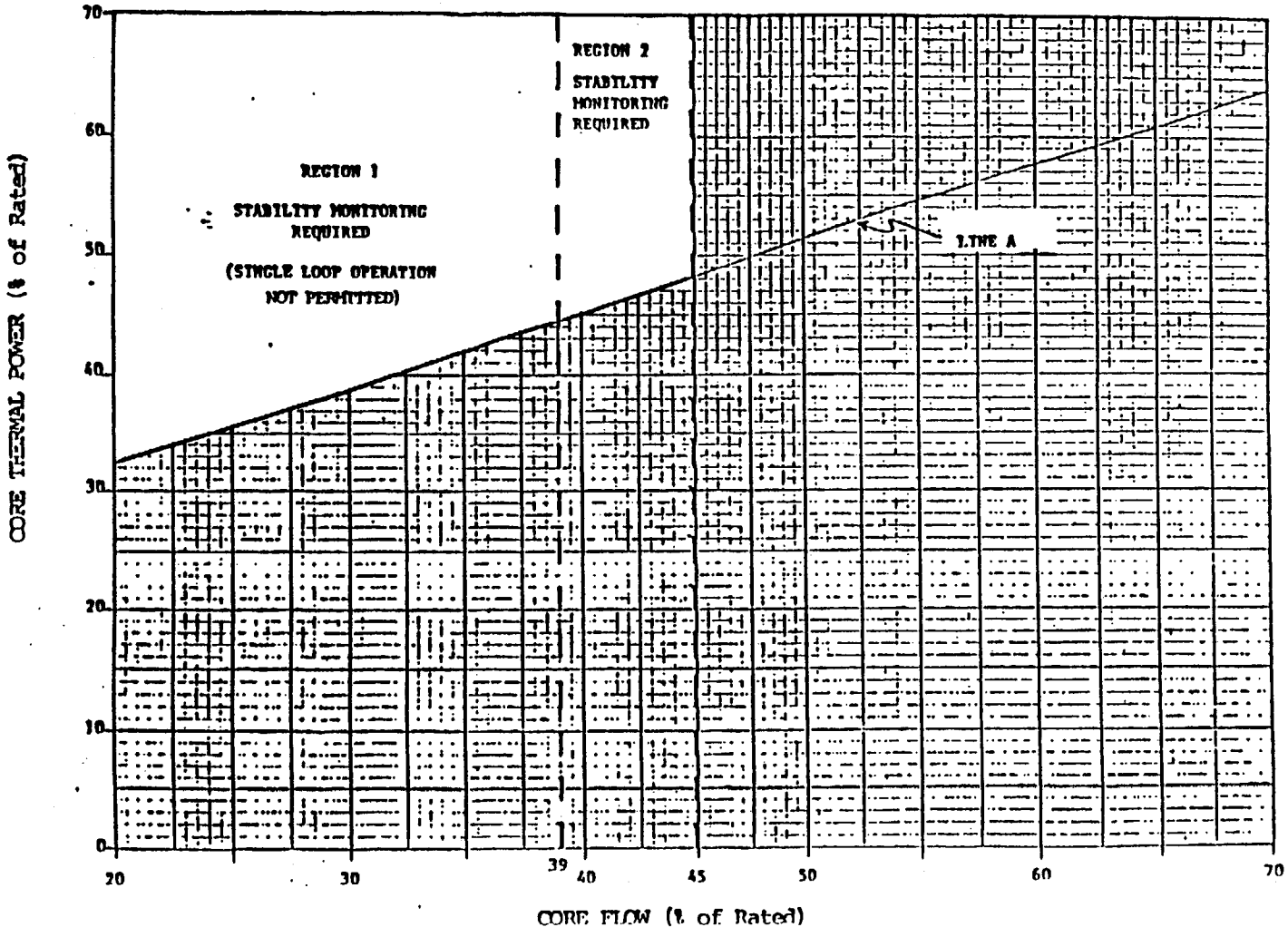
Requiring the discharge valve of the lower speed loop to remain closed until the speed of faster pump is below 50% of its rated speed provides assurance when going from one to two pump operation that excessive vibration of the jet pump risers will not occur.

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. Also, single loop operation with any jet pump flow indication failures is an unanalyzed condition and, therefore, warrants a shutdown. One jet pump flow indication failure during two-loop operation is acceptable, but more than one failure has not been analyzed and, therefore, warrants a shutdown.

