

August 14, 2000

Mr. James A. Hutton
Director-Licensing
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Nuclear Group Headquarters
Correspondence Control
P.O. Box 160
Kennett Square, PA 19348

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION, UNIT NOS. 2 AND 3 - ISSUANCE OF AMENDMENT REGARDING CREDITING OF CONTAINMENT OVERPRESSURE FOR NET POSITIVE SUCTION HEAD CALCULATIONS FOR EMERGENCY CORE COOLING PUMPS (TAC NOS. MA6291AND MA6292)

Dear Mr. Hutton:

The Commission has issued the enclosed Amendments Nos. 233 and 237 to Facility Operating License Nos. DPR-44 and DPR-56 for the Peach Bottom Atomic Power Station, Unit Nos. 2 and 3. These amendments respond to your application dated August 11, 1999, as supplemented by letter dated June 29, 2000, relating to assurance of sufficient net positive suction head for emergency core cooling and containment heat removal pumps.

We have completed our review of your submittals regarding use of containment overpressure for Peach Bottom Units 2 and 3. The Updated Final Safety Analysis Report will be updated to reflect credit for use of a limited amount of containment overpressure in calculations of net positive suction head available for emerging core cooling pumps.

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,

/RA/

Bartholomew C. Buckley, Sr. Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

Enclosures: 1. Amendment No. 233 to DPR-44
2. Amendment No. 237 to DPR-56
3. Safety Evaluation

cc w/encls: See next page

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PECO ENERGY 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. 233
License No. DPR-44

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by PECO Energy Company, et al. (the licensee) dated August 11, 1999, as supplemented by letter dated June 29, 2000, 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, changes to the Updated Final Safety Analysis Report (UFSAR) to reflect Peach Bottom, Unit 2, credit for use of a limited amount of containment overpressure in calculations of net positive suction head available for emergency core cooling pumps, as described in the attached staff safety evaluation, as set forth in the licensee's application for amendment dated August 11, 1999, as supplemented June 29, 2000, are authorized. The licensee shall submit the revised description authorized by this amendment with the next update of the UFSAR.

3. This license amendment is effective as of its date of issuance and shall be implemented as specified in 2 above.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Date of Issuance: August 14, 2000

PECO ENERGY 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. 237
License No. DPR-56

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by PECO Energy Company, et al. (the licensee) dated August 11, 1999, as supplemented by letter dated June 29, 2000, 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, changes to the Updated Final Safety Analysis Report (UFSAR) to reflect Peach Bottom, Unit 3, credit for use of a limited amount of containment overpressure in calculations of net positive suction head available for emergency core cooling pumps, as described in the attached staff safety evaluation, as set forth in the licensee's application for amendment dated August 11, 1999, as supplemented June 29, 2000, are authorized. The licensee shall submit the revised description authorized by this amendment with the next update of the UFSAR.

3. This license amendment is effective as of its date of issuance and shall be implemented as specified in 2 above.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Date of Issuance: August 14, 2000

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NOS. 233 AND 237 TO FACILITY OPERATING
LICENSE NOS. DPR-44 and DPR-56
PECO ENERGY 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 August 11, 1999 (Reference 1), as supplemented by letter dated June 29, 2000 (Reference 2), PECO Energy Company (PECO, the licensee), requested that the licensing basis for Peach Bottom Atomic Power Station, Units 2 and 3 (Peach Bottom Units 2 and 3), be clarified. The requested clarification involves the use of containment overpressure to ensure sufficient net positive suction head (NPSH) for the emergency core cooling system (ECCS) pumps following a loss-of-coolant accident (LOCA). The Peach Bottom Units 2 and 3 licensing basis has always included reliance on containment overpressure for the residual heat removal (RHR) and the core spray pumps during the long term following a LOCA as discussed in the staff's safety evaluation dated August 11, 1972 (Reference 3). Additionally, due to increased suppression pool temperature from the power rerate and the postulated debris loading on the new ECCS suction strainers, the reliance on containment overpressure has increased since Peach Bottom was originally licensed. Reliance on containment overpressure was not captured in the Peach Bottom Updated Final Safety Analysis Report (UFSAR) which was developed in the mid-1980s. Therefore, PECO requested that the Peach Bottom licensing basis be clarified to address the increased reliance on containment overpressure for both the short and long term following a LOCA. The proposed licensing basis change would apply to both the RHR and core spray pumps. The June 29, 2000, letter provided clarifying information that did not change the initial proposed no significant hazards consideration determination or expand the scope of the original Federal Register notice.

Peach Bottom Units 2 and 3 are boiling water reactors (BWRs) BWR/4s with a Mark I containment. The Peach Bottom ECCS consists of a high pressure coolant injection (HPCI) pump, an automatic pressure relief system, two trains of core spray, and two trains of low pressure coolant injection (LPCI). The HPCI system is designed to inject water from the emergency condensate storage tanks or suppression pool into the reactor vessel via a

feedwater line. The HPCI system provides makeup water to the reactor vessel in the event of a small break LOCA which does not result in a rapid depressurization of the reactor vessel. Containment overpressure is not required to ensure adequate NPSH for the HPCI pumps following a small break LOCA. The core spray system injects water from the suppression pool to the reactor vessel via the core spray spargers located above the core. The LPCI is designed to inject water from the suppression pool into the downcomer region of the reactor vessel. The LPCI system is an operating mode of the RHR system. Both the core spray system and LPCI system provide makeup water to the reactor vessel at low pressure following a large break LOCA and depressurization of the reactor vessel.

