ROBERT E. DENTON
Vice President
Nuclear Energy

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 586-2200 Ext. 4455 Local
410 260-4455 Baltimore

BGE

July 13, 1995

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 and 2; Docket Nos. 50-317 and 50-318
Lead Fuel Assembly - Temporary Exemption Request and Request for Amendment

REFERENCE: (a) Letter from Ms. C. M. Thompson (NRC) to Mr. W. F. Conway (APS), dated July 17, 1992, Exemption from 10 CFR 50.46, 10 CFR Part 50, Appendix K, and 10 CFR 50.44

Pursuant to Title 10 of the Code of Federal Regulations (CFR) 50.12(a), Baltimore Gas and Electric Company requests a temporary exemption for Calvert Cliffs Unit No. 1 from the requirements of 10 CFR 50.46, 10 CFR 50.44, and 10 CFR Part 50, Appendix K. Pursuant to 10 CFR 50.90, Baltimore Gas and Electric Company also requests an Amendment to Operating License Nos. DPR-53 and DPR-69 by the incorporation of the changes described below into the Technical Specifications of Calvert Cliffs Unit Nos. 1 and 2.

DESCRIPTION

This exemption will allow four lead fuel assemblies with a limited number of fuel rods clad with advanced zirconium-based alloys to be inserted into the core during the next Unit 1 refueling outage, scheduled to begin in March 1996. The CFR specifies standards and acceptance criteria only for fuel rods clad with zircaloy or ZIRLO. Thus, a temporary exemption is requested to use a limited number of fuel rods clad with advanced zirconium-based alloys that are not zircaloy or ZIRLO.

As detailed below, this temporary exemption is necessary to conduct representative testing of lead fuel assemblies in Calvert Cliffs Unit 1 during Cycles 13, 14, and 15. This testing is intended to provide data to

A001
1/1

support the development of new and improved fuel cladding materials and fuel evaluation codes and methods.

A related change to the Technical Specifications is also required. Currently, Calvert Cliffs Technical Specification 5.2.1, Fuel Assemblies, only allows fuel that is clad with either zircaloy or ZIRLO. Pursuant to 10 CFR 50.90, we request an Amendment to the Calvert Cliffs Units 1 and 2 Technical Specifications to allow the use of cladding materials other than zircaloy or ZIRLO with an approved exemption. We are requesting this change for both units to avoid the need for future amendments. Note that the "Determination of Significant Hazards" section of this submittal applies only to the requested license amendment and not to the requested temporary exemption.

Baltimore Gas and Electric Company believes that the standards of 10 CFR 50.12 are satisfied in this case. Special circumstances are present, as described in 10 CFR 50.12(a)(ii), to warrant granting the temporary exemption. The Nuclear Regulatory Commission (NRC) granted an exemption in Reference (a) for similar lead fuel assemblies in Palo Verde Nuclear Generating Station Unit 3 for Cycles 4, 5, and 6.

BACKGROUND

The Calvert Cliffs Unit 1 core consists of 217 fuel assemblies. Each fuel assembly consists of 176 fuel rods, 5 guide tubes, 5 guide tube sleeves, a bottom Inconel and 8 zircaloy fuel rod spacer grids, upper and lower end fittings, and a hold-down device. The rods are arranged in a square 14x14 array. The guide tubes, spacer grids, and end fittings form the structural frame of the assembly. The four outer guide tubes are mechanically attached to the end fittings and the spacer grids are welded to all five guide tubes.

In a standard fuel assembly, the fuel rods consist of slightly enriched uranium dioxide cylindrical ceramic pellets, a round wire stainless steel compression spring, and an alumina spacer disc located at the bottom of the fuel column, all encapsulated within a seamless Zircaloy-4 tube with a Zircaloy-4 cap welded at each end. The uranium dioxide pellets are dished and chamfered on both ends to accommodate thermal expansion and swelling.