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 and 3.6.F.5



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION SUPPORTING

AMENDMENT NOS. 125 AND 128 TO FACILITY OPERATING

LICENSE NOS. DPR-44 and 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 NOS. 2 and 3

DOCKET NOS. 50-277 and 50-278

## 1.0 INTRODUCTION

By letter dated January 12, 1987, Philadelphia Electric Company (PECo or licensee) requested changes to the Technical Specifications (TSs) for Peach Bottom, Unit Nos. 2 and 3 relating to 1) core thermal hydraulic stability and 2) operation with jet pump flow indication failures and jet pump operability surveillance requirements. The application was in response to NRC generic letters 86-02 and 86-09, issued January 23, 1986 and March 31, 1986, respectively.

On January 23, 1986, NRC issued generic letter 86-02, "Technical Resolution of Generic Issue B-19-Thermal Hydraulic Stability", to licensees of operating BWRs. The generic letter concluded that there was potential uncertainty in the approved methods for calculation of core stability decay ratio in predicting the onset of limit cycle oscillations. The generic letter stated that "licensees should examine each core reload to assure it is typical of previously evaluated cores which have acceptable stability margin. For cores which do not meet the analytical criteria, we have concluded that operating limitations which provide for the detection and suppression of flux oscillations in operating regions of potential instability consistent with the recommendations of General Electric SIL-380 are acceptable." The generic letter further stated that:" all BWR owners should review the need for technical specifications (which enforce GE SIL-380 recommendations for operation of their plants) in light of the approved stability criteria and the status of core stability design calculations for specific plants. Licensees are advised that the approved stability criteria are applicable to all operating reactors, and should be included in future safety evaluations in support of 10 CFR 50.59 determinations for all core reloads and design or operating modifications which relate to core thermal-hydraulic stability."

Philadelphia Electric Company (PECo) submitted a reload amendment for Peach Bottom Unit 2 by letter dated January 9, 1987. The subject application for amendments is in response to generic letter 86-02. The

proposed revisions to the Technical Specifications would add monitoring and operability requirements to the Unit 2 Technical Specifications to avoid the possibility for thermal hydraulic instability. The new, additional requirements would:

1) Add a Limiting Condition for Operation (LCO) to establish thermal power and core flow operating limits to avoid thermal hydraulic instability.

2) Add a LCO to prohibit continued single recirculation loop operation below 39% of rated core flow and power above the 80% rod line.

3) Add a LCO to require APRM and LPRM noise level monitoring when operating in the regions of potential instability (low flow/high power).

4) Revise an existing LCO to reduce the time limit for having the requirements applicable to single loop operation in effect from 24 hours to six hours.

5) Remove a specification which prohibits operation in the natural circulation mode and replace it with an action to-be-taken requirements: namely, an immediate reduction of thermal power followed by a reactor shutdown within six hours if the mode switch is in Startup or Run with no recirculation loops in operation.

6) Remove a restriction on operation at a maximum of 50% thermal power in the single loop mode since stability is assured by other restrictions.

On December 3, 1984, the Commission issued Amendment 107 for Peach Bottom Unit 3 permitting increased core flow. Although generic letter 86-02 had not been developed at the time, the staff was developing some proposed Technical Specification provisions to preclude possible thermal-hydraulic instability. At the NRC staff's request, the licensee incorporated the provisions (which reflected the staff's position at the time) into the increased core flow application which was approved by Amendment 107 issued December 3, 1984 and into the Peach Bottom Unit 2 Cycle 7 reload application which was approved by Amendment 108 issued March 19, 1985. Now that the NRC requirements on thermal-hydraulic stability have been established (generic letter 86-02) some of the staff's previously proposed restrictions are no longer needed or applicable. Accordingly, the proposed amendments would revise the Unit 3 Technical Specifications to 1) remove APRM and LPRM noise level monitoring requirements in operating regions 2, 3 and 4; 2) decrease the allowable time for taking appropriate action when entering single loop operation from 24 to six hours; 3) increase the frequency for monitoring APRM and LPRM noise levels at low flows from 24 hours to once every eight hours; 4) reduce the upper core flow limit for Region I from 45% to 39% of rated flow, and 5) decrease the cut-off criterion for neutron flux noise levels from 5% to 4%. There would also for be some rewording and reformatting of the Technical Specification

requirements on recirculation pump operation to make the thermal-hydraulic stability requirements easier to understand.

