

March 7, 1989

Docket Nos. 50-317
and 50-318

Mr. G. C. Creel
Vice President - Nuclear Energy
Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
MD Rtes. 2 & 4
P. O. Box 1535
Lusby, Maryland 20657

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	LTripp, RI

Dear Mr. Creel:

SUBJECT: AMENDMENT TO INCREASE ENRICHMENT LIMITS FOR THE SPENT FUEL
STORAGE RACKS (TACS NOS. 68416 AND 68417)

The Commission has issued the enclosed Amendment No.136 to Facility Operating License No. DPR-53 and Amendment No.117 to Facility Operating License No. DPR-69 for the Calvert Cliffs Power Plant, Unit Nos. 1 and 2, respectively. The amendments consist of changes to the Technical Specifications (TS) in response to your application transmitted by letter dated June 9, 1988 as supplemented on October 25, November 17 and December 28, 1988.

These amendments modified TS 5.6.1, "Criticality - Spent Fuel," by increasing the U-235 enrichment limit for unirradiated fuel stored in the spent fuel storage racks from 4.1 to 5.0 weight percent U-235.

The NRC staff has determined that an increase in this enrichment limit to 5.0 weight percent U-235 for irradiated fuel stored in the spent fuel storage racks is acceptable contingent upon the acceptability of the NRC analysis for the generic fuel handling accident. This analysis is currently being finalized to generically support facility operations with enrichments of 5.0 weight percent U-235 and burnup levels of 60,000 MWD/MT and is expected to be available to support (1) your Unit 2 Cycle 9 reload amendment request, dated February 7, 1989, and (2) approval of 5.0 weight percent U-235 enriched irradiated fuel assemblies in the Calvert Cliffs Units 1 and 2 spent fuel storage racks prior to the Unit 2 startup following the Cycle 9 refueling outage.

A copy of the related Safety Evaluation and the Notice of Issuance are enclosed.

DFol
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FOR ADDOCK 05000317
PDC

Mr. G. C. Creel

- 2 -

March 7, 1989

A copy of the Environmental Assessment related to this action was transmitted to you by letter dated January 25, 1989.

Sincerely,

ORIGINAL SIGNED BY
Scott Alexander McNeil, Project Manager
Project Directorate I-1
Division of Reactor Projects, I/II

Enclosures:

- 1. Amendment No.136 to DPR-53
- 2. Amendment No.117 to DPR-69
- 3. Safety Evaluation
- 4. Notice

cc: w/enclosures:
See next page

[TACS 68416/17]

OFC	:PDI-1	:PDI-1	:PDI-1	:OGC			
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Mr. G. C. Creel
Baltimore Gas & Electric Company

Calvert Cliffs Nuclear Power Plant

cc:

Mr. William T. Bowen, President
Calvert County Board of
Commissioners
Prince Frederick, Maryland 20768

D. A. Brune, Esq.
General Counsel
Baltimore Gas and Electric Company
P. O. Box 1475
Baltimore, Maryland 21203

Mr. Jay E. Silberg, Esq.
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Mr. W. J. Lippold, General Supervisor
Technical Services Engineering
Calvert Cliffs Nuclear Power Plant
MD Rts 2 & 4, P. O. Box 1535
Lusby, Maryland 20657

Resident Inspector
c/o U.S. Nuclear Regulatory Commission
P. O. Box 437
Lusby, Maryland 20657

Department of Natural Resources
Energy Administration, Power Plant
Siting Program
ATTN: Mr. T. Magette
Tawes State Office Building
Annapolis, Maryland 21204

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, Pennsylvania 19406



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

BALTIMORE GAS AND ELECTRIC COMPANY

DOCKET NO. 50-317

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 136
License No. DPR-53

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Baltimore Gas and Electric Company (the licensee) dated June 9, 1988 as supplemented on October 25, November 17, and December 28, 1988, 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-53 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No.136 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A. Capra

Robert A. Capra, Director
Project Directorate I-1
Division of Reactor Projects, I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: March 7, 1989



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

BALTIMORE GAS AND ELECTRIC COMPANY

DOCKET NO. 50-318

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 117
License No. DPR-69

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Baltimore Gas and Electric Company (the licensee) dated June 9, 1988 as supplemented on October 25, November 17, and December 28, 1988, 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-69 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 117, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A. Capra

Robert A. Capra, Director
Project Directorate I-1
Division of Reactor Projects, I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: March 7, 1989

ATTACHMENT TO LICENSE AMENDMENTS

AMENDMENT NO. 136 FACILITY OPERATING LICENSE NO. DPR-53

AMENDMENT NO. 117 FACILITY OPERATING LICENSE NO. DPR-69

DOCKET NOS. 50-317 AND 50-318

Revise Appendix A as follows:

Remove Pages

5-5
5-6*

Insert Pages

5-5
5-6*

*Overleaf provided for continuity purposes.

