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May 27, 1994

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 2; Docket Nos. 50-318
License Amendment Request; Unit 2 Variable Low Temperature Overpressure Protection

Pursuant to 10 CFR 50.90, the Baltimore Gas and Electric Company hereby requests an Amendment to Operating License No. DPR-69 by incorporating the changes described below into the Technical Specifications for Calvert Cliffs Unit No. 2.

DESCRIPTION

The proposed amendment would revise the heatup and cooldown curves and the Low Temperature Overpressure Protection (LTOP) controls for Unit 2 to support modifications to the LTOP system that are scheduled for the spring 1995 refueling outage. This proposed amendment is plant-specific to Calvert Cliffs. This proposed change and the scheduled modifications are necessary to increase operating flexibility.

BACKGROUND

On July 21, 1977, a plant-specific report on Reactor Coolant System (RCS) LTOP was submitted to the NRC (Reference a). That report detailed the administrative controls and hardware modifications which were necessary to protect the 10 CFR Part 50, Appendix G, Pressure-Temperature (P-T) limits from an LTOP event for reactor vessel irradiation up to 10 Effective Full Power Years (EFPY). In our letter dated October 22, 1990 (Reference b), we described additional measures required to continue 10 CFR Part 50, Appendix G, P-T protection for 12 EFPY. In our letter of November 1, 1993 (Reference c), we revised the fluence from 1.69×10^{19} n/cm^2 to 1.92×10^{19} n/cm^2 based on the revised chemistry for weld 2-203-A, B, and C. With the revision to the chemistry of weld 2-203-A, B, and C, plate D-8906-1 becomes the limiting material. The revised chemistry for this weld was approved in Reference (d).

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This License Amendment Request describes the modifications scheduled to be made to the LTOP system to provide continued low temperature overpressurization protection. The significant changes are: 1) the fluence used to determine the heatup and cooldown rates was increased to 4.0×10^{19} n/cm^2 (E > 1 MeV) in order to extend the applicable operating period. This fluence value was selected in order to extend the applicability of the curves to greater than 30 EFPY. This applicability is based on the peak fluence and EFPY at the end of Cycle 9, and the peak predicted fluence for Cycles 10 and beyond as discussed in Reference (e). This fluence results in higher Adjusted Reference Temperatures (ARTs). The effects of the higher peak fluence on the Minimum Pressure and Temperature (MPT) Enable temperature is offset by using a lower heatup rate and a lower temperature uncertainty resulting in a lower MPT Enable temperature; 2) a digital Power Operated Relief Valve (PORV) actuation system is used to provide a variable PORV trip setpoint during low temperature operation, while retaining the single PORV trip setpoint during shutdown cooling (SDC) operations. This proposed change is similar to the License Amendment Request for Unit 1 VLTOP in Reference (f) and approved in Reference (g).

The current LTOP system utilizes two pressurizer PORVs. When the LTOP system is enabled, each of the two PORVs is set to open at a reduced pressure. The present configuration of the MPT Enable temperature circuitry (with the single setpoint PORV), combined with the reactor coolant pump (RCP) operating curves, gives a small operating window with a "knee" at the MPT Enable temperature. The MPT Enable temperature is the RCS temperature below which the LTOP controls are required to be in place to protect the Appendix G limits. In addition, the current LTOP system does not allow the use of one RCP in each coolant loop as recommended in CEN-152 (Reference h) for recovery from certain postulated accidents.

A variable-setpoint low temperature overpressure protection (VLTOP) system is being installed to increase the allowable operating pressure band in the LTOP region and to increase our flexibility in the use of RCPs. The VLTOP system uses a variable PORV setpoint to take advantage of increased Appendix G pressure limits at increased RCS temperatures. The new system will allow operators to cool down to SDC conditions while running one RCP in each loop. This system significantly increases the operating window in the LTOP region.

The LTOP system is scheduled to be modified in the spring 1995 refueling outage so that a programmable microprocessor is used to determine the PORV trip setpoint. This modification has been reviewed under the controls provided in 10 CFR 50.59, and it has been determined that it does not involve an unreviewed safety question. The equipment necessary to implement the VLTOP system will meet or exceed the hardware requirements of the existing LTOP equipment. The microprocessor that will be used for the control system has been purchased as Class 1E and will be classified in the Q-List as Augmented Quality-PORV to be consistent with the current classifications of the LTOP system. Issues such as verification and validation of the program software and the effects of electromagnetic interference were evaluated to provide reasonable assurance that the new equipment would not result in a common-mode failure.