## 2.0 EVALUATION

The primary purpose of the PECo submittal is to provide suitable surveillance and action specifications for monitoring and suppressing, if necessary, core thermal hydraulic instabilities. The specifications reflect the conclusions of the staff Generic Letters 86-02 and 86-09 (Refs. 2 and 3), which were based on extensive stability reviews and the recommendations of the General Electric report SIL-380 (Ref. 4). The specifications are required for operation under conditions of (a) Two Loop Operation (TLO) when approved analytical methods indicate that acceptable stability limits are not met and (b) Single Loop Operation (SLO), regardless of analytical results.

These specifications generally call for restrictions or surveillance in the regions on the power-flow map above the 80 percent rod line and below 45 percent flow. This involves surveillance between 39 and 45 percent flow and no operation below 39 percent flow. (Thirty-nine percent corresponds approximately to minimum two pump flow so that this restriction is effectively only for SLO.) Surveillance is by observation of the noise level of the Average Power Range Monitor (APRM) and selected Local Power Range Monitor (LPRM) neutron detectors. Noise levels greater than three times base levels generally call for noise suppression activity, e.g., lower power level or increased flow.

Peach Bottom 3 has stability surveillance and action specifications, approved in Amendment 107 (December 3, 1984). However, these were developed prior to the more recent staff reviews leading to the current positions of References 2, 3, and 4, and those TS differ from more recently approved TS, e.g., the Duane Arnold TS (See Reference 3 of Reference 3) or those for Susquehanna (Ref. 5). Following discussions with the staff, the current Peach Bottom 3 TS have been revised in this submittal to reflect these recent staff positions and approvals.

The action and surveillance regions on the power-flow map given in the Peach Bottom 3 TS 3/4.6.F and Figure 3.6.5 have been altered. These now require, above the 80 percent rod line, no operation below 39 percent flow and surveillance up to 45 percent flow. Appropriate surveillance to establish base noise levels for the relevant (specified in Ref. 4) APRM and LPRM detectors is required. Action levels requiring power or flow change to suppress oscillations are set at noise levels of four percent and three times base levels. Appropriate times or frequencies for required surveillance and suppression actions are specified. These are all in accordance with NRC current positions and recent approvals and with Peach Bottom operating experience (as called for in Ref. 4). The proposed Specifications and Bases relating to Peach Bottom 3 TS 3/4.6.F are acceptable.

Peach Bottom 2 currently has a TS 2.1.A.4 prohibiting operation in natural circulation (no recirculation loops in operation). PECo proposes to move that TS to a Limiting Condition of Operation category as TS 3.6.F.6. This specification requires immediate reduction of power and shutdown within six hours when no recirculation loops are in operation. Peach Bottom 3 has such a specification as TS 3.6.F.5, but with an allowable 12 hours for shutdown. PECo proposes that this be changed to six hours and the TS renumbered to 3.6.F.6, as with Unit 2. When the TSs for the first BWR-4s (such as Brown Ferry, Peach Bottom, Duane Arnold, etc.) were proposed, the NRC(AEC) staff had concerns about the possibility of thermal-hydraulic stability stemming from the GE test programs at low flows. At the time, there was not enough data at low flows to define what restrictions, if any, there should be on operating at low primary coolant flow rates. This was conservatively resolved by simply adding a safety limit in Section 2 of all BWR-4 TSs prohibiting operation in the natural circulation mode. Over the years, there have been extensive test programs and analyses funded by NRC and the utilities to determine what conditions might lead to thermal-hydraulic instability and what restrictions on plant operation will preclude entering these regimes. In February 1985, a carefully controlled series of tests was conducted at Browns Ferry Unit 1 with NRC and Oak Ridge National Laboratory participation at various power levels and with two recirculation pumps in operation, with only one pump (single loop operation) and with no pumps operating (natural circulation). Parameters were monitored with specially installed sophisticated instrumentation. The tests showed that stability ratios were very much better than had been predicted by calculations. The perturbations in jet pump differential pressure lines (which are translated into flow rates) which had been noted in some BWRs at low-flow rates ( and had been regarded as an indication of possible instability) were due to harmonics set up in the sensing lines. The various test programs defined more precisely what restrictions would preclude thermal-hydraulic instability in all power/flow regimes, taking into account instrumentation uncertainties. The proposed restrictions - i.e., proposed backfit TSs for BWR-4s, BWR-5s and BWR-6s - were presented to the NRC's Committee for Review of Generic Requirements (CRGR) in September 1985 as the proposed resolution of generic issue B-19. The resolution approved by CRGR, including acceptable TS changes, were set forth in generic letter 86-02 issued January 23, 1986. The proposed TSs include restrictions on operation in the natural circulation mode. Thus, the specific restriction which is now in the Safety Limits Section (Section 2) of the Peach Bottom Unit 2 TSs (and which was in Section 2 of the Peach Bottom Unit 3 and many were other BWR TSs) is no longer necessary since the basis for the restriction is fully addressed by the overall restrictions (LCOs) being added to Section 3 of the TSs. The changes proposed by PECo are in accordance with generic letter 86-02 and are acceptable.

