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GAS AND
ELECTRIC

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March 9, 1993

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 1; Docket No. 50-317
Request for Exigent License Amendment, Reduction of In-Core Instrument Requirements

REFERENCES:

(a) Letter from Mr A. E. Lundvall, Jr. (BG&E) to Mr. E. J. Butcher, Jr. (NRC), dated December 17, 1985, Request for Amendment, Operability Requirements for Incore Detector Strings

(b) Letter from Mr. D. H. Jaffe (NRC) to Mr. J. A. Tiernan (BG&E), dated March 31, 1986, Issuance of Amendment 116

(c) CENPD-153-P, Rev. 1-P-A, Evaluation of Uncertainty in the Nuclear Power Peaking Measured by the Self-Powered, Fixed In-Core Detector System, dated May 1980.

(d) CEN-150(O)-P, Analysis of CECOR Power Peaking Uncertainties for Fort Calhoun Unit 1 Cycle 6, dated February 1981

(e) CEN-172(F)-P, Analysis of CECOR Power Peaking Uncertainties for St. Lucie Unit 1 Cycle 4, dated July 1981

(f) CEN-318(B)-P, Analysis of CECOR Power Peaking Uncertainties for Calvert Cliffs Unit 1 Cycle 8, dated November 1985

Gentlemen:

Pursuant to 10 CFR 50.90, the Baltimore Gas and Electric Company (BG&E) hereby requests an Amendment to Operating License No. DPR-53 by the incorporation of the changes described below into the Technical Specifications for Calvert Cliffs Unit No. 1. We ask that this Amendment Request be considered under exigent circumstances as described in 10 CFR Part 50, Paragraph 50.91(a)(6) in that failure to act quickly could result in the shutdown of Calvert Cliffs Unit 1.

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DESCRIPTION

Calvert Cliffs Unit 1 , Cycle 11 has experienced a number of In-Core Instrumentation (ICI) detector failures. A small number of additional detector failures could render the system incapable of meeting the Technical Specification requirements. This proposed change will allow a reduction in the number of required ICI detectors for the remainder of Unit 1, Cycle 11, yet still provides the ability to adequately monitor the Technical Specification power distribution limits.

BACKGROUND

The In-Core Instrumentation (ICI) system at Calvert Cliffs consists of 45 neutron detector strings positioned in the center of selected fuel assemblies as shown in Attachment (1). The detector strings are inserted from the top of the fuel assembly and electrical connection of the detectors is made on the reactor vessel head. Each detector string contains 4 rhodium neutron detector segments located at 20, 40, 60, and 80% of core height. The neutron flux indicated by the detector segments is processed by a full-core power distribution system (CECOR 3.3) to determine the peak linear heat rate, peak pin power, radial peaking factors, and azimuthal power tilt for comparison to the Technical Specification limits.

During the Calvert Cliffs Unit 1, Cycle 11 refueling outage which ended on August 18, 1992, 19 of the 45 ICI detector strings were replaced and one other ICI detector string was removed and not replaced due to mechanical problems. Prior to reaching 100% power following the refueling outage, 20 detector segments had failed. There have been eight additional segment failures since reaching 100% power. All 28 of these detector segment failures are in the group of new detectors strings installed during the outage. Adding the 4 detectors segments which were not replaced, 32 of the 180 detector segments (17.8%) are inoperable. Specification 3.3.3.2.b requires that 75% of the detector segments be operable for recalibrating the Excore Neutron Flux Detector System.

Specification 3.3.3.2.a requires that for monitoring azimuthal power tilt there be at least two quadrant symmetric incore detector segment groups at each of the four detector elevations in the outer 184 fuel assemblies. A quadrant symmetric incore detector segment group consists of a minimum of three operable detector segments in 90° symmetric fuel assemblies. Furthermore, there must be sufficient operable detector segments in these detector groups to compute at least two azimuthal power tilt values at each of the four axial elevations. We could not meet the quadrant symmetric tilt requirement in Specification 3.3.3.2.a if there were an additional two selected failures in the second axial position (40% of core height).

There are currently nine inoperable detector strings (e.g., locations) locations (e.g., strings). This includes the string which was not installed. Specification 3.3.3.2 states that for a detector string to be considered operable, three of the four detector segments in that string must be operable. Currently seven additional strings have one failed detector segment each, and an additional segment failure in any of these seven strings would result in failure of the entire string. Specification 3.3.3.2.c requires that at least 75% of the detector strings be operable for the purpose of monitoring Unrodded Planar Radial Peaking Factor, the Unrodded Integrated Radial Peaking Factor, and the linear heat rate. Therefore, 34 detector strings must remain operable to meet this requirement. The failure of three additional detector strings would render the incore detector system incapable of meeting this requirement.

