

May 28, 1993

Mr. George A. Hunger, Jr.
Director-Licensing, MC 52A-5
Philadelphia Electric Company
Nuclear Group Headquarters
Correspondence Control Desk
P.O. Box No. 195
Wayne, Pennsylvania 19087-0195

Dear Mr. Hunger:

SUBJECT: FUEL STORAGE CRITICALITY CRITERIA, PEACH BOTTOM ATOMIC POWER
STATION, UNITS 2 AND 3 (TAC NOS. M85756 AND M85757)

The Commission has issued the enclosed Amendments Nos. 175 and 178 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 February 5, 1993.

These amendments change Technical Specifications Section 5.5.D concerning fuel storage criteria. The revised TS allow the use of the maximum k-infinity method of demonstrating compliance with fuel storage criticality limits, replacing the current U-235 loading/enrichment method by a k-infinity method. You are requested to inform the NRC staff when you have implemented the provisions of these amendments.

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,

/s/

Joseph W. Shea, Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:

- 1. Amendment No. 175 to DPR-44
- 2. Amendment No. 178 to DPR-56
- 3. Safety Evaluation

cc w/enclosures:

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| PDI-2 Reading | OGC | ACRS(10) | |
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

May 28, 1993

Docket Nos. 50-277
and 50-278

Mr. George A. Hunger, Jr.
Director-Licensing, MC 52A-5
Philadelphia Electric Company
Nuclear Group Headquarters
Correspondence Control Desk
P.O. Box No. 195
Wayne, Pennsylvania 19087-0195

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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,

A handwritten signature in black ink, appearing to read "Joseph W. Shea".

Joseph W. Shea, Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:

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2. Amendment No. 178 to DPR-56
3. Safety Evaluation

cc w/enclosures:
See next page

Mr. George A. Hunger, Jr.
Philadelphia Electric Company

Peach Bottom Atomic Power Station,
Units 2 and 3

cc:

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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. 175
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 February 5, 1993, 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. 175, 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

Charles L. Miller

Charles L. Miller, Director
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: May 28, 1993

ATTACHMENT TO LICENSE AMENDMENT NO. 175

FACILITY OPERATING LICENSE NO. DPR-44

DOCKET NO. 50-277

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

Remove

242

Insert

242

PBAPS

5.5 FUEL STORAGE

- A. The new fuel storage facility shall be such that the K_{eff} dry is less than 0.90 and flooded is less than 0.95.
- B. The K_{eff} of the spent fuel storage pool shall be less than or equal to 0.95.
- C. Spent fuel shall only be stored in the spent fuel pool in a vertical orientation in approved storage racks.
- D. The spent fuel storage racks are designed and shall be maintained with fuel assemblies having a maximum K-infinity of 1.362 in the nominal reactor core configuration at cold conditions.

5.6 SEISMIC DESIGN

The station Class I structures and systems have been designed for ground accelerations of 0.05g (design earthquake) and 0.12g (maximum credible earthquake)

*By letter dated February 19, 1986, the Commission's granted approval limited to certain specific high density storage racks and methods of storage for Unit 2 spent fuel pool.



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. 178
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 February 5, 1993, 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. 178, 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

Charles L. Miller

Charles L. Miller, Director
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: May 28, 1993

ATTACHMENT TO LICENSE AMENDMENT NO. 178

FACILITY OPERATING LICENSE NO. DPR-56

DOCKET NO. 50-278

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

Remove

242

Insert

242

PBAPS

5.5 FUEL STORAGE

- A. The new fuel storage facility shall be such that the K_{eff} dry is less than 0.90 and flooded is less than 0.95.
- B. The K_{eff} of the spent fuel storage pool shall be less than or equal to 0.95.
- C. Spent fuel shall only be stored in the spent fuel pool in a vertical orientation in approved storage racks.
- D. The spent fuel storage racks are designed and shall be maintained with fuel assemblies having a maximum K-infinity of 1.362 in the nominal reactor core configuration at cold conditions.

