Charles H. Cruse
Vice President
Nuclear Energy

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 495-4455

Constellation Nuclear

Calvert Cliffs Nuclear Power Plant

A Member of the Constellation Energy Group

July 27, 2001

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
License Amendment Request: Incorporate Methodology References for the Implementation of ZIRLO™ Clad Fuel Rods into the Technical Specifications

REFERENCES:

(a) Letter from Mr. J. Cushing (NRC) to Mr. P. W. Richardson (WEC), dated February 27, 2001, Acceptance of CENPD-404-P, Revision 0, "Implementation of ZIRLO™ Cladding Material in CE Nuclear Power Fuel Designs" for Review (TAC MB1035)

(b) Letter from Mr. S. A. Richards (NRC) to Mr. P. W. Richardson (WEC), dated December 15, 2000, Safety Evaluation of Topical Report CENPD-132, Supplement 4, Revision 1, "Calculative Methods for the CE Nuclear Power Large Break LOCA Evaluation Model" (TAC MA5660)

(c) Letter from Mr. T. H. Essig (NRC) to Mr. I. C. Rickard (ABB-CE), dated December 16, 1997, Acceptance for Referencing of the Topical Report CENPD-137(P), Supplement 2, "Calculative Methods for the C-E Small Break LOCA Evaluation Model" (TAC No. M95687)

Pursuant to 10 CFR 50.90, the Calvert Cliffs Nuclear Power Plant, Inc. hereby requests an amendment to the Renewed Operating License Nos. DPR-53 and DPR-69 to add three methodology references to the list of approved core operating limits analytical methods in the Technical Specifications for Calvert Cliffs Unit Nos. 1 and 2.

DESCRIPTION

The proposed change provides the necessary references in the Technical Specifications to implement ZIRLO™ cladding material into the fuel design for Calvert Cliffs Nuclear Power Plant. The proposed changes to Technical Specification 5.6.5.b are shown in Attachment (1). The final Technical Specification pages will be renumbered to accommodate the insertion of this change. The same change will be made in the Core Operating Limits Report (COLR).

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BACKGROUND

In a continuing effort to improve fuel performance, Calvert Cliffs Nuclear Power Plant plans to implement ZIRLO™ cladding material into Unit Nos. 1 and 2 for all new fuel assemblies beginning in 2002. The use of ZIRLO™ clad fuel rods will substantially reduce exterior corrosion and particularly spalling experienced by some current Zircaloy-4 clad fuel rods as they approach higher burnup levels and duty cycles. Technical Specification 5.6.5.b currently does not include a methodology reference for the use of ZIRLO™ clad fuel rods in the Calvert Cliffs reactor cores. The proposed Technical Specification change provides this methodology reference.

ZIRLO™ Topical Report

Topical Report CENPD-404-P will be added to the list of analytical methods used to determine the core operating limits. This topical report describes the implementation of ZIRLO™ fuel rod cladding material properties and correlations in Westinghouse Electric Company (WEC) (formally Combustion Engineering Nuclear Power) design and safety analysis methodologies for Combustion Engineering (CE) designed PWRs and fuel. It is expected to be approved by the Nuclear Regulatory Commission (NRC) for application to CE designed PWRs and fuel by the fall of 2001 (Reference a). The ZIRLO™ material properties are documented in NRC accepted WEC topical reports. Westinghouse Electric Company has confirmed the range of properties and data to also support implementation for CE fuel designs and safety analysis methodologies. Similarly, data reduction and correlation development activities, including the definition of property uncertainties, have also been confirmed to be compatible with application to CE fuel designs and safety analysis methodologies. Finally, WEC design and licensing safety analysis activities require the application of performance criteria or limits, which have been NRC accepted for the CE Zircaloy-4 cladding material, and have been confirmed to be consistent with, and applicable to, ZIRLO™ cladding as well. Following this extensive evaluation, WEC has concluded that application of ZIRLO™ in existing CE fuel designs does not result in any undesirable changes in predicted fuel performance or safety analysis results. The use of ZIRLO™ results in significant improvements in exterior corrosion. While modifications to CE computer codes are required to implement ZIRLO™ material properties, no modifications are required to the NRC-accepted ZIRLO™ properties or analysis methodologies for CE designed Nuclear Steam Supply Systems and fuel designs, design performance criteria, or regulatory acceptance criteria. Calvert Cliffs Unit Nos. 1 and 2 are CE designed PWRs and are supplied with CE designed nuclear fuel.