In summary, three Technical Specification limits are threatened by additional failures. Any 14 additional detector segment failures would exceed Specification 3.3.3.2.b on the percentage of operable segments. Two selected detector segment failures would exceed Specification 3.3.3.2.a on the distribution of symmetric groups for measuring azimuthal power tilt. As few as three additional segment failures could exceed the Specification 3.3.3.2.c limit on the number of operable strings. Based on the pattern of failures, it is most likely that Specification 3.3.3.2.c will be the first to be challenged if there are additional failures.

Should the number of operable detector strings drop below 75%, the monitoring of Total Planar Radial Peaking Factor (Surveillance 4.2.2.1.2), Total Integrated Radial Peaking Factor (Surveillance 4.2.3.2) and linear heat rate (Surveillance 4.2.1.4) would be affected. The radial peaking factors must be measured every 31 days or the plant must be in Hot Standby in six hours (Actions 3.2.2.1.b and 3.2.3.a). Linear heat rate must be continuously monitored (Surveillance 4.2.1.2) using either the excore or incore detectors (Surveillance 4.2.1.4). If the excore detectors are being used, as would be required if less than 75% of the strings are operable, Surveillance 4.2.1.3.c requires the determination of the factor "N." Specification 3.2.2.2 and Surveillance 4.2.2.2.2.b require that the factor "N" be verified within its limit every three days of accumulated Mode 1 operation or be in Hot Standby within six hours. Verification that the factor "N" is within its limit requires the measurement of Total Planar Radial Peaking Factor which cannot be accomplished without 75% of the detector strings operable. Therefore, upon the failure of greater than 75% of the detector strings, the plant must be in Hot Standby within three days, six hours.

Baltimore Gas and Electric Company performed a root cause analysis of the detector failures, but no clear cause of the failures was established. The detector receipt, storage and installation process will be examined during the current Unit 2 refueling outage in order to determine the cause of the Unit 1 failures and to prevent recurrence.

ABB/Combustion Engineering (ABB/CE) has previously analyzed similar situations. Explicit analyses of current and projected detector failure patterns were performed for Fort Calhoun Unit 1, Cycle 6; St. Lucie Unit 1, Cycle 4; and Calvert Cliffs Unit 1, Cycle 8 (References a and b). In each case, the licensees requested and were granted technical specifications changes which allowed operation with a reduced complement of incore detectors. The changes proposed for Calvert Cliffs Unit 1, Cycle 11 are similar to those requests.

REQUESTED CHANGE

Revise Technical Specifications as shown in Attachment (2). Specifically:

Specifications 3.2.2.1, 3.2.3 and 4.2.1.4.b.1 - A footnote applicable for only Unit 1 Cycle 11 is added. The footnote requires that when the percentage of OPERABLE incore detector locations (e.g., strings) falls below 75%, the measured values be increased by 1% prior to being compared to the Technical Specifications limits.

Surveillances 4.2.1.4.a, 4.2.2.1.2.b, and 4.2.3.2.b - A footnote applicable for only Unit 1 Cycle 11 is added. The footnote requires that when the percentage of OPERABLE incore detector locations (e.g., strings) falls below 75%, the full core power distribution mapping frequency be increased to at least once per 15 days of accumulated operation in MODE 1.

Specification 3.3.3.2.a - A footnote which supersedes the current requirement for only Calvert Cliffs Unit 1 Cycle 11 was added. The current requirement for two quadrant symmetric incore detector segment groups at each axial location is changed to a total of eight quadrant symmetric incore detector segment groups. The current requirement for at least two azimuthal power tilt values at each detector segment axial elevation is changed to at least one azimuthal power tilt value at each detector segment axial elevation and at least two azimuthal power tilt values at three detector segment axial elevations.

Specifications 3.3.3.2.b.1 and 3.3.3.2.c.1 - Footnotes were added which supersede the current requirement for only Calvert Cliffs Unit 1 Cycle 11. The minimum number of operable detector segments and strings is reduced from 75% to 60%.

SAFETY ANALYSIS

The monitoring of incore neutron flux is accomplished by the incore detectors which provide the detailed power distributions necessary for Technical Specification surveillance of power peaks and for trending of core data. Groups of incore detector strings are used to detect anomalous power distributions. This is important, as persistent anomalous power distributions can degrade core thermal-hydraulic performance.