Title 10 CFR 50.46(a)(1)(i) states, "Each boiling and pressurized light-water nuclear power reactor fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in paragraph (b) of this section. ECCS cooling performance must be calculated in accordance with an acceptable evaluation model and must be calculated for a number of postulated loss-of-coolant accidents of different sizes, locations, and other properties sufficient to provide assurance that the most severe postulated loss-of-coolant accidents are calculated." Section 10 CFR 50.46 goes on to delineate specifications for peak cladding temperature, maximum cladding oxidation, maximum hydrogen generation, coolable geometry, and long-term cooling.

In addition, 10 CFR 50.44(a) states, "Each boiling or pressurized light-water nuclear power reactor fueled with oxide pellets with cylindrical zircaloy or ZIRLO cladding, must, as provided in paragraphs (b) through (d) of this section, include means for control of hydrogen gas that may be generated, following a postulated loss-of-coolant accident (LOCA) . . . ." Since 10 CFR 50.46 and 10 CFR 50.44 specifically

refer to fuel with zircaloy or ZIRLO clad, the use of fuel clad with zirconium-based alloys that do not conform to either of these two designations requires an exemption from this section of the Code.

Finally, 10 CFR Part 50, Appendix K, paragraph I.A.5, states, "The rate of energy release, hydrogen generation, and cladding oxidation from the metal/water reaction shall be calculated using the Baker-Just equation." Since the Baker-Just equation presumes the use of zircaloy or ZIRLO cladding, the use of fuel with zirconium-based alloys that do not conform to either of these two designations requires an exemption from this section of the Code.

Baltimore Gas and Electric Company plans to insert four lead fuel assemblies into Calvert Cliffs Unit 1 containing up to 164 fuel rods with advanced cladding materials that do not meet the definition of zircaloy or ZIRLO. The lead fuel assemblies are scheduled to be inserted into the core at the next Unit 1 refueling outage, scheduled to begin in March 1996, and will remain in the Calvert Cliffs Unit 1 core for Cycles 13, 14, and 15. Presently, Cycle 15 is scheduled to end on or about February 2002. We are requesting a temporary exemption to 10 CFR 50.46, 10 CFR 50.44, and 10 CFR Part 50, Appendix K, for the period when these four lead fuel assemblies reside in the core.

We are also requesting that a sentence be added to the Calvert Cliffs Units 1 and 2 Technical Specification 5.2.1, Fuel Assemblies, to allow the use of cladding materials other than zircaloy or ZIRLO with an approved exemption.

REQUESTED CHANGE

Change Technical Specification 5.2.1, Fuel Assemblies, as shown on the marked-up pages for Calvert Cliffs Units 1 and 2 in Attachments (1) and (2), respectively. The change allows the use of cladding materials other than zircaloy or ZIRLO with an approved exemption to the regulations, and will allow the use of the Lead Fuel Assemblies after the exemption is approved.

THE REQUIREMENTS OF 10 CFR 50.12 ARE MET

The standards set forth in 10 CFR 50.12 provide that specific exemptions may be granted which:

- are authorized by law;
- are consistent with the common defense and security;
- will not present an undue risk to the public health and safety; and
- are accompanied by special circumstances.

Baltimore Gas and Electric Company believes that the activities to be conducted under the temporary exemption are clearly authorized by law and are consistent with the common defense and security. The remaining standards for the temporary exemption are also satisfied, as described below.

No Undue Risk

The temporary exemption will not present an undue risk to the public health and safety. The attached safety evaluation performed by ABB-Combustion Engineering (ABB-CE) demonstrates that the predicted chemical, mechanical, and material performance of the advanced zirconium-based cladding is within that approved for zircaloy under all anticipated operational occurrences and postulated accidents. Furthermore, the lead fuel assemblies will be placed in non-limiting core locations. Information contained in the attached safety evaluation report (Attachment 5) is considered proprietary by ABB-CE. Accordingly, it is requested that the report be withheld from public disclosure in accordance with the provisions of 10 CFR 2.790 and that this material be appropriately controlled. The reasons for the classification of this material as proprietary are delineated in the affidavit provided in Attachment (4). A non-proprietary version of the safety evaluation report is included as Attachment (3).

