

March 15, 2001

Mr. Charles H. Cruse  
Vice President - Nuclear Energy  
Calvert Cliffs Nuclear Power Plant, Inc.  
Calvert Cliffs Nuclear Power Plant  
1650 Calvert Cliffs Parkway  
Lusby, MD 20657-4702

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 -  
AMENDMENT RE: PRESSURE-TEMPERATURE CURVES (TAC NOS.  
MA9999 AND MB0000)

Dear Mr. Cruse:

The Commission has issued the enclosed Amendment No. 243 to Renewed Facility Operating License No. DPR-53 and Amendment No. 217 to Renewed Facility Operating License No. DPR-69 for the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2. This amendment consists of changes to the Technical Specifications (TSs) in response to your application transmitted by letter dated September 14, 2000.

The amendments revise the Unit 1 and 2 heatup and cooldown curves to increase the allowable reactor coolant heatup and cooldown curves. An exemption to the regulations was issued on February 26, 2001, to permit for the use of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Code Case N-640 for the purposes described herein. The proposed TS changes relate to the exemption.

A copy of the related Safety Evaluation is enclosed. A Notice of Issuance will be included in the Commission's next regular biweekly *Federal Register* notice.

Sincerely,

*/RA/*

Donna Skay, Project Manager, Section 1  
Project Directorate 1  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosures: 1. Amendment No. 243 to DPR-53  
2. Amendment No. 217 to DPR-69  
3. Safety Evaluation

cc w/encls: See next page

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ACCESSION NUMBER: ML010330176

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OFFICIAL RECORD COPY

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CALVERT CLIFFS NUCLEAR POWER PLANT, INC.

DOCKET NO. 50-317

CALVERT CLIFFS NUCLEAR POWER PLANT UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 243  
Renewed License No. DPR-53

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Calvert Cliffs Nuclear Power Plant, Inc. (the licensee) dated September 14, 2000, 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 Renewed 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. 243 , 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 and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

*/RA/*

Marsha Gamberoni, Chief, Section 1  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Technical  
Specifications

Date of Issuance: March 15, 2001

CALVERT CLIFFS NUCLEAR POWER PLANT, INC.

DOCKET NO. 50-318

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 217  
Renewed License No. DPR-69

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Calvert Cliffs Nuclear Power Plant, Inc. (the licensee) dated September 14, 2000, 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 Renewed 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. 217 , 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 and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

*/RA/*

Marsha Gamberoni, Chief, Section 1  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Technical  
Specifications

Date of Issuance: March 15, 2001

ATTACHMENT TO LICENSE AMENDMENTS

AMENDMENT NO. 243 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-53

AMENDMENT NO. 217 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-69

DOCKET NOS. 50-317 AND 50-318

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages

3.4.3-3  
3.4.3-4  
3.4.3-5  
3.4.3-6

Insert Pages

3.4.3-3  
3.4.3-4  
3.4.3-5  
3.4.3-6



SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 243 TO RENEWED  
FACILITY OPERATING LICENSE NO. DPR-53  
AND AMENDMENT NO. 217 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-69  
CALVERT CLIFFS NUCLEAR POWER PLANT, INC.  
CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2  
DOCKET NOS. 50-317 AND 50-318

## 1.0 INTRODUCTION

By letter dated September 14, 2000, Calvert Cliffs Nuclear Power Plant, Inc. (CCNPPI or the licensee) submitted a request for changes to the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (CCNPP) Technical Specifications (TSs). The requested changes would revise the heatup and cooldown curves. An exemption to the regulations was issued on February 26, 2001, to permit for the use of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Code Case N-640 for the purposes described herein. The proposed TS changes relate to the exemption.

## 2.0 BACKGROUND

The NRC has established requirements in 10 CFR Part 50 to protect the integrity of the reactor coolant pressure boundary in nuclear power plants. The staff evaluates the pressure/temperature (P-T) limit curves based on the following NRC regulations and guidance: Generic Letter (GL) 88-11, "NRC Position on Radiation Embrittlement of Reactor Vessel Materials and its Impact on Plant Operations"; GL 92-01, Revision 1, "Reactor Vessel Structural Integrity"; GL 92-01, Revision 1, Supplement 1; Regulatory Guide (RG) 1.99, Revision 2 (Rev. 2), "Radiation Embrittlement of Reactor Vessel Materials"; 10 CFR Part 50, Appendix G, "Fracture Toughness Requirements"; and Standard Review Plan (SRP) Section 5.3.2. A discussion of each of these requirements follows:

GL 88-11 advised licensees that the staff would use RG 1.99, Rev. 2, to review P-T limit curves. RG 1.99, Rev. 2, contains methodologies for determining the increase in transition temperature and the decrease in upper-shelf energy (USE) resulting from neutron radiation.