DESIGN FEATURES

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 10,614 ± 460 cubic feet at a nominal T_{avg} of 532°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

5.6 FUEL STORAGE

CRITICALITY - SPENT FUEL

5.6.1 The spent fuel storage racks are designed and shall be maintained with a minimum 10 3/32" x 10 3/32" center-to-center distance between fuel assemblies placed in the storage racks to ensure a k_{eff} equivalent to < 0.95 with the storage pool filled with unborated water. The k_{eff} of < 0.95 includes the conservative allowances for uncertainties described in Section 9.7.2 of the FSAR. The maximum fuel enrichment to be stored in the fuel pool will be 4.1 weight percent for irradiated fuel* and 5.0 weight percent for fuel that has not been irradiated.

CRITICALITY - NEW FUEL

5.6.2 The new fuel storage racks are designed and shall be maintained with a nominal 18 inch center-to-center distance between new fuel assemblies such that k_{eff} will not exceed 0.95 when fuel having a maximum enrichment of 5.0 weight percent U-235 is in place and various densities of unborated water are assumed including aqueous foam moderation and full flood conditions. The k_{eff} of < 0.95 includes the conservative allowance for uncertainties described in Section 9.7.2 of the FSAR.

DRAINAGE

5.6.3 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 63 feet.

CAPACITY

5.6.4 The fuel storage pool is designed and shall be maintained with a combined storage capacity, for both Units-1 and 2, limited to no more than 1830 fuel assemblies.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMITS

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

*Irradiated fuel is fuel that has experienced the critical state (K_{eff} greater than or equal to one).

TABLE 5.7-1

COMPONENT CYCLIC OR TRANSIENT LIMITS

<u>Component</u>	<u>Cyclic or Transient Limit</u>	<u>Design Cycle or Transient</u>
Reactor Coolant System	500 heatup and cooldown cycles	70°F to 532°F to 70°F
	400 reactor trip cycles	100% to 0% RATED THERMAL POWER
	10 Primary Hydrostatic Tests	3125 psia and 60°F > NDTT
	320 Primary Leak Tests	2500 psia and 60°F > NDTT
Steam Generator	10 Secondary Hydrostatic Tests	1250 psia Secondary Side and temperature \geq 100°F
	320 Secondary Leak Tests	1000 psia Secondary Side With Primary - Secondary Δ p of 820 psi and shell side temperature between 100°F and 200°F

DESIGN FEATURES

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 10,614 ± 460 cubic feet at a nominal T_{avg} of 532°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

5.6 FUEL STORAGE

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5.6.2 The new fuel storage racks are designed and shall be maintained with a nominal 18 inch center-to-center distance between new fuel assemblies such that k_{eff} will not exceed 0.95 when fuel having a maximum enrichment of 5.0 weight percent U-235 is in place and various densities of unborated water are assumed including aqueous foam moderation and full flood conditions. The k_{eff} of ≤ 0.95 includes the conservative allowance for uncertainties described in Section 9.7.2 of the FSAR.

DRAINAGE

5.6.3 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 63 feet.