The temperature input for the system is taken from the RCS cold leg. The system continually monitors the coldest RCS temperature during forced and natural circulation. However, due to the plant configuration, these temperature sensors are not in the flow stream during SDC operation. The SDC water enters the RCS through the safety injection nozzles downstream of the cold leg temperature sensors. Therefore, the cold leg temperature sensors may not reflect the reactor vessel temperature when on SDC. To account for this, the VLTOP system maintains an extra single-pressure setpoint that is independent of RCS temperature. The single setpoint is equal to the lowest variable setpoint to conservatively protect the Appendix G limits at all temperatures when on SDC. The single setpoint is manually selected from the PORV handswitch when the operators align the

SDC System and is maintained until forced circulation is re-established. Both the variable and single setpoint are manually activated via handswitch position in the Control Room. The manual action to enable the variable LTOP system remains the same as the current LTOP system.

REQUESTED CHANGE

Change the Unit 2 Technical Specifications as shown on the marked-up pages attached to this transmittal. These changes to the Technical Specifications include the following items:

1. Heatup and Cooldown Curves and Rates

a. Change Technical Specification Limiting Condition for Operation (LCO) 3.4.9.1.a, maximum allowable heatup rates, as follows:

FROM

A maximum heatup of 75°F in any one hour period

TO

Maximum Allowable Heatup Rates	RCS Temperature
30°F in any one hour period	70°F to 156°F
40°F in any one hour period	>156°F to 246°F
60°F in any one hour period	>246°F

b. Change Technical Specification LCO 3.4.9.1.b, maximum allowable cooldown rates, as follows:

Maximum Allowable Cooldown Rates	RCS Temperatures
FROM	
100°F in any one hour period	> 180°F
40°F in any one hour period	180°F to 140°F
15°F in any one hour period	< 140°F
TO	
100°F in any one hour period	> 200°F
40°F in any one hour period	200°F to 176°F
15°F in any one hour period	< 176°F

c. Replace Technical Specification Figures 3.4.9-1 and 3.4.9-2, RCS P-T Limits, with new figures. The revised curves and rates are based on the fluence value of 4.0×10^{19} n/cm^2 (E >1 MeV) at the clad/base metal interface. This change in the fluence value makes it necessary to revise the ART for 1/4 T position and 3/4 T position in the Bases. Accordingly, the ART for 1/4 T position has been changed from 171°F to 177.1°F, and the ART for 3/4 T position has been changed from 125°F to 146.8°F.

2. LTOP Controls

a. Change Technical Specifications 3.4.9.3.a.1 and 2 from "lift setting of ≤ 430 psia" to "trip setpoint below the curve in Figure 3.4.9-3*" to account for the variable LTOP system that will be installed. The footnote, "When on shutdown cooling, the PORV trip setpoint shall be ≤ 443 psia," has been added to account for SDC operation.

b. The MPT Enable temperature has been changed from 305°F to 301°F. The Technical Specifications effected by this change are 3.1.2.1, 3.1.2.3, Table 3.3-3, 3.4.1.2, 3.4.1.3, 3.4.3, 3.4.9.3, 4.5.2, 3.5.3, Bases 3/4.4.1, Bases 3/4.4.9, and Bases 3/4.5.2.

c. Due to the lower MPT Enable temperature, the transition region at which the high pressure safety injection (HPSI) pumps are placed under manual control on cooldown and restored to automatic status on heatup has been changed from 305°F - 350°F, to 301°F - 325°F. This affects Technical Specification 3.5.3 and Table 3.3-3.

3. Technical Specification Bases

Revise the Technical Specification Bases 3/4.4.1, Coolant Loops and Coolant Circulation, Bases 3/4.4.9, Pressure/Temperature Limits, and Bases 3/4.5.2, Emergency Core Cooling System subsystem, to be consistent with the above changes and to clarify some of the existing material.

The final Technical Specification pages will be renumbered to accommodate added and/or deleted pages.

SAFETY ANALYSIS

The LTOP system, including the administrative controls, ensures that the Appendix G P-T limits for the reactor pressure vessel will not be violated while operating at low temperatures. The heatup and cooldown curves are conservatively developed in accordance with the fracture toughness requirements of 10 CFR Part 50, Appendix G, as supplemented by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code Section III, Appendix G. The reactor vessel material Adjusted RT_{NDT} values are based on the conservative methodology provided in Regulatory Guide 1.99, Revision 2.