In the unlikely event that cladding failures occur in the lead fuel assemblies, environmental impact would be minimal and is bounded by previous environmental assessments. In addition, the insertion of the lead fuel assemblies will not foreclose the option of reverting to the use of standard zircaloy cladding. That is, the change is not irreversible. The long-term benefits expected from the lead fuel assembly program include reduced incidence of fuel failure, longer operating cycles, higher fuel burnup, and improved thermal margin.

Special Circumstances

This request involves special circumstances as set forth in 10 CFR 50.12(a)(ii). The underlying purpose of 10 CFR 50.46 is to ensure that nuclear power facilities have adequate acceptance criteria for ECCS. The effectiveness of the ECCS in Calvert Cliffs Unit 1 will not be affected by the insertion of the four lead fuel assemblies. Due to the similarities in the material properties of the advanced zirconium-based alloys to zircaloy and the location of the lead fuel assemblies in non-limiting locations, the attached safety evaluation concludes that the ECCS performance in Calvert Cliffs Unit 1 will not be adversely affected. Thus, the attached safety evaluation demonstrates the acceptability of the advanced zirconium-based cladding material under LOCA conditions.

The intent of 10 CFR 50.44 is to ensure that there is an adequate means of controlling generated hydrogen. The hydrogen produced in a post-LOCA scenario comes from a metal-water reaction. The attached safety evaluation also shows that the use of the Baker-Just equation to determine the metal-water reaction rate is conservative for the advanced zirconium-based cladding material. Therefore, the amount of hydrogen generated by metal-water reaction in these materials will be within the design basis of Calvert Cliffs Unit 1.

The intent of paragraph I.A.5 of Appendix K to 10 CFR Part 50 is to apply an equation for rates of energy release, hydrogen generation, and cladding oxidation from a metal-water reaction which conservatively bounds all post-LOCA scenarios. The safety evaluation forwarded with this submittal shows that due to the similarities in the composition of the advanced zirconium-based cladding and zircaloy, the application of the Baker-Just equation will continue to conservatively bound all post-LOCA scenarios.

The wording of the regulations renders the criteria of 10 CFR 50.46, 10 CFR 50.44, and Appendix K to 10 CFR Part 50 inapplicable to the advanced zirconium-based cladding, even though the safety evaluation shows that the intent of the regulations are met. Therefore, application of these regulations would not meet the underlying purpose of the rule and special circumstances exist.

DETERMINATION OF SIGNIFICANT HAZARDS

The proposed change to the Technical Specifications has been evaluated against the standards in 10 CFR 50.92. Note that this determination is not required to address the requested temporary exemption, in accordance with 10 CFR 50.12. The proposed change has been determined to not involve a significant hazards consideration, in that operation of the facility in accordance with the proposed amendments:

1. *Would not involve a significant increase in the probability or consequences of an accident previously evaluated.*

   Calvert Cliffs Technical Specification 5.2.1, Fuel Assemblies, states that fuel rods are clad with either zircaloy or ZIRLO. This reflects the requirements of 10 CFR 50.44, 50.46, and 10 CFR 50, Appendix K, which also restrict fuel rod cladding materials to zircaloy or ZIRLO. Baltimore Gas and Electric Company proposes to insert fuel assemblies into Calvert Cliffs Unit 1 which have some fuel rods clad in zirconium alloys that do not meet the definition of zircaloy or ZIRLO for testing purposes and has applied for an exemption to the regulations to allow that change. The proposed change to the Calvert Cliffs Technical Specifications will allow the use of cladding materials that are not zircaloy or ZIRLO with an approved exemption in accordance with 10 CFR 50.12.

   The proposed change to the Unit 1 and Unit 2 Technical Specifications will allow the use of fuel rod cladding materials other than zircaloy or ZIRLO as long as those materials have been approved by an exemption to the regulations. To obtain approval of new cladding materials, 10 CFR 50.12 requires that the applicant show that the proposed exemption is authorized by law, is consistent with the common defense and security, will not present an undue risk to the public health and safety, and is accompanied by special circumstances.