CAPACITY

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TABLE 5.7-1

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Reactor Coolant System	500 heatup and cooldown cycles	70°F to 532°F to 70°F
	400 reactor trip cycles	100% to 0% RATED THERMAL POWER
	10 Primary Hydrostatic Tests	3125 psia and 60°F > NDTT
	320 Primary Leak Tests	2500 psia and 60°F > NDTT
Steam Generator	10 Secondary Hydrostatic Tests	1250 psia Secondary Side and temperature \geq 100°F
	320 Secondary Leak Tests	1000 psia Secondary Side With Primary - Secondary Δp of 820 psi and shell side temperature between 100°F and 200°F



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. TO FACILITY OPERATING LICENSE NO. DPR-53

AND AMENDMENT NO. TO FACILITY OPERATING LICENSE NO. DPR-69

BALTIMORE GAS AND ELECTRIC COMPANY

CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-317 AND 50-318

U-235 ENRICHMENT INCREASE FOR THE SPENT FUEL POOL

1.0 INTRODUCTION

By its letter dated June 9, 1988, Baltimore Gas and Electric Company (BG&E, the licensee) requested that the Calvert Cliffs Units 1 and 2 Technical Specifications (TS) 5.6.1, "Criticality - Spent Fuel," be modified by increasing the enrichment limit for fuel which may be stored in the spent fuel storage racks from 4.1 to 5.0 weight percent U-235.

2.0 EVALUATION

The Calvert Cliffs spent fuel storage racks consist of square stainless steel cells having an inside dimension of 8-9/16 inches. The inner wall of each storage cell is made of a 0.060 inch thick sheet of 304L stainless steel. A Boraflex sheet 6-1/2 inches wide is sandwiched between this inner wall and an external 0.060 inch thick stainless steel sheet. The Boraflex sheet is 0.90 inches thick with a nominal boron-10 (B^{10}) loading of 0.020 gm/cm². The average distance between the centers of these cells is 10.09 inches. Spent fuel is normally stored in pool water containing about 2300 ppm of soluble boron. This normal storage arrangement would result in extremely subcritical configurations. However, for conservatism, the spent fuel racks are calculated assuming no soluble boron in the water.

The DOT-IV two-dimensional discrete ordinates (S_n) transport theory code was used to determine the effective multiplication factor (k_{eff}) of the spent fuel pool storage arrays. Neutron cross section data from the ENDF/B-IV library was generated for input to this code using the CEPAC code. This model has been benchmarked against experimental data and has been found to adequately reproduce the critical values.

The spent fuel pool criticality calculations were also based on no burnable poison or control rods in the fuel assemblies, unirradiated fuel with 5.0 weight percent U-235, and, as previously mentioned, no soluble boron in the water. In addition, the most adverse effects of temperature, eccentric

placement of fuel assemblies and poison boxes, changes in steel thickness, change in center to center spacing, boron poison loss possible over the life of the Boraflex, and the calculational uncertainty were included in the following manner. The squares of each delta-k change were added and the square root of the sum was taken. This result was then added to the calculational bias of -0.00138 and the nominal K_{eff} of 0.93678 giving a K_{eff} of 0.946 including all uncertainties at a 95/95 probability/confidence level. This meets the NRC limiting acceptance criterion of k_{eff} no greater than 0.95. Consequently, the NRC staff concludes that the spent fuel storage racks at Calvert Cliffs Units 1 and 2 can accommodate, with respect to criticality, fuel having a maximum enrichment of 5.0 eight percent U-235.

Recently the NRC staff has expressed concerns regarding the possibility of gaps developing in Boraflex sheets due to irradiation induced axial shrinkage. This concern was documented in NRC Information Notice No. 87-43. In response, the licensee has performed an analysis to determine the reactivity effects of Boraflex gap formation in the Calvert Cliffs spent fuel pool. The results indicate that, even with the assumption of a complete loss of soluble boron in the pool water, sufficient margin is available to accommodate nearly a 4 inch vertical gap in every Boraflex sheet at the active fuel centerline without exceeding the NRC limiting criterion of a maximum k_{eff} of 0.95. Although the licensee has no surveillance requirements in place for detecting degradation of the full length Boraflex sheets, it has a poison coupon monitoring program to detect degraded Boraflex specimens which would indicate any extreme shrinkage or loss of neutron absorption properties. In addition, since the installation process for the Boraflex assemblies involved only single sheets, that are not fastened or permanently glued onto any surface or structure, gap formation due to Boraflex shrinkage would not be expected. Based on the above and on normal spent fuel pool conditions, that it contains sufficient soluble boron to more than offset any reactivity increase due to Boraflex degradation, the NRC staff finds the use of Boraflex in the Calvert Cliffs spent fuel pool design to be an acceptable means of meeting the required acceptance criteria.