The proposed change to the Technical Specifications will revise the existing heatup and cooldown curves and rates. For plate D-8906-1, the limiting material, the fluence was increased from 1.92×10^{19} n/cm^2 (E > 1 MeV) to 4.0×10^{19} n/cm^2 (E > 1 MeV) at the clad/base metal interface in order to extend the applicable operating period of the heatup and cooldown curves and rates for the plant. This fluence value was selected so that the revised heatup and cooldown curves would be applicable to greater than 30 EFPY. This is based on the peak fluence and EFPY at the end of Cycle 9 and the peak predicted fluence for Cycles 10 and beyond. The term "lift setting" has been replaced with "trip setpoint" to make Unit 2 Technical Specifications consistent with Unit 1 Technical Specifications. This terminology was approved for Unit 1 by Amendment 171, dated June 16, 1992. The new peak fluence, the new heatup rates, and the new definition of the PORV setpoint resulted in the lowest maximum PORV opening pressure to be 443 psia.

The proposed change to the Technical Specifications will decrease the MPT Enable temperature from 305°F to 301°F. The new MPT Enable temperature is determined using the guidance in Standard Review Plan 5.2.2. The temperature is based on a fluence of 4.0×10^{19} n/cm^2 (E > 1 MeV) at the clad/base metal interface and a heatup rate of 60°F/hr. Although the fluence has increased, this is compensated for by a decreased heatup rate (60°F/hr vs. 75°F/hr) and a decreased temperature uncertainty (6°F vs. 10°F). Due to the lower MPT Enable temperature, the range of temperatures where the HPSI pumps are placed on manual control on a cooldown and returned to automatic status on a heatup has changed. The old range was 305°F to 350°F, and the new range is 301°F to 325°F. The new range changes the temperature span to 24°F for performing the required actions. This range is similar to the Unit 1 range of 20°F. Analyses have shown that there is sufficient time (> 10 minutes) for an operator to manually start a HPSI pump and prevent core damage during a Loss-of-Coolant-Accident when the RCS temperature is less than 400°F.

The selection of the proposed heatup and cooldown curves and rates and the use of variable setpoint for the PORV ensures that the Appendix G P-T limits will not be violated when operating at low temperatures. This will also increase the operating window in which the plant may operate during heatup and cooldown. To conservatively protect the Appendix G limits at all temperatures when on SDC, the VLTOP system will maintain an extra single setpoint that is independent of RCS temperature and is equal to the lowest variable setpoint.

Additional analyses were conducted to ensure the LTOP administrative controls protect the Appendix G P-T limits for all anticipated initial conditions in MPT Enable. The RCS pressure response was modeled using, where required, RELAP5/MOD3. This program was chosen over the previous use of hand calculations and RETRAN in order to more realistically model the integrated system response, including the interaction between the RCS and the pressurizer. Also, RELAP was able to model complex phenomena, such as primary-to-secondary and secondary-to-primary heat transfer, for the wider range of initial conditions including conditions initiated while on SDC. In addition, RELAP allowed use of a multi-node pressurizer to more accurately model the temperature stratification during the insurge. As with the previous analysis, the PORV flow using RELAP was benchmarked against data from the Electric Power Research Institute PORV qualification tests.

DETERMINATION OF SIGNIFICANT HAZARDS

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 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.*

The Low Temperature Overpressure Protection (LTOP) system, including the administrative controls, ensures that the 10 CFR Part 50, Appendix G, Pressure-Temperature (P-T) limits for the reactor pressure vessel will not be violated while operating at low temperatures. The heatup and cooldown curves are conservatively developed in accordance with the fracture toughness requirements of 10 CFR Part 50, Appendix G, as supplemented by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code Section III, Appendix G. The reactor vessel material Adjusted RT_{NDT} values are based on the conservative methodology provided in Regulatory Guide 1.99, Revision 2.

Analyses show that the proposed use of a variable LTOP system will not result in a significant increase in the probability of an inadvertent opening of a Power-Operated Relief Valve (PORV) causing a small break Loss-of-Coolant-Accident. The proposed heatup and cooldown curves and associated limits continue to provide conservative restrictions on Reactor Coolant System (RCS) pressure to minimize material stresses in the RCS due to normal operating transients, thus minimizing the likelihood of a rapidly propagating fracture due to pressure transients at low temperatures. Because the proposed heatup and cooldown curves and rates are based on conservative Appendix G methods, and because the LTOP controls protect the Appendix G P-T limits, the proposed curves and limits do not involve an increase in the probability of accidents previously evaluated.

The proposed use of a variable PORV trip setpoint and the increase in the allowable fluence at the reactor vessel wall results in the changes to the heatup and cooldown curves and rates, the Minimum Pressure and Temperature (MPT) Enable temperature, and high pressure safety injection pump manual control transition temperature. These proposed changes continue to provide sufficient margin to accommodate postulated pressurization from mass and energy addition transients. Calculations have been performed that predict the response to such transients. Because the results of the analyses remain well within the conservative acceptance limits of Appendix G, these changes do not increase the consequences of accidents previously evaluated.