   Under the proposed change, any fuel rod cladding materials that are not zircaloy or ZIRLO must still be approved by the Nuclear Regulatory Commission (NRC) prior to use under 10 CFR 50.12. This change to the Technical Specifications allows the NRC to approve the use of cladding materials that are not either zircaloy or ZIRLO under 10 CFR 50.12 and not require an additional approval under 10 CFR 50.90. As such, the proposed change eliminates a duplicative regulatory requirement and would have no effect on the probability or consequences of an accident.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. *Would not create the possibility of a new or different type of accident from any accident previously evaluated.*

The proposed change eliminates a duplicated approval requirement and would have no effect on the possibility of a new or different type of accident. The proposed change to the Technical Specifications would allow the NRC to approve the use of fuel rod cladding materials that are not either zircaloy or ZIRLO under 10 CFR 50.12 and not require an additional approval under 10 CFR 50.90.

Therefore, the proposed change does not create the possibility of a new or different type of accident from any accident previously evaluated.

3. *Would not involve a significant reduction in a margin of safety.*

The proposed change eliminates a duplicated approval requirement and will have no effect on the margin of safety. The proposed change to the Technical Specifications would allow the NRC to approve the use of fuel rod cladding materials that are not either zircaloy or ZIRLO under 10 CFR 50.12, and not require an additional approval under 10 CFR 50.90.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

ENVIRONMENTAL IMPACT

There will be no impact on the environment as a result of this exemption. No new operational or safety considerations are introduced by this exemption. The advanced zirconium-based cladding material is expected to perform at least as well as zircaloy cladding. In the unlikely event that cladding failure occurs, the consequences are no more adverse than that of zircaloy clad fuel rods. As a result, the environmental impact would remain unchanged and is bounded by previous environmental assessments.

SCHEDULE

The insertion of the lead fuel assemblies is currently scheduled to occur during the next refueling outage which is expected to begin in March 1996. Should this request not be granted, we must have substitute fuel assemblies fabricated. Therefore, we request that this temporary exemption and license amendment be granted by January 15, 1996.

SAFETY COMMITTEE REVIEW

These proposed changes to the Technical Specifications and our determination of significant hazards have been reviewed by our Plant Operations and Safety Review Committee and Offsite Safety Review Committee. They have concluded that implementation of these changes will not result in an undue risk to the health and safety of the public.

CONCLUSION

Baltimore Gas and Electric Company believes that standards of 10 CFR 50.12 are satisfied including the existence of special circumstances as required by 50.12(a)(ii). This temporary exemption is necessary to permit insertion of four lead fuel assemblies that contain fuel rods clad with advanced zirconium-based alloys that are not zircaloy or ZIRLO as required by the regulations.

Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,

STATE OF MARYLAND :
: TO WIT:
COUNTY OF CALVERT :

I hereby certify that on the 13th day of July, 1995, before me, the subscriber, a Notary Public of the State of Maryland in and for Calvert County, personally appeared Robert E. Denton, being duly sworn, and states that he is Vice President of the Baltimore Gas and Electric Company, a corporation of the State of Maryland; that he provides the foregoing response for the purposes therein set forth; that the statements made are true and correct to the best of his knowledge, information, and belief; and that he was authorized to provide the response on behalf of said Corporation.

WITNESS my Hand and Notarial Seal:

Michelle D. Hall
Notary Public

My Commission Expires:

02/02/98
Date

RED/BDM/dlm

Attachments:
(1) Unit 1 Technical Specifications Marked Up Pages
(2) Unit 2 Technical Specifications Marked Up Pages
(3) Safety Evaluation Report for Use of Advanced Zirconium-Based Cladding Materials in Calvert Cliffs Unit 1 Batch R Lead Fuel Assemblies, May 1995 (Non-Proprietary)
(4) Proprietary Affidavit for Attachment (5)
(5) Safety Evaluation Report for Use of Advanced Zirconium-Based Cladding Materials in Calvert Cliffs Unit 1 Batch R Lead Fuel Assemblies, May 1995 (**Proprietary**) [3 Copies]

cc: **(Without Attachment 5)**
D. A. Brune, Esquire
J. E. Silberg, Esquire
M. J. Case, NRC
D. G. McDonald, Jr., NRC
T. T. Martin, NRC
P. R. Wilson, NRC
R. I. McLean, DNR
J. H. Walter, PSC