The current Technical Specification 3.3.3.2.a requires at least eight azimuthal power tilt estimates with a minimum of two estimates of each of the four detector segment axial elevations. The proposed revision still requires at least eight azimuthal power tilt estimates, but requires only one estimate at each elevation and two estimates at three of the four elevations. These changes preserve the statistical validity of the tilt estimates and ensure adequate core coverage since the requirement that there be at least one operable segment in each quadrant at each elevation is maintained. This degree of coverage is sufficient because azimuthal tilts at one elevation are seen at adjacent levels.

Detector data is also used to calculate power peaking factors which are used to verify compliance with fuel performance limits. As the number of inoperable detector segments increases, the uncertainties in the CECOR power distribution calculation increase. The determination of the CECOR uncertainties is described in Reference (c). Explicit analyses have been performed in the past for several reactor cycles to evaluate the effect of unexpected detector failures on the CECOR uncertainties using the known and extrapolated failure patterns. These previous analyses are described in Attachment (3) and in References (d), (e), and (f). In those cases, the extrapolated failure patterns had up to 75% of the detector segments failed. The cases are similar to and bound the extrapolated failure patterns of up to 40% failed detector segments in Calvert Cliffs Unit 1, Cycle 11.

For Calvert Cliffs Unit 1 Cycle 11, the requested change would reduce the operability requirement from 75% to 60% of the detector segments and strings. It is expected that the increase in CECOR uncertainties with 40% of the detector segments and strings failed will be below those determined in previous analyses and the resulting uncertainties still remain less than those in the topical report. However, as a conservative measure in the absence of explicit evaluation of Cycle 11 uncertainties, if the percentage of operable detector strings falls below 75%, then the linear heat rate, total planar radial peaking factor (F_{xy}^T) and total integrated radial peaking factor (F_r^T) calculated by CECOR will be increased by 1% before they are compared to the values given in the Technical Specifications. As discussed in Attachment (3), this will more than offset any increase in the uncertainties due to increased detector string failures. In this way, the comparison of the augmented measured values to

the setpoint values in the Technical Specifications will be valid, and the setpoint analyses will remain valid. This will be checked with the periodic surveillance maps to show continued compliance.

If the number of operable incore detector strings falls below the current limit of 75%, BG&E will take the power distribution surveillance maps on a frequency once-per-15-days of accumulated Mode 1 operation, which is twice as often as the Technical Specifications now require.

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 proposed change would relax the requirements for the number and distribution of operable incore detectors. The safety function of the incore detectors is to verify that the core power distribution is consistent with the assumptions used in the safety analyses. Sufficient measurements will be required to adequately verify compliance with power distribution Technical Specification limits. Penalties will be applied to the values measured by the incore detectors prior to comparison with the Technical Specifications limits when the number of operable detector strings falls below the current requirement. This will ensure that all current Technical Specification and fuel design limits are protected and the core power distribution assumptions in all analyses remain valid. 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 difference type of accident from any accident previously evaluated.*

   The proposed change does not represent a change in the configuration or operation of the plant. The current Technical Specifications limits measured by the incore detector system will still be met. 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 changes will continue to protect the current power distribution Technical Specifications limits. When the number of operable incore detector strings falls below the current Technical Specification requirement, a penalty will be added to the measured values before they are compared with the Technical Specification limits. This penalty has been shown by prior analysis to be greater than the increased uncertainty. This penalty ensures that the Technical Specifications limits monitored using the incore detectors will continue to be protected. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

STATEMENT OF EXIGENT CIRCUMSTANCES

This situation could not have been avoided. As stated previously, a Root Cause Analysis was unable to identify the cause of the detector failures and the large number of failures was unexpected. Failure to act quickly to reduce the incore detector requirements for Calvert Cliffs Unit 1 could lead to a plant shutdown. It is impossible to predict when, or if, additional detector failures will occur. The time between failures has varied from as much as 62 days to as little as 10 days; but based on the failure history, BG&E believes that there is insufficient time to allow for the normal 30-day public comment period. Therefore, given the need to act quickly and the determination that this change does not represent a significant hazard, we request that this Amendment be considered under exigent circumstances, as described in 10 CFR 50.91(a)(6).

ENVIRONMENTAL ASSESSMENT

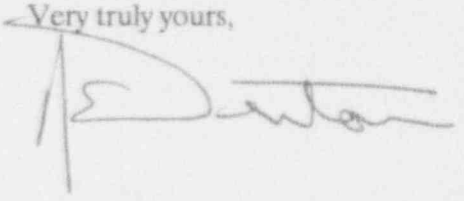
The proposed amendment changes requirements with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 or changes an inspection or surveillance requirement. We have determined that the proposed amendment involves no significant hazards 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 Part 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

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.