In the December 28, 1988 letter, BG&E committed to considering the fuel handling accident in each Unit 1 or 2 core reload analysis to ensure that the accident analysis would bound all possible U-235 enrichment and fuel burnup levels for each specific fuel assembly in the reactor core or the spent fuel pool. The NRC staff finds this analytical approach to be acceptable.

However, until final completion of the NRC generic fuel handling accident analysis for 5.0 weight percent U-235 enriched fuel with burnup levels up to 60,000 MWD/MT, TS 5.6.1, "Criticality - Spent Fuel," cannot be modified to permit the storage of irradiated fuel with U-235 enrichment levels above that currently permitted at Calvert Cliffs, specifically 4.1 weight percent U-235.

Consequently, the NRC staff has determined that an increase in the enrichment limit of TS 5.6.1 for unirradiated fuel stored in the spent fuel storage racks, to a value up to and including 5.0 weight percent U-235 is acceptable. Furthermore, the staff has determined that an increase in the TS 5.6.1 enrichment limit up to and including 5.0 weight percent U-235 for irradiated fuel is acceptable, contingent upon the acceptability of the NRC generic fuel handling accident analysis, but that the TS 5.6.1 enrichment limit shall not be modified for irradiated fuel until this contingency is satisfied.

3.0 INTENT

The intent of the proposed change is to permit the storage of fuel, that is not irradiated, with enrichment levels up to and including 5.0 weight percent U-235, in the spent fuel storage racks.

Irradiated fuel is fuel that has experienced criticality (i.e., k_{eff} greater than or equal to 1.0).

4.0 STATE CONSULTATIONS

A Notice of Consideration of Issuance of Amendment to Facility Operating License and Opportunity for Prior Hearing was published in the Federal Register on August 8, 1988 (53 FR 28791). No hearing requests or intervention petitions were received. The State of Maryland was consulted on this matter and had no comments on the determination.

5.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32 and 51.35, an environmental assessment and finding of no significant impact was published in the Federal Register on January 30, 1989 (53 FR 4352).

Accordingly, based upon the environmental assessment, the Commission has determined that issuance of this amendment will not have a significant effect on the quality of the human environment.

6.0 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 (3) the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

PRINCIPAL CONTRIBUTORS: L. Kopp, S. McNeil

Dated: March 7, 1989

UNITED STATES NUCLEAR REGULATORY COMMISSION
BALTIMORE GAS AND ELECTRIC COMPANY
CALVERT CLIFFS NUCLEAR POWER PLANT UNIT NOS. 1 AND 2
DOCKET NOS. 50-317 AND 50-318
NOTICE OF ISSUANCE OF AMENDMENT TO
FACILITY OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (Commission) has issued Amendment Nos. 136 and 117 to Facility Operating License Nos. DPR-53 and DPR-69, respectively, to the Baltimore Gas and Electric Company which revised the Technical Specifications (TS) for operation of the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 located in Calvert County, Maryland.

The amendments are effective as of the date of issuance.

The amendments modified TS 5.6.1, "Criticality - Spent Fuel," by increasing the U-235 enrichment limit for unirradiated fuel stored in the spent fuel storage racks from 4.1 to 5.0 weight percent.

The application for the amendments complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendments.

Notice of Consideration of Issuance of Amendment and Opportunity for Hearing in connection with this action was published in the FEDERAL REGISTER on August 8, 1988 (53 FR 29791). No request for a hearing or petition for leave to intervene was filed following this notice.

The Commission has prepared an Environmental Assessment related to the action and has determined not to prepare an environmental impact statement. Based upon the environmental assessment, the Commission has concluded that the issuance of this amendment will not have a significant effect on the quality of the human environment.

For further details with respect to the action see (1) the application for amendment dated June 9, 1988, as supplemented on October 25, November 17, and December 28, 1988, (2) Amendment Nos. 136 and 117 to License Nos. DPR-53 and DPR-69, respectively, and (3) the Commission's related Safety Evaluation and Environmental Assessment. All of these items are available for public inspection at the Commission's Public Document Room, 2120 L Street, N. W., and at the Calvert County Library, Prince Frederick, Maryland. A copy of items (2) and (3) may be obtained upon requested addressed to the U. S. Nuclear Regulatory Commission, Washington D. C. 20555, Attention: Director, Division of Reactor Projects I/II.

