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Constellation
Nuclear

Calvert Cliffs
Nuclear Power Plant

A Member of the
Constellation Energy Group

September 14, 2000

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 2; Docket No. 50-318
Lead Fuel Assembly – Temporary Exemption Request and License Amendment Request

REFERENCES:

(a) Letter from Mr. D. G. McDonald, Jr. (NRC) to Mr. R. E. Denton (BGE), dated November 28, 1995, Temporary Exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50, for Lead Fuel Assemblies – Calvert Cliffs Nuclear Power Plant, Unit No. 1 (TAC No. M93232)

(b) Letter from Mr. D. G. McDonald, Jr. (NRC) to Mr. R. E. Denton (BGE), dated February 21, 1996, Issuance of Amendment for Calvert Cliffs Nuclear Power Plant, Unit No. 1 (TAC No. M94365)

Pursuant to Title 10 of the Code of Federal Regulations (CFR) 50.12(a), Calvert Cliffs Nuclear Power Plant, Inc. requests a temporary exemption for Calvert Cliffs Unit No. 2 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, Calvert Cliffs Nuclear Power Plant also requests an amendment to License No. DPR-69 to incorporate the changes described below into the Technical Specifications for Calvert Cliffs Unit 2.

This exemption and Technical Specification change will allow a lead fuel assembly (LFA) with a limited number of fuel rods clad with advanced zirconium-based alloys to be inserted into the core during the next Unit 2 refueling outage, scheduled to begin in March 2001. This LFA was approved to be inserted into Unit 1 Cycle 15 by Reference (a) and (b). Because of concerns with corrosion performance, all of the Anikuloy, Alloy C, and Zr-2P clad rods were removed from this LFA and replaced with OPTIN and Alloy E rods from another LFA. Due to the length of time needed to perform this activity and the duration of the Unit 1 outage, it was not possible to reinsert this LFA into Unit 1 for Cycle 15 operation. Therefore, we are requesting approval to insert this assembly into Unit 2 for Cycle 14 operation. The safety evaluation report supporting the Unit 1 exemption is applicable to Unit 2. Since the information

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contained in the safety evaluation report is considered proprietary by Asea Brown Boveri, Inc. (ABB)-Combustion Engineering, Inc. (CE), it is not being re-submitted in this request.

The proposed change to Technical Specification 4.2.1, Fuel Assemblies, will allow the installation of the LFA into the Unit 2 Cycle 14 core.

ASSESSMENT AND REVIEW

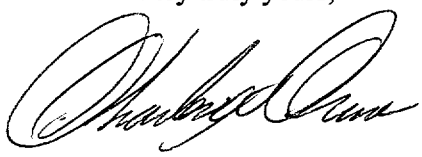
We have considered the possibility of significant hazards associated with this change and have determined that there are none (see Attachment 2 for a complete discussion). We have also determined that operation with the proposed amendment would not result in any significant change in the types, or significant increases in the amounts, of any effluents that may be released offsite, nor would it result in any significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed amendment is eligible for categorical exclusion as set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment is needed in connection with the approval of the proposed amendment. The Plant Operations and Safety Review Committee and Offsite Safety Review Committee have reviewed this proposed change and concur that operation with the proposed changes will not result in an undue risk to the health and safety of the public.

SCHEDULE

The insertion of the LFA is currently scheduled to occur during the next Unit 2 refueling outage, which is expected to begin in March 2001. Should this request not be granted, we would need to insert a substitute fuel assembly in its place. Therefore, we request that this temporary exemption and license amendment be approved and issued by February 1, 2001.

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

Very truly yours,

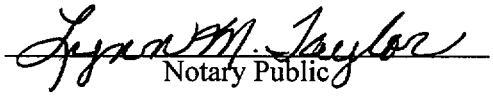


STATE OF MARYLAND :
: **TO WIT:**
COUNTY OF CALVERT :

I, Charles H. Cruse, being duly sworn, state that I am Vice President, Nuclear Energy, Calvert Cliffs Nuclear Power Plant, Inc. (CCNPP), and that I am duly authorized to execute and file this License Amendment Request on behalf of CCNPP. To the best of my knowledge and belief, the statements contained in this document are true and correct. To the extent that these statements are not based on my personal knowledge, they are based upon information provided by other CCNPP employees and/or consultants. Such information has been reviewed in accordance with company practice and I believe it to be reliable.