5.6 SEISMIC DESIGN

The station Class I structures and systems have been designed for ground accelerations of 0.05g (design earthquake) and 0.12g (maximum credible earthquake)

*By letter dated February 19, 1986, the Commission's granted approval limited to certain specific high density storage racks and methods of storage for Unit 3 spent fuel pool.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NOS. 175 AND 178 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 February 5, 1993 (Reference 1), the Philadelphia Electric Company, Public Service Electric & Gas Company, Delmarva Power and Light Company and Atlantic City Electric Company (the licensees) submitted a request for changes to the Peach Bottom Atomic Power Station, Units 2 and 3, Technical Specifications (TS). The proposed Technical Specification (TS) changes would allow the use of the maximum k-infinity based method of demonstrating compliance with fuel storage criticality limits. This method would replace the current limit on fuel assembly average U-235 loading. The proposed changes would allow the storage of fuel with a calculated incore K-infinity (k_{∞}) of ≤ 1.362 , in the spent fuel storage pools (SFSP) at the Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3.

PBAPS, Units 2 and 3 (PB-2/3) are General Electric (GE) designed boiling water reactors (BWRs). The storage of GE 7x7 and 8x8 fuel rod lattice array assembly types has previously been reviewed and approved (Reference 2) for the spent fuel pool storage racks. The existing TS 5.5, "Fuel Storage," states that the SFSP racks are capable of storing fuel having a fuel assembly average loading not to exceed 17.3 grams of U-235 per axial centimeter of total active fuel height of the assembly. This limit was based on a uniform 3.50 weight percent U-235 enrichment for the original GE 7x7 fuel design.

The licensee request would revise TS 5.5.D to allow the k_{∞} method. To support this proposed change, the licensee has included a GE analysis (Reference 3) of the PBAPS SFSP racks, which addresses the conversion from a grams of U-235 loading limit to an incore k_{∞} limit, which also applies to GE 9x9 fuel.

2.0 EVALUATION

The design basis for preventing criticality in fuel storage facilities is based on Section 9.1, "Fuel Storage and Handling," of the NRC Standard Review Plan (SRP), NUREG-0800 (Reference 4).

Section 9.1.1, "New Fuel Storage," effectively requires, by reference to ANSI Standards ANS 57.1 (Reference 5) and ANS 57.3 (Reference 6), that there is a 95 percent probability at a 95 percent confidence level (95/95 probability/confidence) that the effective multiplication factor (k_{eff}), including uncertainties, will be no greater than 0.95 under unborated moderator conditions and no greater than 0.98 under optimum moderation.

Section 9.1.2, "Spent Fuel Storage," requires, by reference to ANS 57.2 (Reference 7), at a 95/95 probability/confidence level, that k_{eff} for fuel stored under normal conditions or accident conditions (such as a dropped fuel assembly) shall be less than or equal to 0.95. Credit may be taken for integral burnable poisons in the fuel and for fuel burnup effects.

General Design Criterion (GDC) 62 (Reference 8) also states that:

"Criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations".

2.1 Criticality Analysis Methods

An analysis of the criticality aspects of the storage of PBAPS fuel assemblies having a fuel enrichment up to 4.5 weight percent U-235 was performed by the licensee's current fuel vendor (GE). The analysis methodology and results were described in the GE report that was furnished as Attachment 3 to Reference 1. The method and the cross-section library used consist of the GE MERIT computer code, using the ENDF/B-IV cross section set, which is stated to have been verified against extensive critical experiments. The MERIT program is a three-dimensional Monte Carlo neutron tracking code, that calculates the system effective neutron multiplication factor (k_{eff}). The MERIT code uses a 190 group cross-section library with the Haywood scattering kernel for water.

The GE MERIT methodology has been extensively benchmarked against critical experiment measurement data to determine the calculational uncertainty and bias for specific applications. The benchmark measurements included six standard sets of measured critical experiments which verified the application of the MERIT code and ENDF/B library. The results of the comparisons yielded a MERIT calculational bias of 0.0054 (± 0.0022) delta-k for water moderated uranium lattices.