Dated at Rockville, Maryland, this 7th day of March 1989.

FOR THE NUCLEAR REGULATORY COMMISSION

ORIGINAL SIGNED BY

Scott Alexander McNeil, Project Manager
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

See changes in SER APH
APH

OFC	:PDI-1	:PDI-1	:PDI-1	:OGC	:	:
NAME	:CVogan	:SAMcNeil	:RACapra	:	:	:
DATE	:03/3/89	:03/2/89	:03/7/89	: 3/03/89	:	:

March 7, 1989

Docket Nos. 50-317
and 50-318

Mr. G. C. Creel
Vice President - Nuclear Energy
Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
MD Rtes. 2 & 4
P. O. Box 1535
Lusby, Maryland 20657

DISTRIBUTION

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DHagan	EJordan
BGrimes	TMeek (8)
Wanda Jones	EButcher
MWHodges	ACRS (10)
GPA/PA	ARM/LFMB
	LTripp, RI

Dear Mr. Creel:

SUBJECT: AMENDMENT TO INCREASE ENRICHMENT LIMITS FOR THE SPENT FUEL
STORAGE RACKS (TACS NOS. 68416 AND 68417)

The Commission has issued the enclosed Amendment No. 136 to Facility Operating License No. DPR-53 and Amendment No. 117 to Facility Operating License No. DPR-69 for the Calvert Cliffs Power Plant, Unit Nos. 1 and 2, respectively. The amendments consist of changes to the Technical Specifications (TS) in response to your application transmitted by letter dated June 9, 1988 as supplemented on October 25, November 17 and December 28, 1988.

These amendments modified TS 5.6.1, "Criticality - Spent Fuel," by increasing the U-235 enrichment limit for unirradiated fuel stored in the spent fuel storage racks from 4.1 to 5.0 weight percent U-235.

The NRC staff has determined that an increase in this enrichment limit to 5.0 weight percent U-235 for irradiated fuel stored in the spent fuel storage racks is acceptable contingent upon the acceptability of the NRC analysis for the generic fuel handling accident. This analysis is currently being finalized to generically support facility operations with enrichments of 5.0 weight percent U-235 and burnup levels of 60,000 MWD/MT and is expected to be available to support (1) your Unit 2 Cycle 9 reload amendment request, dated February 7, 1989, and (2) approval of 5.0 weight percent U-235 enriched irradiated fuel assemblies in the Calvert Cliffs Units 1 and 2 spent fuel storage racks prior to the Unit 2 startup following the Cycle 9 refueling outage.

A copy of the related Safety Evaluation and the Notice of Issuance are enclosed.

8903150401
3pp

Mr. G. C. Cree

- 2 -

March 7, 1989

A copy of the Environmental Assessment related to this action was transmitted to you by letter dated January 25, 1989.

Sincerely,

ORIGINAL SIGNED BY
Scott Alexander McNeil, Project Manager
Project Directorate I-1
Division of Reactor Projects, I/II

Enclosures:

- 1. Amendment No.136 to DPR-53
- 2. Amendment No.117 to DPR-69
- 3. Safety Evaluation
- 4. Notice

cc: w/enclosures:
See next page

[TACS 68416/17]

OFC	:PDI-1	:PDI-1	:PDI-1	:OGC			
NAME	:CVogan	:SAM McNeil	:ah	:RACapra			
DATE	:03/ /89	:03/8 /89	:03/7 /89	:03/13 /89			

OFFICIAL RECORD COPY

Mr. G. C. Cress
Baltimore Gas & Electric Company

Calvert Cliffs Nuclear Power Plant

cc:

Mr. William T. Bowen, President
Calvert County Board of
Commissioners
Prince Frederick, Maryland 20768

D. A. Brune, Esq.
General Counsel
Baltimore Gas and Electric Company
P. O. Box 1475
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Washington, DC 20036

Mr. W. J. Lippold, General Supervisor
Technical Services Engineering
Calvert Cliffs Nuclear Power Plant
MD Rts 2 & 4, P. O. Box 1535
Lusby, Maryland 20657

Resident Inspector
c/o U.S. Nuclear Regulatory Commission
P. O. Box 437
Lusby, Maryland 20657