The ZIRLO™ Topical, CENPD-404-P, requires the use of specific versions of the Westinghouse Emergency Core Cooling System (ECCS) performance evaluation models for Combustion Engineering designed PWRs [i.e., the 1999 Evaluation Model for Large Break Loss of Coolant Accident (LBLOCA) evaluation and the new evaluation model for Small Break Loss of Coolant Accident (SBLOCA) evaluation]. The Calvert Cliffs Technical Specifications do not list these ECCS methods. A reference to both CENPD-132, Supplement 4 and CENPD-137, Supplement 2 will be added. These two topical reports have been generically accepted by the NRC for the analysis of ECCS performance of CE designed PWRs. The proposed change adds these ECCS performance evaluation model references to the Technical Specifications.

Large Break LOCA Model Topical Report

CENPD-132, Supplement 4-P-A presents modifications to Combustion Engineering Nuclear Power's 1985 LBLOCA ECCS performance evaluation model. The 1985 evaluation model has been used to evaluate Calvert Cliffs to date. The currently approved evaluation model and the new modified evaluation model through Supplement 4 are abbreviated "1985 evaluation model" and "1999 evaluation model," respectively. The 1999 evaluation model modifications are organized into three basic categories:

1. Modifications that involve change to the 1985 evaluation model analysis process within the currently NRC-approved methodologies.
2. Replacement of the Dougall-Rohsenow film boiling heat transfer correlation (this change was required for compliance with a requirement of the 1988 revision to 10 CFR Part 50, Appendix K).
3. Model changes designed to reduce unnecessary conservatism in the following models:
    - Hot assembly fuel rod internal gas pressure,
    - Steam venting reflood thermal-hydraulics,
    - Steam/water interaction during safety injection tank nitrogen discharge, reflood heat transfer,
    - Hot rod steam cooling heat transfer.

As discussed in the NRC's SER (Reference b), the 1985 evaluation model process changes, including the use of an Automated/Integrated Code System (AICS), the explicit cladding swelling/rupture calculations in the CEFLASH-4A and STRIKIN-II codes, and the consistent modeling of spray and spillage into Containment, represent no change to NRC-accepted thermal-hydraulic models and methodologies, and is therefore acceptable in the context of the 1999 evaluation model. Taken collectively, these changes form the 1999 evaluation model and result in a substantial improvement in analytic margin to the peak clad temperature regulatory criteria. There are no limitations and/or constraints imposed by the NRC SER that impact analysis of Calvert Cliffs.

Small Break LOCA Model Topical Report

Topical Report CENPD-137(P), Supplement 2, introduced the following changes to the previous small break LOCA evaluation model:

- Addition of a radiation to steam heat transfer model,
- Revision of the convection to steam heat transfer model,
- Improved coupling of the hot rod fuel and coolant channel energy models.

The updated models introduced by CENPD-137(P), Supplement 2 were verified against various data sets and against calculations using a variety of established thermal-hydraulic codes, including TRAC and computational fluid dynamics codes. Comparisons of calculated results with test data benchmarking calculations using other thermal-hydraulic codes indicate that, for the range of SBLOCA conditions expected in a plant of CE design, the updated models provide more realistic simulation of the thermal-hydraulic phenomena that they calculate. From its review of CENPD-137(P), Supplement 2, the staff concluded that the models introduced in the updated methodology provide improved realism in the treatment of SBLOCA thermal-hydraulic phenomena while retaining significant conservatism. Therefore, the staff concluded that CENPD-137(P), Supplement 2, was acceptable and is suitable for reference in CE plant licensing documentation, including Technical Specifications and COLRs. There

are no limitations and/or constraints imposed by the NRC SER (Reference c) that impact analysis of Calvert Cliffs.