The TS for both Peach Bottom units address the requirement for flow indication for the jet pumps for TLO (the indication for no more than one jet pump may be unavailable), but neither unit has a specification for SLO. PECo proposes to add TS 3.6.E.4 allowing no jet pump flow indication failures for SLO. They have also clarified the language, but not changed

the content, of TS 3.6.E.3 for TLO. They also propose that the surveillance specification 4.6.E.1.C requiring the diffuser to lower plenum pressure reading for a jet pump not to vary from the mean of all pumps by more than 10 percent to be divided into two (c and d), the first for TLO remaining the same and the second for SLO indicating the individual and mean references are to the operating loop. These changes are reasonable clarifications and are acceptable.

Peach Bottom 2 and 3 Amendments Nos. 78 and 77 (approved May 15, 1981) were primarily about SLO. These amendments approved SLO for these reactors but because of concerns about thermal hydraulic stability, a restriction of a maximum SLO power level of 50 percent was imposed. This restriction was removed for Unit 3 in Amendment 107 (December 3, 1984) after the NRC acceptance of the stability TS which are currently in effect for Unit 3. It is still in effect for Unit 2. PECo now requests that with the approval of the stability TS for Unit 2, the same as the recently improved TS for Unit 3, that the restriction be removed for Peach Bottom 2 also. Since the stability question was the issue requiring the power limit, and since that problem has now been resolved and appropriate TS proposed, the removal of this restriction for Peach Bottom 2 is acceptable.

## 3.0 SUMMARY

PECo has proposed TS for Peach Bottom 2 and 3 providing for surveillance and, if necessary, suppression of core thermal hydraulic instabilities. The TS are in accordance with staff positions and other stability TS approvals. Our review has concluded that the appropriate material has been submitted and TS changes and additions are acceptable and that restrictions on Peach Bottom 2 SLO power level because of stability problems may be removed. Other proposed TS changes clarifying aspects of jet pump operability and natural circulation operation are also acceptable.

## 4.0 ENVIRONMENTAL CONSIDERATIONS

These amendments involve changes to requirements with respect the to installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 and changes to the surveillance requirements. The staff has determined that the amendments involve 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, these amendments meet 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 nor environmental assessment need be prepared in connection with the issuance of these amendments.

## 5.0 CONCLUSION

The Commission made a proposed determination that the amendments involve no significant hazards consideration which was published in the Federal Register on March 25, 1987 (52 FR 9578) and renoticed on May 20, 1987 (52 FR 18985) and consulted with the State of Pennsylvania. No public comments were received and the State of Pennsylvania did not have any comments.

The staff has 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 the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: H. Richings and R. Clark

Dated: September 24, 1987

## 6.0 REFERENCES


1. Letter (and enclosures) from E. Bradley, PECo, to H. Denton, NRC, dated January 12, 1987, "Peach Bottom Atomic Power Station Units 2 and 3."

2. Generic Letter No. 86-02, "Technical Resolution of Generic Issue B-19 Thermal Hydraulic Stability," January 23, 1986.

3. Generic Letter No. 86-09, "Technical Resolution of Generic Issue No. B-59-(N-1) Loop Operation in BWRs and PWRs," March 31, 1986.

4. General Electric Service Information Letter No. 380, Revision 1, February 10, 1984.

5. Letter (and enclosures) from E. Adensam, NRC, to H. Keiser, Pennsylvania Power & Light Co., dated April 11, 1986, "Amendment No. 56 and 26 to Facility Operating License No. NPF-14 and NPF-22 Susquehanna Steam Electric Station, Units 1 and 2."