Subscribed and sworn before me, a Notary Public in and for the State of Maryland and County of CALVERT, this 14th day of SEPTEMBER, 2000.

WITNESS my Hand and Notarial Seal:


Notary Public

My Commission Expires:

2/1/02
Date

CHC/DJM/bjd

Attachments: (1) Background and Analysis
(2) Determination of Significant Hazards
(3) Technical Specification Marked-Up Pages

cc: R. S. Fleishman, Esquire
J. E. Silberg, Esquire
Director, Project Directorate I-1, NRC
A. W. Dromerick, NRC
H. J. Miller, NRC
Resident Inspector, NRC
R. I. McLean, DNR

ATTACHMENT (1)

BACKGROUND AND ANALYSIS

Calvert Cliffs Nuclear Power Plant, Inc.
September 14, 2000

ATTACHMENT (1)

BACKGROUND AND ANALYSIS

The Calvert Cliffs Unit 2 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 or 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 within 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.

We plan to insert one lead fuel assembly (LFA) in Calvert Cliffs Unit 2 containing advanced cladding materials that do not meet the definition of zircaloy or ZIRLO. The LFA is scheduled to be inserted into the core at the next Unit 2 refueling outage, scheduled to begin in March 2001, and will remain in the Calvert Cliffs Unit 2 core for Cycle 14. Presently, Cycle 14 is scheduled to end on or about March 2003. 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 this LFA resides in the core.

This LFA was approved to be inserted into the Unit 1 Cycle 15 core by References 1 and 2. However, because of concerns with corrosion performance, all of the Anikuloy, Alloy C, and ZR-2P clad rods were removed from this LFA and replaced with OPTIN and Alloy E rods from another LFA. Due to the length of time needed to perform this activity and the duration of the outage, it was not possible to reinsert this LFA into Unit 1 for Cycle 15 operation. We are requesting a temporary exemption to insert this LFA into

the Unit 2 Cycle 14 core to continue its representative testing in a timely manner. Its testing is intended to provide data to support the development of new and improved fuel cladding materials and fuel evaluation codes and methods.

Following Unit 1 Cycle 14 irradiation, we removed rods from this LFA (1RT4) whose cladding had unsatisfactory performance due to corrosion. This resulted in 30 Anikuloy, 6 Zr-2P, and 12 Alloy C rods being replaced with 27 OPTIN and 21 Alloy E rods from another LFA (1RT2), reducing the number of different advanced claddings to only two for this LFA. Reference 3 discusses the possibility of performing reconstitution in the event of unsatisfactory performance occurs. A set of criteria was established for these rod swaps such that design analysis for 1RT4 would remain applicable. A calculation was performed that verified that the pin replacements in 1RT4 assembly do not impact the continued applicability of the design analyses. Finally, our original submittal made to the NRC stated that the final burnups achieved in the LFAs would exceed the current approved peak pin limit of 60,000 MWD/T. However, for Unit 2 Cycle 14, 1RT4 will not exceed this burnup limit.

A related change to the Technical Specifications is also required. Currently, Calvert Cliffs Technical Specification 4.2.1, Fuel Assemblies, allows advanced cladding material to be used in four lead test assemblies for Unit 1 Cycles 13, 14, and 15 only. Pursuant to 10 CFR 50.90, we request an Amendment to Renewed Operating License No. DPR-69 to allow advanced cladding material to be used in one lead test assembly for Unit 2 Cycle 14 only. Note that the "Determination of Significant Hazards" section of the submittal applies only to the requested license amendment and not to the requested temporary exemption.

We believe 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.

PROPOSED TECHNICAL SPECIFICATION CHANGES

This submittal proposes to change Technical Specification 4.2.1, Fuel Assemblies, as shown on the marked-up pages for Calvert Cliffs Unit 2 in Attachment (3). The change allows a fuel assembly with advanced cladding material to be inserted in the Unit 2 Cycle 14 core.

10 CFR 50.12 REQUIREMENTS

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

- 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.

We believe 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 safety evaluation performed by Asea Brown Boveri, Inc.-Combustion Engineering, Inc. (ABB-CE) to support the exemption for Unit 1 demonstrated that the predicted chemical, mechanical, and material performance of the advance zirconium-based cladding is within that approved for zircaloy under all anticipated operational occurrences and postulated accidents. Furthermore, the LFA will be placed in a non-limiting core location. The safety evaluation report supporting the Unit 1 exemption is applicable to Unit 2. Since the information contained in the safety evaluation report is considered proprietary by ABB-CE, it is not being re-submitted in this request.