SAFETY ANALYSIS

The proposed change to Technical Specification 5.6.5.b will provide three additional methodology references. The proposed change will provide the capability for the Safety Analyses to analyze ZIRLO™ clad fuel rods. In addition, it will allow the use of Westinghouse's current ECCS performance methodology for CE designed PWRs. The subject methodologies have been reviewed and generically accepted by the NRC for application to CE designed PWRs. Since the affected methodologies will be used for safety analyses for which they were accepted, the proposed changes are applicable to Calvert Cliffs.

With ZIRLO™ material introduced in the reactor, cores will exist in which ZIRLO™ and Zircaloy-4 clad fuel rods are co-resident. Fuel rods clad with each material will be evaluated based on the approved topical report.

DETERMINATION OF SIGNIFICANT HAZARDS

Calvert Cliffs Nuclear Power Plant, Inc. (CCNPP) is proposing a change to the Technical Specifications for Calvert Cliffs Unit Nos. 1 and 2 to allow the use of methods required for the implementation of ZIRLO™ clad fuel rods and the use of current versions of the emergency core cooling system (ECCS) performance evaluation models for large and small break loss-of-coolant accidents (LOCAs). The proposed change to Technical Specification 5.6.5.b adds CENPD-404-P to the Core Operating Limits Report reference list. The proposed change also adds references CENPD-132, Supplement 4 and CENPD-137, Supplement 2 for the large break LOCA and small break LOCA evaluation models, which are required for analysis of ZIRLO™ clad fuel.

The proposed change has been evaluated against the standards in 10 CFR 50.92 and has been determined to not involve a significant hazards consideration in 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.*

   The proposed change allows the use of methods required for the implementation of ZIRLO™ clad fuel rods in Calvert Cliffs Unit Nos. 1 and 2 and the use of current versions of the ECCS performance evaluation models for large and small break LOCAs. The use of updated analysis methodologies will not increase the probability of an accident because the plant systems will not be operated outside of design limits, no different equipment will be operated, and system interfaces will not change.

   With ZIRLO™ material introduced in the reactor, cores will exist in which ZIRLO™ and Zircaloy-4 clad fuel rods are co-resident. Fuel rods clad with each material will be evaluated based on the approved topical report.

   The use of the three additional methodologies will not increase the consequences of an accident because Limiting Conditions for Operation (LCOs) will continue to restrict operation to within the

regions that provide acceptable results, and Reactor Protective System (RPS) trip setpoints will restrict plant transients so that the consequences of accidents will be acceptable. Also, the consequences of the accidents will be calculated using NRC accepted methodologies.

The cores that will exist with ZIRLO™ and/or Zircaloy-4 clad fuel in the reactor will not increase the consequences of an accident. Operation within the LCOs and RPS setpoints will continue to restrict plant transients so that the consequences of accidents will be acceptable.

Therefore, the proposed Technical Specification changes do 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 any existing equipment, alter the equipment's function or change the method of operating the equipment. The proposed change does not alter plant conditions in a manner that could affect other plant components. The proposed change does not cause any existing equipment to become an accident initiator. The ZIRLO™ clad fuel rod design does not introduce features that could initiate an accident. 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 the margin of safety.*

Safety Limits ensure that Specified Acceptable Fuel Design Limits are not exceeded during steady state operation, normal operational transients, and anticipated operational occurrences. All fuel limits and design criteria shall be met based on the approved methodologies defined in the topical reports. The RPS in combination with the LCOs, will continue to prevent any anticipated combination of transient conditions for reactor coolant system temperature, pressure and thermal power level that would result in a violation of the Safety Limits. Therefore, the proposed changes will not involve a significant reduction in the margin of safety.