GL 92-01, Rev. 1, requested that licensees submit their reactor pressure vessel (RPV) data for their plants to the staff for review. GL 92-01, Rev. 1, Supplement 1, requested that licensees provide and assess data from other licensees that could affect their RPV

integrity evaluations. This data is used by the staff as the basis for the staff's review of P-T limit curves and as the basis for the staff's review of pressurized thermal shock (PTS) assessments (10 CFR 50.61 assessments).

Appendix G to 10 CFR Part 50 requires that P-T limit curves be at least as conservative as those obtained by applying the methodology of Appendix G to Section XI of the ASME Code. Appendix G to 10 CFR Part 50 also provides minimum temperature requirements that must be considered in the development of the P-T limit curves.

SRP Section 5.3.2 provides an acceptable method of determining the P-T limit curves for ferritic materials in the beltline of the RPV based on the linear elastic fracture mechanics (LEFM) methodology of Appendix G to Section XI of the ASME Code.

The basic parameter of the methodology in Appendix G to Section XI of the ASME Code is the stress intensity factor  $K_I$ , which is a function of the stress state and flaw configuration. Appendix G requires a safety factor of 2.0 on stress intensities resulting from reactor pressure during normal and transient operating conditions, and a safety factor of 1.5 for hydrostatic testing curves. The methods of Appendix G postulate the existence of a sharp surface flaw in the RPV that is normal to the direction of the maximum stress. This flaw is postulated to have a depth that is equal to 1/4 of the RPV beltline thickness and a length equal to 1.5 times the RPV beltline thickness. The critical locations in the RPV beltline region for calculating heatup and cooldown P-T curves are the 1/4 thickness (1/4T) and 3/4 thickness (3/4T) locations, which correspond to the maximum depth of the postulated inside surface and outside surface defects, respectively.

The Appendix G ASME Code methodology requires that licensees determine the adjusted reference temperature (ART or adjusted  $RT_{NDT}$ ). The ART is defined as the sum of the initial (unirradiated) reference temperature (initial  $RT_{NDT}$ ), the mean value of the adjustment in reference temperature caused by irradiation ( $\Delta RT_{NDT}$ ), and a margin (M) term.

The  $\Delta RT_{NDT}$  is a product of a chemistry factor and a fluence factor. The chemistry factor is dependent upon the amount of copper and nickel in the material and may be determined from tables in RG 1.99, Rev. 2, or from surveillance data. The fluence factor is dependent upon the neutron fluence at the maximum postulated flaw depth. The margin term is dependent upon whether the initial  $RT_{NDT}$  is a plant-specific or a generic value and whether the chemistry factor (CF) was determined using the tables in RG 1.99, Rev. 2, or surveillance data. The margin term is used to account for uncertainties in the values of the initial  $RT_{NDT}$ , the copper and nickel contents, the fluence and the calculational procedures. RG 1.99, Rev. 2, describes the methodology to be used in calculating the margin term.

### 3.0 EVALUATION

#### 3.1 Licensee Evaluation

CCNPPI has proposed amendments to revise the heatup and cooldown curves to increase the allowable heatup and cooldown rates. Use of stress intensity factor  $K_{IC}$ , permitted by ASME Code Case N-640, makes it possible to increase the heatup and cooldown rates without changing the existing P-T limits. Use of Code Case N-640 to generate P-T curves is not currently permitted by the regulations. Therefore, an exemption to use ASME Code Case N-640 was approved.