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 9th day of March, 1993, 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, 1994
Date

RED/BDM/bdm/dlm

Attachments: (1) Incore Instrumentation System Detector Locations
(2) Unit 1 Technical Specification Revised Pages
(3) Description of Previous Analyses

cc: D. A. Brune, Esquire
J. E. Silberg, Esquire
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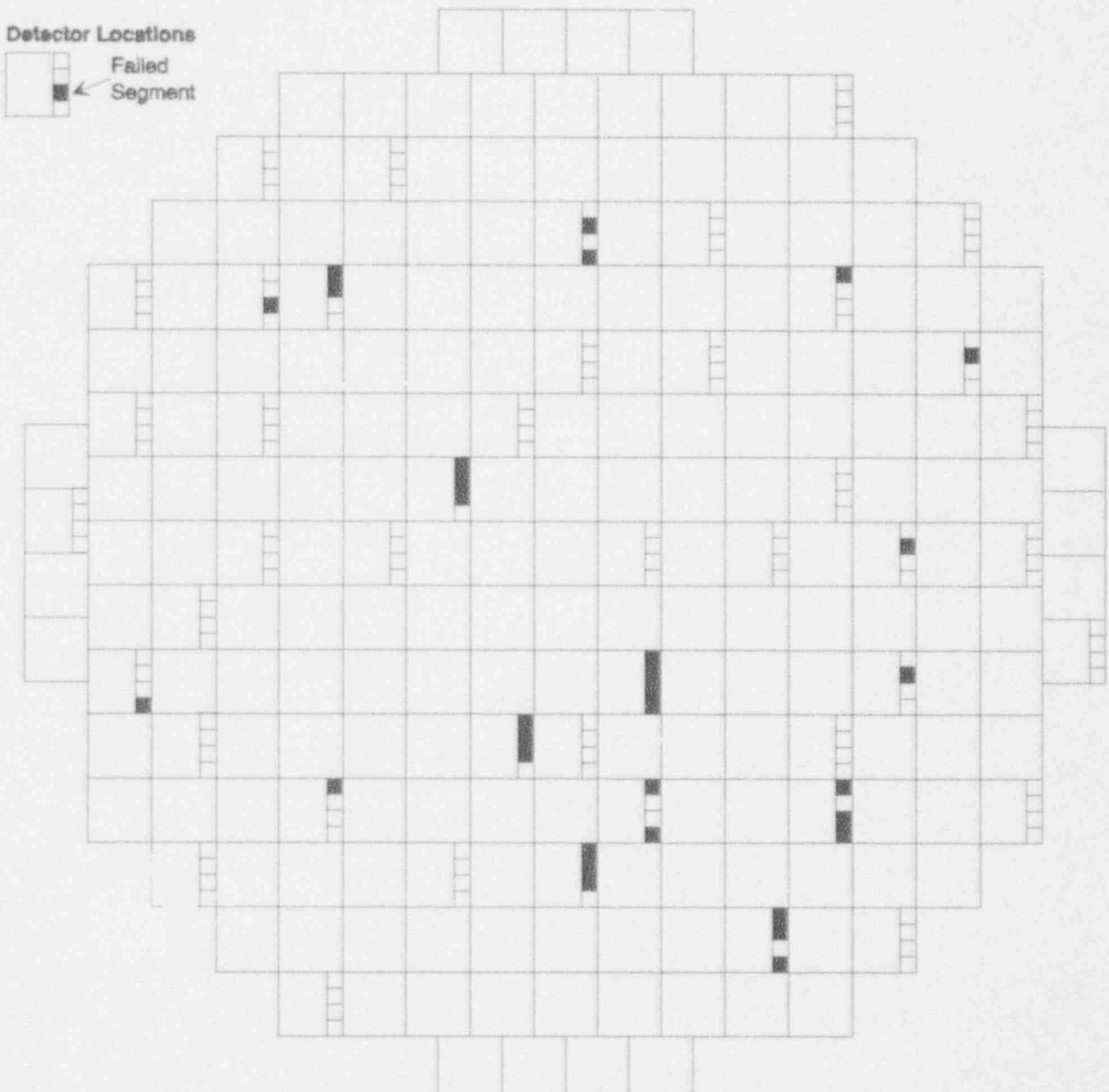
ATTACHMENT (1)

INCORE INSTRUMENTATION SYSTEM DETECTOR LOCATIONS

CALVERT CLIFFS UNIT 1 CYCLE 11
INCORE DETECTOR LOCATIONS AND
CURRENT FAILURES AS OF MARCH 9, 1993



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