Department of Natural Resources
Energy Administration, Power Plant
Siting Program
ATTN: Mr. T. Magette
Tawes State Office Building
Annapolis, Maryland 21204

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, Pennsylvania 19406



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

BALTIMORE GAS AND ELECTRIC COMPANY

DOCKET NO. 50-317

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 136
License No. DPR-53

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Baltimore Gas and Electric Company (the licensee) dated June 9, 1988 as supplemented on October 25, November 17, and December 28, 1988, 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-53 is hereby amended to read as follows:

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TR

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 136, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A. Capra

Robert A. Capra, Director
Project Directorate I-1
Division of Reactor Projects, I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: March 7, 1989



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20585

BALTIMORE GAS AND ELECTRIC COMPANY

DOCKET NO. 50-318

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 117
License No. DPR-69

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Baltimore Gas and Electric Company (the licensee) dated June 9, 1988 as supplemented on October 25, November 17, and December 28, 1988, 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-69 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 117, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A. Capra

Robert A. Capra, Director
Project Directorate I-1
Division of Reactor Projects, I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: March 7, 1989

ATTACHMENT TO LICENSE AMENDMENTS

AMENDMENT NO. 136 FACILITY OPERATING LICENSE NO. DPR-53

AMENDMENT NO. 117 FACILITY OPERATING LICENSE NO. DPR-69

DOCKET NOS. 50-317 AND 50-318

Revise Appendix A as follows:

Remove Pages

5-5
5-6*

Insert Pages

5-5
5-6*

*Overleaf provided for continuity purposes.

DESIGN FEATURES

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 10,614 ± 460 cubic feet at a nominal T_{avg} of 532°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

5.6 FUEL STORAGE

CRITICALITY - SPENT FUEL

5.6.1 The spent fuel storage racks are designed and shall be maintained with a minimum 10 3/32" x 10 3/32" center-to-center distance between fuel assemblies placed in the storage racks to ensure a k_{eff} equivalent to < 0.95 with the storage pool filled with unborated water. The k_{eff} of < 0.95 includes the conservative allowances for uncertainties described in Section 9.7.2 of the FSAR. The maximum fuel enrichment to be stored in the fuel pool will be 4.1 weight percent for irradiated fuel* and 5.0 weight percent for fuel that has not been irradiated.

CRITICALITY - NEW FUEL

5.6.2 The new fuel storage racks are designed and shall be maintained with a nominal 18 inch center-to-center distance between new fuel assemblies such that k_{eff} will not exceed 0.95 when fuel having a maximum enrichment of 5.0 weight percent U-235 is in place and various densities of unborated water are assumed including aqueous foam moderation and full flood conditions. The k_{eff} of ≤ 0.95 includes the conservative allowance for uncertainties described in Section 9.7.2 of the FSAR.

DRAINAGE

5.6.3 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 63 feet.

CAPACITY

5.6.4 The fuel storage pool is designed and shall be maintained with a combined storage capacity, for both Units-1 and 2, limited to no more than 1830 fuel assemblies.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMITS

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

*Irradiated fuel is fuel that has experienced the critical state (K_{eff} greater than or equal to one).

TABLE 5.7-1

COMPONENT CYCLIC OR TRANSIENT LIMITS

<u>Component</u>	<u>Cyclic or Transient Limit</u>	<u>Design Cycle or Transient</u>
Reactor Coolant System	500 heatup and cooldown cycles	70°F to 532°F to 70°F
	400 reactor trip cycles	100% to 0% RATED THERMAL POWER
	10 Primary Hydrostatic Tests	3125 psia and 60°F > NDTT
	320 Primary Leak Tests	2500 psia and 60°F > NDTT
Steam Generator	10 Secondary Hydrostatic Tests	1250 psia Secondary Side and temperature \geq 100°F
	320 Secondary Leak Tests	1000 psia Secondary Side With Primary - Secondary Δ p of 820 psi and shell side temperature between 100°F and 200°F

DESIGN FEATURES

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5.4.2 The total water and steam volume of the reactor coolant system is 10,614 + 460 cubic feet at a nominal T_{avg} of 532°F.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. _____ TO FACILITY OPERATING LICENSE NO. DPR-53

AND AMENDMENT NO. _____ TO FACILITY OPERATING LICENSE NO. DPR-69

BALTIMORE GAS AND ELECTRIC COMPANY

CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-317 AND 50-318

U-235 ENRICHMENT INCREASE FOR THE SPENT FUEL POOL

1.0 INTRODUCTION

By its letter dated June 9, 1988, Baltimore Gas and Electric Company (BG&E, the licensee) requested that the Calvert Cliffs Units 1 and 2 Technical Specifications (TS) 5.6.1, "Criticality - Spent Fuel," be modified by increasing the enrichment limit for fuel which may be stored in the spent fuel storage racks from 4.1 to 5.0 weight percent U-235.