The proposed changes to the heatup and cooldown rates are necessary to address operator difficulties and safety challenges encountered when entering and exiting plant outage periods. The existing restrictive heatup and cooldown rates in low temperature regions impact the integrity of plant components due to corrosion, plant work-arounds and critical path time. Compliance with Appendix G to the Code, without the relief provided by ASME Code Case N-640 results in needless transitions to and from shutdown cooling. This can occur because during startup from an outage, operation of two reactor coolant pumps (RCPs) to heat up the reactor coolant system (RCS) challenges the existing allowed heatup rate. Two RCPs in the low temperature region generate a heatup rate that can exceed the existing heatup rate. Single RCP operation is currently prohibited at CCNPP. Prior to planned heatup, operators allow temperature of the RCS to drift up. The steam generators (SGs) act as a large heat sink limiting the maximum temperature achievable in the RCS with decay heat. Therefore, the SGs frequently require heating with sparged condensate to meet the RCP start criteria. Sparging the condenser and reducing vacuum to raise the temperature of the SG feedwater raises the saturation temperature of the water and increases the oxygen concentration to a level that creates a corrosion environment on the outside of the SG tubes. In addition, the temperature differential between the SGs and the RCS is restricted to prevent exceeding the existing cooldown rates. This restriction imposes a limit to the maximum RCS temperature for an RCP start and needless transitions to and from shutdown cooling can occur due to these restrictions. This places an unnecessary burden on the plant and the operators.

### 3.2 Staff Evaluation

In previous evaluations (References 3 and 4) the staff performed independent calculations of the ART values for the limiting material using the methodology in RG 1.99, Revision 2. Based on these calculations, the staff previously verified the licensee's limiting materials for the CCNPP reactor vessels. The staff's calculated ART values for the limiting material agreed with the licensee's calculated ART values. Since the licensee used the previously calculated ART for calculating the revised P-T limit curves, the licensee did not change the applicable years for the curves.

In this evaluation, the staff performed check calculations to verify the revised P-T limit curves using the revised heatup and cooldown rates and stress intensity factor  $K_{IC}$ , permitted by ASME Code Case N-640. This Code Case was previously approved for CCNPPI by an exemption dated February 26, 2001. The staff found agreement with the submitted P-T curves, as calculations confirmed various points on the submitted P-T limit curves were bounded by the indicated temperature.

The staff determined that CCNPPI's P-T limit methods were based on conservative assumptions that made the proposed P-T limit curves as conservative or slightly more conservative than the P-T limit curves generated by the staff. The staff also confirmed that CCNPPI's P-T limit curves included appropriate minimum temperature requirements that were at least as conservative as those required in 10 CFR Part 50, Appendix G, Paragraph IV.A.2, "Pressure-Temperature Limits and Minimum Temperature Requirements" as exempted and modified by the Code Case methods.

#### 4.0 CONCLUSIONS

Based on its review of CCNPPI's proposed P-T limit curves, the staff has determined that the proposed P-T limit curves satisfy the requirements of Appendix G of 10 CFR Part 50, as modified by Code Case N-640, and hence, meet the requirements of 10 CFR 50.60a, "Acceptance Criteria for Fracture Prevention Measures for Light Water Nuclear Power Reactors for Normal Operation."

The proposed P-T limit curves also satisfy GL 88-11, because the method in RG 1.99, Rev. 2, was used to calculate the ART. Hence, the proposed P-T limit curves are acceptable for incorporation in the CCNPP TSs.

#### 5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Maryland State official was notified of the proposed issuance of the amendments. The State official had no comments.

#### 6.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (65 FR 62382). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

#### 7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

#### 8.0 REFERENCES

1. Letter from C. H. Cruse, Vice President, Constellation Nuclear to the U.S. Nuclear Regulatory Commission Document Control Desk, "Calvert Cliffs Nuclear Power Plant Unit Nos. 1 & 2; Docket No. 50-317 & 50-318, License Amendment Request: Revision to Technical Specification P-T Curves," dated September 14, 2000.
2. Letter from C. H. Cruse, Vice President, Constellation Nuclear to the U.S. Nuclear Regulatory Commission Document Control Desk, "Calvert Cliffs Nuclear Power Plant Unit Nos. 1 & 2; Docket No. 50-317 & 50-318, Request for Exemption from 10 CFR Part 50, Appendix G, Requirements," dated September 14, 2000.

3. Letter from D. G. McDonald, U.S. Nuclear Regulatory Commission to R. E. Denton, Vice President, Baltimore Gas and Electric Co., "Issuance of Amendment for Calvert Cliffs Nuclear Power Plant Unit No. 2; (TAC No. M89588)," dated November 1, 1994.
4. Letter from A. W. Dromerick, U.S. Nuclear Regulatory Commission to C. H. Cruse, Vice President, Constellation Nuclear, "Calvert Cliffs Nuclear Power Plant Unit No. 1 - Amendment Re: Pressure-Temperature Limits Evaluation (TAC No. MA7220)," dated March 20, 2000.

Principal Contributor: E. Andruszkiewicz

Date: March 15, 2001