The safety analyses determine the LCO settings and RPS setpoints that establish the initial conditions and trip setpoints, which ensure that the Design Basis Events (Postulated Accidents and Anticipated Operational Occurrences) analyzed in the Updated Final Safety Analysis Report produce acceptable results. Also all fuel limits and design criteria shall be satisfied. The Design Basis Events that are impacted by the implementation of ZIRLO™ cladding will be analyzed using the NRC accepted methodology described in CENPD-404-P.

The change in the fuel rod cladding material and the use of the current ECCS performance evaluation models will not involve a reduction in the margin of safety because acceptable results for the impacted Design Basis Events will be maintained.

Therefore, the margin of safety is not significantly reduced by this proposed change.

Based on the above evaluations, Calvert Cliffs Nuclear Power Plant concludes that the activities associated with the above described change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92 and accordingly, a finding by the Nuclear Regulatory Commission of no significant hazards consideration is justified.

ENVIRONMENTAL ASSESSMENT

We have 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.

SAFETY COMMITTEE REVIEW

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

This change is requested to be approved by January 31, 2002 since we plan to introduce ZIRLO™ clad fuel rods in the Calvert Cliffs Nuclear Power Plant core reloads during the 2002 Unit 1 Refueling Outage. It is requested that this proposed Technical Specification amendment become effective 60 days following issuance of this amendment.

Should you have questions regarding this matter, we would 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 27 day of July, 2001.

WITNESS my Hand and Notarial Seal:

Notary Public

My Commission Expires: 2/1/2002

Date

CHC/DJM/bjd

Attachments: (1) Technical Specifications Marked-Up Page

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

ATTACHMENT (1)

TECHNICAL SPECIFICATIONS

MARKED-UP PAGE

5.0-39

5.6 Reporting Requirements

41. The power distribution monitoring system referenced in various specifications and the BASES, is described in the following documents:

    i. CENPD-153-P, Latest Approved Revision, "Evaluation of Uncertainty in the Nuclear Power Peaking Measured by the Self-Powered, Fixed Incore Detector System"

    ii. CEN-119(B)-P, "BASSS, Use of the Incore Detector System to Monitor the DNB-LCO on Calvert Cliffs Unit 1 and Unit 2," November 1979

    iii. Letter from Mr. G. C. Creel (BG&E) to NRC Document Control Desk, dated February 7, 1989, "Calvert Cliffs Nuclear Power Plant Unit No. 2; Docket 50-318, Request for Amendment, Unit 2 Ninth Cycle License Application"

    iv. Letter from Mr. S. A. McNeil, Jr. (NRC) to Mr. G. C. Creel (BG&E), dated January 10, 1990, "Safety Evaluation Report Approving Unit 2 Cycle 9 License Application"

42. Letter from Mr. D. G. McDonald, Jr. (NRC) to Mr. R. E. Denton (BGE), dated May 11, 1995, "Approval to Use Convolution Technique in Main Steam Line Break Analysis - Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (TAC Nos. M90897 and M90898)

43. CENPD-387-P-A, Latest Approved Revision, "ABB Critical Heat Flux Correlations for PWR Fuel"

44. CENPD-199-P, Supplement 2-P-A, Appendix A, Latest Approved Revision, "CE Setpoint Methodology," June 1998

INSERT A

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, ECCS limits, nuclear limits such as

INSERT A

45. CENPD-404-P-A, Latest Approved Revision, "Implementation of ZIRLO™ Cladding Material in CE Nuclear Power Fuel Assembly Designs"

46. CENPD-132, Supplement 4-P-A, Latest Approved Revision, "Calculative Methods for the CE Nuclear Power Large Break LOCA Evaluation Model"

47. CENPD-137, Supplement 2-P-A, Latest Approved Revision, "Calculative Methods for the ABB CE Small Break LOCA Evaluation Model"