2.0 EVALUATION

The Calvert Cliffs spent fuel storage racks consist of square stainless steel cells having an inside dimension of 8-9/16 inches. The inner wall of each storage cell is made of a 0.060 inch thick sheet of 304L stainless steel. A Boraflex sheet 6-1/2 inches wide is sandwiched between this inner wall and an external 0.060 inch thick stainless steel sheet. The Boraflex sheet is 0.90 inches thick with a nominal boron-10 (B^{10}) loading of 0.020 gm/cm². The average distance between the centers of these cells is 10.09 inches. Spent fuel is normally stored in pool water containing about 2300 ppm of soluble boron. This normal storage arrangement would result in extremely subcritical configurations. However, for conservatism, the spent fuel racks were calculated assuming no soluble boron in the water.

The DOT 3-Dimensional discrete ordinates (S₃) transport theory code was used to determine the effective multiplication factor (k_{eff}) of the spent fuel storage arrays. Neutron cross section data from the ENDF/B-IV library was generated for input to this code using the CEPAC code. This model has been benchmarked against experimental data and has been found to adequately reproduce the critical values.

The spent fuel pool criticality calculations were also based on no burnable poison or control rods in the fuel assemblies, unirradiated fuel with 5.0 weight percent U-235, and, as previously mentioned, no soluble boron in the water. In addition, the most adverse effects of temperature, eccentric

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placement of fuel assemblies and poison boxes, changes in steel thickness, change in center to center spacing, boron poison loss possible over the life of the Boraflex, and the calculational uncertainty were included in the following manner. The squares of each delta-k change were added and the square root of the sum was taken. This result was then added to the calculational bias of -0.00138 and the nominal K_{eff} of 0.93678 giving a K_{eff} of 0.946 including all uncertainties at a 95/95 probability/confidence level. This meets the NRC limiting acceptance criterion of k_{eff} no greater than 0.95. Consequently, the NRC staff concludes that the spent fuel storage racks at Calvert Cliffs Units 1 and 2 can accommodate, with respect to criticality, fuel having a maximum enrichment of 5.0 eight percent U-235.

Recently the NRC staff has expressed concerns regarding the possibility of gaps developing in Boraflex sheets due to irradiation induced axial shrinkage. This concern was documented in NRC Information Notice No. 87-43. In response, the licensee has performed an analysis to determine the reactivity effects of Boraflex gap formation in the Calvert Cliffs spent fuel pool. The results indicate that, even with the assumption of a complete loss of soluble boron in the pool water, sufficient margin is available to accommodate nearly a 4 inch vertical gap in every Boraflex sheet at the active fuel centerline without exceeding the NRC limiting criterion of a maximum k_{eff} of 0.95. Although the licensee has no surveillance requirements in place for detecting degradation of the full length Boraflex sheets, it has a poison coupon monitoring program to detect degraded Boraflex specimens which would indicate any extreme shrinkage or loss of neutron absorption properties. In addition, since the installation process for the Boraflex assemblies involved only single sheets, that are not fastened or permanently glued onto any surface or structure, gap formation due to Boraflex shrinkage would not be expected. Based on the above and on normal spent fuel pool conditions, that it contains sufficient soluble boron to more than offset any reactivity increase due to Boraflex degradation, the NRC staff finds the use of Boraflex in the Calvert Cliffs spent fuel pool design to be an acceptable means of meeting the required acceptance criteria.

In the December 28, 1988 letter, BG&E committed to considering the fuel handling accident in Unit 1 or 2 core reload analysis to ensure that the accident analysis would include all possible U-235 enrichment and fuel burnup levels for each specific fuel assembly in the reactor core or the spent fuel pool. The NRC staff finds this analytical approach to be acceptable.