2.0 EVALUATION

Based on the analyses described below, the licensee has proposed the following table to be incorporated into the Peach Bottom Units 2 and 3 UFSAR.

Time	Containment Overpressure License (COPL)
0 to 10 minutes	2.25 psig
10 minutes to 12.5 hours	COPL of Figure 5.2.16
12.5 to 78 hours	Exponentially decreasing from Figure 5.2.16 to zero

At Peach Bottom, containment overpressure is defined as available pressure above 14.696 psia. The containment overpressure license (COPL) is the amount of containment overpressure credited in the RHR and core spray NPSH analyses. The COPL represents the maximum containment overpressure credit that can be taken for design basis accident analysis. The amount of containment overpressure credited at any given time, as depicted on proposed UFSAR Figure 5.2.16, is greater than the containment overpressure required (COPR) to ensure adequate NPSH for the RHR and core spray pumps. Additionally, the COPL is below the minimum containment pressure available (MCPA). According to the licensee, the COPL was defined in a manner which provides margin below the MCPA and provides margin above the COPR for minor design changes. It is noted that the MCPA is event specific and system independent. The COPL is based on the design basis LOCA MCPA since this is the event that requires the most credit for containment overpressure. The licensee has proposed that, for any other design basis event, the maximum containment overpressure credit allowed is the MCPA associated with the event being analyzed, but not greater than the COPL described in the table above.

2.1 Calculation of Containment Pressure

As part of the licensee's demonstration that there is sufficient NPSH available, the licensee performed a calculation of the containment pressure (PM-1013) with assumptions and input values chosen to underestimate the likely containment pressure. The licensee called this value the MCPA. In cases where there were some questions as to whether the assumption was conservative (for example, for the value of the service water temperature), the licensee performed sensitivity analyses to establish the conservative direction.

The licensee did not calculate a blowdown mass and energy release to the containment. Instead, suppression pool temperature values from the GE SHEX computer code were used as the starting point. The drywell pressure calculated by SHEX was also used as a boundary condition for the calculation and the torus pressure was assumed to be equal to the drywell pressure. This is conservative since the wetwell pressure cannot become greater than the drywell pressure by any appreciable amount due to the vacuum breakers.

SHEX has not been reviewed and approved by the Nuclear Regulatory Commission (NRC) staff but has been approved for use by General Electric for containment temperature and pressure calculations for BWRs on the basis of comparison with pressure and temperature calculations performed by other computer codes. In addition, the SHEX calculations were only performed to a problem time of 12 hours. In order to obtain values of suppression pool temperature after this time, the licensee extrapolated the SHEX results based on a suppression pool energy balance.

The licensee did not include a 2σ uncertainty on the value of decay heat used in these calculations. However, the licensee has included calculations which demonstrate that there is sufficient conservatism without this uncertainty based on neglect of heat losses from the torus structure to the secondary containment and the use of a power level greater than the licensed power of Peach Bottom Units 2 and 3.

Based on the use of assumptions which conservatively minimize the containment pressure, the staff finds the licensee's calculation of containment pressure to be acceptable for NPSH calculations.

2.2 NPSH Analyses

PECO provided the relationship which was used to calculate the available NPSH (NPSHA) for the core spray and RHR pumps.

$$\text{NPSHA} = Z_{\text{sp}} - Z_{\text{pump}} + 144P_{\text{sp}}/\rho - h_f - h_{\text{st}} - 144P_{\text{vap}}/\rho$$

where

Z_{sp} elevation of torus water surface (feet)

Z_{pump} elevation of pump suction (feet)

P_{sp} torus pressure (psia)

P_{vap} vapor pressure at torus water temperature (psia)

h_f piping friction losses (feet)

h_{st} strainer head loss (feet)

ρ density of water at torus water temperature (lb/ft³)

PECO installed new large capacity emergency core cooling system (ECCS) strainers to meet the requested actions under NRC Bulletin 96-03 (Reference 4). For the proposed licensing

basis, the strainer head loss associated with the new strainers is included in the revised NPSH calculations. According to PECO, additional credit for containment overpressure is required due to their resolution of Bulletin 96-03 and the increased suppression pool temperature due to power rerate.

2.2.1 Short-Term NPSH Requirements

For the short-term analysis, the licensee postulated a recirculation suction line break with no offsite power and the failure of one emergency diesel. The “short-term” for this accident analysis is defined as the first 10 minutes after the LOCA. Operator action to control pump flows or to initiate a containment cooling mode is not credited during the short term. The pressure and temperature profiles for the first 10 minutes following the LOCA are depicted in Figure 14.6.10A of the Peach Bottom Units 2 and 3 UFSAR. Figure 14.6.10A is a maximum containment pressure profile. However, since the containment sprays are not assumed to be used during the first 10 minutes following the LOCA, the minimum containment pressure analysis would not differ significantly from the maximum containment pressure analysis for this time period.