Therefore, the proposed 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 new variable LTOP control system along with the proposed changes to the Technical Specifications will ensure that the Appendix G P-T limits will not be violated during low temperature operations. While setpoints and curves have changed, this proposed change does not introduce any operator actions that are significantly different from current operator actions used at the plant. The variable LTOP system will continue to have redundant channels to ensure that no single equipment failure or operator error will result in violation of the P-T limits. The use of a variable LTOP system does not create a new failure mechanism for the PORV. The failure mechanism for the PORV continues to be an inadvertent opening or the failure to open during a pressure transient which has been previously evaluated. 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.*

This change will ensure that the margin of safety is maintained with respect to energy or mass addition events in that none of the events postulated could challenge the Appendix G limits. The proposed use of a variable PORV trip setpoint and the increase in the allowable fluence at the reactor vessel wall necessitate the changes to the heatup and cooldown curves and rates, the MPT Enable temperature, and high pressure safety injection pump manual control transition temperature. These changes ensure that the margin of safety is maintained by protecting the Appendix G limits for all postulated transients. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

ENVIRONMENTAL ASSESSMENT

The proposed amendment would change requirements with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 or changes to an inspection or surveillance requirement. We have determined that the proposed amendment involves no significant hazards consideration, and that operation with the proposed amendment would result in no significant change in the types or significant increases in the amounts of any effluents that may be released offsite, and in no 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.

SCHEDULE

This change is requested to be approved and issued by December 1, 1994. This schedule will allow for the implementation of both the hardware and the revised heatup and cooldown curves during the 1995 Unit 2 Refueling Outage. Due to the hardware modifications to the LTOP system, implementation of these Technical Specifications cannot occur until after the RCS is vented and the pressurizer manway is removed. This is currently scheduled to occur in March, 1995. Due to the engineering that would be involved to make the variable LTOP system function like the current single setpoint system, this modification will be removed from the 1995 Unit 2 outage scope if the proposed License Amendment is not approved by the requested date. If this would occur, the modification would be installed in the 1997 Unit 2 Refueling Outage and, therefore, the implementation of the proposed Technical Specifications will not occur until the pre-implementation requirements discussed above are met in 1997.

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 the Offsite Safety Review Committee. They have concluded that implementing these changes will not result in an undue risk to the health and safety of the public.

Should you have any 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 27th day of May, 1994, 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: February 2, 1998
Date

RED/DJM/dlm

Attachment: (1) Unit 2 Technical Specification Revised Pages

cc: D. A. Brune, Esquire
J. E. Silberg, Esquire
R. A. Capra, NRC
D. G. McDonald, Jr., NRC
T. T. Martin, NRC
P. R. Wilson, NRC
R. I. McLean, DNR
J. H. Walter, PSC

REFERENCES:

(a) Letter from Mr. V. R. Evans (BGE) to Mr. D. K. Davis, dated July 21, 1977, Reactor Coolant System Overpressurization

(b) Letter from Mr. G. C. Creel (BGE) to NRC Document Control Desk, dated October 22, 1990, Technical Specification Change - Low Temperature Overpressure Protection (TAC No. 76130)

(c) Letter from Mr. R. E. Denton (BGE) to NRC Document Control Desk, dated November 1, 1993, License Amendment Request; Extension of Unit 2 Heatup and Cooldown Curves

(d) Letter from Mr. D. G. McDonald, Jr. (NRC) to Mr. R. E. Denton (BGE), dated May 24, 1993, Response to the 1991 Pressurized Thermal Shock (PTS) Rule, 10 CFR 50.61, Calvert Cliffs Nuclear Power Plant, Unit No. 2

(e) Letter from Mr. R. E. Denton (BGE) to NRC Document Control Desk, dated March 18, 1994, Analysis of the Calvert Cliffs Unit No. 2 Reactor Vessel Surveillance Capsule Withdrawn from the 97° Location

(f) Letter from Mr. R. E. Denton (BGE) to NRC Document Control Desk, dated September 3, 1994, License Amendment Request: Variable Low Temperature Overpressure Protection

(g) Letter from Mr. D. G. McDonald, Jr. (NRC) to Mr. R. E. Denton (BGE), dated March 15, 1994, Issuance of Amendment for Calvert Cliffs Nuclear Power Plant, Unit No. 1 (TAC No. M87690)

(h) CEN-152, "Combustion Engineering Emergency Procedure Guidelines," Revision 3

ATTACHMENT (1)

UNIT 2

TECHNICAL SPECIFICATION

REVISED PAGES

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