However, until final completion of the NRC generic fuel handling accident analysis for 5.0 weight percent U-235 enriched fuel with burnup levels up to 60,000 MWD/MT, TS 5.6.1, "Criticality - Spent Fuel," cannot be modified to permit the storage of irradiated fuel with U-235 enrichment levels above that currently permitted at Calvert Cliffs, specifically 4.1 weight percent U-235.

Consequently, the NRC staff has determined that an increase in the enrichment limit of TS 5.6.1 for unirradiated fuel stored in the spent fuel storage racks, to a value up to and including 5.0 weight percent U-235 is acceptable. Furthermore, the staff has determined that an increase in the TS 5.6.1 enrichment limit up to and including 5.0 weight percent U-235 for irradiated fuel is acceptable, contingent upon the acceptability of the NRC generic fuel handling accident analysis, but that the TS 5.6.1 enrichment limit shall not be modified for irradiated fuel until this contingency is satisfied.

3.0 INTENT

The intent of the proposed change is to permit the storage of fuel, that is not irradiated, with enrichment levels up to and including 5.0 weight percent U-235, in the spent fuel storage racks.

Irradiated fuel is fuel that has experienced criticality (i.e., k_{eff} greater than or equal to 1.0).

4.0 STATE CONSULTATIONS

A Notice of Consideration of Issuance of Amendment to Facility Operating License and Opportunity for Prior Hearing was published in the Federal Register on August 8, 1988 (53 FR 28791). No hearing requests or intervention petitions were received. The State of Maryland was consulted on this matter and had no comments on the determination.

5.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32 and 51.35, an environmental assessment and finding of no significant impact was published in the Federal Register on January 30, 1989 (53 FR 4352).

Accordingly, based upon the environmental assessment, the Commission has determined that issuance of this amendment will not have a significant effect on the quality of the human environment.

6.0 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 (3) the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

PRINCIPAL CONTRIBUTORS: L. Kopp, S. McNeil

Dated: March 7, 1989

UNITED STATES NUCLEAR REGULATORY COMMISSION
BALTIMORE GAS AND ELECTRIC COMPANY
CALVERT CLIFFS NUCLEAR POWER PLANT UNIT NOS. 1 AND 2
DOCKET NOS. 50-317 AND 50-318
NOTICE OF ISSUANCE OF AMENDMENT TO
FACILITY OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (Commission) has issued Amendment Nos. 136 and 117 to Facility Operating License Nos. DPR-53 and DPR-69, respectively, to the Baltimore Gas and Electric Company which revised the Technical Specifications (TS) for operation of the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 located in Calvert County, Maryland.

The amendments are effective as of the date of issuance.

The amendments modified TS 5.6.1, "Criticality - Spent Fuel," by increasing the U-235 enrichment limit for unirradiated fuel stored in the spent fuel storage racks from 4.1 to 5.0 weight percent.

The application for the amendments complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendments.

Notice of Consideration of Issuance of Amendment and Opportunity for Hearing in connection with this action was published in the FEDERAL REGISTER on August 8, 1988 (53 FR 29791). No request for a hearing or petition for leave to intervene was filed following this notice.

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The Commission has prepared an Environmental Assessment related to the action and has determined not to prepare an environmental impact statement. Based upon the environmental assessment, the Commission has concluded that the issuance of this amendment will not have a significant effect on the quality of the human environment.

For further details with respect to the action see (1) the application for amendment dated June 9, 1988, as supplemented on October 25, November 17, and December 28, 1988, (2) Amendment Nos. 136 and 117 to License Nos. DPR-53 and DPR-69, respectively, and (3) the Commission's related Safety Evaluation and Environmental Assessment. All of these items are available for public inspection at the Commission's Public Document Room, 2120 L Street, N. W., and at the Calvert County Library, Prince Frederick, Maryland. A copy of items (2) and (3) may be obtained upon requested addressed to the U. S. Nuclear Regulatory Commission, Washington D. C. 20555, Attention: Director, Division of Reactor Projects I/II.

Dated at Rockville, Maryland, this 7th day of March 1989.

FOR THE NUCLEAR REGULATORY COMMISSION

ORIGINAL SIGNED BY

Scott Alexander McNeil, Project Manager
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

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See change order ER AP II