The PECO calculations state that the maximum suppression pool temperature at 10 minutes is 148 °F. The licensee’s calculations demonstrate that, at a suppression pool temperature up to 148 °F, containment overpressure of approximately 0.6 psig is required for the RHR pump during the first 10 minutes after the LOCA. The RHR pumps have a higher requirement for containment overpressure for the design basis LOCA than the core spray pumps. The licensee has requested that the COPL for the first 10 minutes following the LOCA be limited to 2.25 psig. According to the licensee, this value was chosen to provide a conservative but reasonable limit for credit of containment overpressure during the first 10 minutes following the design basis LOCA.

The NRC staff has reviewed the containment analysis and has found that the 2.25 psig will be available during the short term following the accident. The 2.25 psig is less than the MCPA and is, therefore, acceptable. Based on these analyses, the staff finds the use of 2.25 psig of containment overpressure acceptable for the first 10 minutes after the LOCA for both the RHR and core spray pumps.

2.2.2 Long-term NPSH Requirements

The long-term of the accident analysis is defined as the time period from 10 minutes to the end of the accident. For the long-term analysis, the licensee postulated a recirculation suction line break with no off-site power and the failure of one emergency diesel. The analysis also assumes that after 10 minutes following the LOCA, the operators control ECCS flows and initiate containment cooling.

The PECO calculations state that the maximum suppression pool temperature that will occur is 205.7 °F. The licensee’s calculations demonstrate that, at a suppression pool temperature up to 205.7 °F, containment overpressure is required from 4290 seconds to the end of the accident. The maximum amount of containment overpressure required for the RHR pumps is approximately 6.1 psig. The maximum COPR occurs at the peak suppression pool temperature of 205.7 °F. The COPR decreases as the suppression pool temperature decreases. The maximum amount of containment overpressure for the core spray pumps is less than that

required for the RHR pumps. The maximum amount of containment overpressure credited, the COPL, in the design basis LOCA NPSH analyses is depicted on proposed Figure 5.2.16 of the Peach Bottom UFSAR. The maximum COPR, 6.1 psig, is less than the COPL

The NRC staff performed confirmatory calculations of the RHR NPSH analysis. According to our calculations, the minimum margin between the COPL and the COPR for the RHR pumps is 0.88 psig. This occurred at the peak suppression pool temperature of 205.7 °F. This margin allows for minor design changes which could affect the COPR. This result is consistent with the licensee's calculations. Additionally, our calculations demonstrated that the minimum margin between the COPL and MCPR was approximately 0.42 psig (1 foot). Because of the way the COPL was defined, i.e., the COPL will be 1 foot less than the MCPA for a design basis LOCA, this minimum margin is maintained over the entire COPL curve.

The NRC staff has reviewed the containment analysis and has found that containment overpressure greater than 6.1 psig will be available when required during the long term following the LOCA. The value of 6.1 psig is the maximum COPR at the peak suppression pool temperature. The 6.1 psig is less than the MCPA at the peak suppression pool temperature and is, therefore, acceptable. Based on these analyses, the staff finds the use of the containment overpressure described above acceptable for the long term following the LOCA.

3.0 SUMMARY

The staff has reviewed the licensee's minimum containment pressure and NPSH analyses for the RHR and core spray pumps. The staff finds that the use of the requested containment overpressure, as provided in the table above, to ensure adequate NPSH for the RHR and core spray pumps during the first 10 minutes following a LOCA acceptable. The approved amount of containment overpressure is 2.25 psia above the initial airspace pressure of 14.696 psia. For the long term following a LOCA, the staff has approved the use of the containment overpressure depicted on UFSAR Figure 5.2.16 and provided in the table above for both the RHR and core spray pumps. The maximum amount of containment overpressure required during the long term is approximately 6.1 psig for RHR. The time period of the containment overpressure credit for the long term is approximately 4290 seconds to the end of the accident.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Pennsylvania State official was notified of the proposed issuance of the amendments. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC 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 the amendments involve no significant hazards consideration, and there has been no public comment on such finding (65 FR 21038). Accordingly, the 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 or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission 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, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

7.0 REFERENCES

1. Hutton, J. A., PECO Energy Company, to USNRC, "Peach Bottom Atomic Power Station, Units 2 and 3 Request for License Amendment Regarding Clarification on Use of Containment Overpressure for Ensuring Adequate NPSH," August 11, 1999.
2. Hutton, J. A., PECO Energy Company, to USNRC, "Peach Bottom Atomic Power Station, Units 2 and 3 Response to May 10, 2000, Telephone Questions Regarding PECO Energy License Amendment Request Related to Generic Letter 97-04," June 29, 2000.
3. SE dated August 11, 1972.
4. U.S. Nuclear Regulatory Commission Bulletin 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling-Water Reactors," May 6, 1996.

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Date: August 14, 2000

Peach Bottom Atomic Power Station,
Units 2 and 3

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