2.2 Fuel Storage Rack Analysis

The SFSP high-density storage racks consist of 15 rack modules with storage cells on a nominal center to center distance of 6.28 inches in both directions as described in the PBAPS Updated Final Safety Analysis Report. The criticality of fuel assemblies in the storage racks is prevented by limiting the fuel reactivity, by the Boraflex neutron absorbers between the storage cells, and by maintaining a minimum separation between assemblies. The NRC acceptance criteria that fuel assembly storage must meet is that the k_{eff} shall be no greater than 0.95 when the racks are fully loaded and flooded with pure, unborated water. The k_{eff} shall include all biases and uncertainties at a 95/95 probability/confidence level.

The GE analyses showed that a fully loaded SFSP would meet the NRC acceptance criterion of k_{eff} less than 0.95 under flooded conditions. A conservative analysis shows that this rack configuration can safely accommodate up to 4.5 weight percent U-235 fuel with a maximum 95/95 storage rack k_{eff} of 0.918, resulting in a fuel storage compliance limit of maximum incore $K_{\infty} \leq 1.362$. This meets the staff acceptance criterion for k_{eff} no greater than 0.95 and also satisfies GDC 62, and is therefore acceptable.

2.3 Accident Analysis

Certain postulated events which could lead to a storage rack reactivity increase were evaluated in the high-density rack analysis of Reference 2. A dropped fuel assembly on top of the rack will be sufficiently separated from the active fuel height of the assemblies in the rack such that there will be no storage rack reactivity increase. Conditions which would result in an increase in reactivity such as dropping or misloading a fuel assembly outside or adjacent to the rack were also evaluated. The evaluation showed that an assembly dropped or misloaded in a maximum reactivity configuration meets the staff acceptance criterion of k_{eff} no greater than 0.95 under any condition.

2.4 Summary

Based on the above review, the staff concludes that fuel assemblies having a maximum incore k_{∞} of 1.362 may be stored in the fuel storage racks and that TS 5.5, "Fuel Storage," may be revised as proposed by the licensee in the February 5, 1993 application. Our conclusion is based on the following:

1. The criticality analyses involved in this change have been performed with a methodology which has been extensively benchmarked by the fuel vendor against industry standard critical experiments.
2. Appropriate uncertainties have been accounted for at the 95/95 probability/confidence level.
3. Abnormal events and accidents that have been previously considered are not affected by the change in the reactivity basis.

4. The effective neutron multiplication factor, including uncertainties, meets our acceptance criteria for all postulated conditions.

3.0 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.

4.0 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 (58 FR 12266). 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.

5.0 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.

Principal Contributor: E. Kendrick

Date: May 28, 1993

REFERENCES

1. Letter from Mr. George J. Beck, Philadelphia Electric Company, to Document Control Desk, U.S. NRC, dated February 5, 1993, "Peach Bottom Atomic Power Station, Units 2 and 3, Technical Specification Change Request."
2. "Safety Evaluation by Office of Nuclear Reactor Regulation Supporting Amendment Nos. 116 and 120 to Facility Operating License Nos. DPR-44 and DPR-56," for Peach Bottom Atomic Power Station, Units 2 and 3, Docket Nos. 50-277 and 50-278, dated February 18, 1986.
3. GENE-512-92073, "Peach Bottom Atomic Power Station Spent Fuel Storage K-infinity Conversion Analyses," General Electric Nuclear Energy, November 1992.
4. U.S. Nuclear Regulatory Commission, Standard Review Plan, Section 9.1, "Fuel Storage and Handling," NUREG-0800 (Revision 2), July 1981.
5. ANS 57.1/ANSI-N208, "Design Requirements for Light-Water Reactor Fuel Handling Systems."
6. ANS 57.3, "Design Requirements for New LWR Fuel Storage Facilities."
7. ANSI/ANS-57.2-1983, "Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants."
8. U.S. Code of Federal Regulations, Title 10, Chapter I, Part 50, Appendix A, General Design Criterion 62, "Prevention of Criticality in Fuel Storage and Handling."
9. U.S. Nuclear Regulatory Commission, Regulatory Guide 5.14, "Validation of Calculational Methods for Nuclear Criticality Safety."
10. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.13, "Design Objectives for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Stations." (1970's)