In the unlikely event that cladding failures occur in the LFA, environmental impact would be minimal and is bounded by previous environmental assessments. In addition, the insertion of the LFA 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 LFA 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 2 will not be affected by the insertion of the LFA. Due to the similarities in the material properties of the advanced zirconium-based alloys to zircaloy and the location of the LFA in a non-limiting location, the safety evaluation concluded that the ECCS performance would not be adversely affected. Thus, the 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 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.

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 that conservatively bounds all post-LOCA scenarios. The safety evaluation 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.

REFERENCES:

1. Letter from Mr. D. G. McDonald, Jr. (NRC) to Mr. R. E. Denton (BGE), dated November 28, 1995, Temporary Exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50, for Lead Fuel Assemblies – Calvert Cliffs Nuclear Power Plant, Unit No. 1 (TAC No. M93232)
2. Letter from Mr. D. G. McDonald, Jr. (NRC) to Mr. R. E. Denton (BGE), dated February 21, 1996, Issuance of Amendment for Calvert Cliffs Nuclear Power Plant, Unit No. 1 (TAC No. M94365)
3. Letter from Mr. R. E. Denton (BGE) to Document Control Desk (NRC), dated July 13, 1995, Lead Fuel Assembly – Temporary Exemption Request and Request for Amendment

ATTACHMENT (2)

DETERMINATION OF SIGNIFICANT HAZARDS

ATTACHMENT (2)

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 4.2.1, 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 Part 50, Appendix K, which also restricts fuel rod cladding materials to zircaloy or ZIRLO. Calvert Cliffs Nuclear Power Plant, Inc. proposes to insert a fuel assembly into Calvert Cliffs Unit 2 that have some fuel rods clad in zirconium alloys that do not meet the definition of zircaloy or ZIRLO. An exemption to the regulations has also been requested to allow this fuel assembly to be inserted into Unit 2. The proposed change to the Calvert Cliffs Technical Specifications will allow the use of cladding materials that are not zircaloy or ZIRLO for one fuel cycle once the exemption is approved. 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. The proposed change to the Technical Specification is effective only as long as the exemption is effective. The addition of what will be an approved temporary exemption to Unit 2 Technical Specification 4.2.1 does not change the probability or consequences of an accident previously evaluated.

   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 does not add any new equipment, modify any interfaces with existing equipment, change the equipment's function, or change the method of operating the equipment. The proposed change does not affect normal plant operations or configuration. Since the proposed change does not change the design, configuration, or operation, it could not become an accident initiator.

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

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

   The proposed change will add an approved temporary exemption to the Unit 2 Technical Specifications allowing the installation of a lead fuel assembly. This assembly uses advanced cladding materials that are not specifically permitted by existing regulations or Calvert Cliffs' Technical Specifications. A temporary exemption to allow the installation of this assembly has been requested. The addition of an approved temporary exemption to Technical Specification 4.2.1 is simply intended to allow the installation of the lead fuel assembly under the provisions of the temporary exemption. The license amendment is effective only as long as the exemption is effective. This amendment does not change the margin of safety since it only adds a reference to an approved, temporary exemption to the Technical Specifications.

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

ATTACHMENT (3)

TECHNICAL SPECIFICATIONS

MARKED-UP PAGES

4.0-1

4.0 DESIGN FEATURES

4.1 Site Location

The site for the Calvert Cliffs Nuclear Power Plant is located on the western shore of the Chesapeake Bay in Calvert County, Maryland, about 10-1/2 miles Southeast of Prince Frederick, Maryland. The site is approximately 45 miles southeast of Washington, DC, and 60 miles south of Baltimore, Maryland. The exclusion area boundary has a minimum radius of 1,150 meters from the center of the plant.

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 217 fuel assemblies. Each assembly shall consist of a matrix of Zircalloy or ZIRLO fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions. For Unit 1 Cycles 13, 14, and 15 only, advanced cladding material may be used in four lead test assemblies as described in an approved temporary exemption dated November 28, 1995. For Unit 2 Cycle 14 only, advanced cladding material may be used in one lead test assembly as described in an approved temporary exemption dated _____.

4.2.2 Control Element Assemblies

The reactor core shall contain 77 control element assemblies.