



1650 CALVERT CLIFFS PARKWAY • LUSBY, MARYLAND 20657-4702

GEORGE C. CREEL
VICE PRESIDENT
NUCLEAR ENERGY
(410) 260-4455

March 25, 1992

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; Steam Generator Inspections

- REFERENCES:
- (a) Generic Letter 91-04, Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle, dated April 2, 1991
 - (b) Letter from Mr. G. C. Creel (BG&E) to NRC Document Control Desk, Report of Steam Generator Tube Plugging dated February 21, 1990

Gentlemen:

The Baltimore Gas and Electric Company (BG&E) hereby requests an Amendment to its Operating License Nos. DPR-53 and DPR-69 for Calvert Cliffs Unit Nos. 1 and 2, respectively, with the submittal of the proposed changes to the Technical Specifications. The proposed amendment would revise the Calvert Cliffs Technical Specifications for both units to provide conditions under which the steam generator inspection intervals may be extended to 30 months in accordance with the guidance provided in Generic Letter 91-04 (Reference a). In addition, Calvert Cliffs requests a one-time variance, for Unit 2 only, from the proposed Technical Specification condition which requires that the last inspection include 20 percent of the steam generator tubes when extending the inspection frequency beyond 24 months.

DESCRIPTION

The proposed amendment would revise the Calvert Cliffs Technical Specifications to provide conditions under which the steam generator inspection intervals may be extended to 30 months. The proposed amendment is requested in accordance with the guidance provided in Generic Letter 91-04 (Reference a). In addition, Calvert Cliffs requests a one-time variance, for Unit 2 only, from the proposed Technical Specification condition which requires that the last inspection include 20 percent of the tubes with results in the C-1 category. Because the alternative inspection requirements

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proposed in the Generic Letter had not been issued at the time, Calvert Cliffs' last steam generator inspection included only 15 percent of the tubes for Unit 2 with results in the C-1 category. As described below, BG&E believes that there is sufficient technical justification to allow the current inspection interval to be extended to 30 months. This extension would allow the inspections to be conducted during the next refueling outage and prevent an additional outage solely for these inspections.

BACKGROUND

Under the current Calvert Cliffs Technical Specifications, the surveillance interval for performing the inservice inspection of steam generators may be extended to a maximum of 40 months if the results from two consecutive inspections are each in the C-1 category or if two consecutive inspections demonstrate that previously observed degradation has not continued and no additional degradation has occurred. However, if either of the two previous inspections yielded inspection results in the C-2 category, the next inspection must be performed within 24 months. Unlike other surveillances, the 24-month inspection period is not subject to a 25 percent extension under Technical Specification 4.0.2. Calvert Cliffs Units 1 and 2 operate on a nominal 24 month fuel cycle and the 24 month inspection interval frequently does not coincide with the next refueling outage, particularly if there were unplanned outages during the fuel cycle or if there is a delay between the completion of the steam generator inspection and plant startup.

Generic Letter 91-04 proposed alternate technical specifications which extend the inspection interval for steam generators in the C-2 category from 24 to 30 months. This alternative includes increasing the number of tubes inspected based on the results of the previous inspection, performing an engineering analysis of steam generator tube integrity for operation longer than 24 months between inspections, and reducing the technical specification limit on leakage between the primary and secondary coolant systems.

Calvert Cliffs' steam generators have a very good inspection history. The last three inspections for Unit 1 have shown results in the C-2 category and a total of only 177 of the 17,038 tubes are plugged. The last inspection for Unit 2 was in the C-1 category and the final results of the two previous inspections were in the C-2 category. A total of only 113 of the 17,038 tubes have been plugged on Unit 2.

REQUESTED CHANGE

CHANGE NO. 1

Change Specifications 4.4.5.3 and 3.4.6.2 of the Unit 1 and Unit 2 Technical Specifications, and their associated BASES as shown on the marked-up pages attached to this transmittal. These changes implement the suggestions in Generic Letter 91-04 with the following exceptions.

1. The Generic Letter 91-04 proposed Technical Specification 4.4.5.3.a states "If 20 percent of the tubes were inspected . . ." and "if 40 percent of the tubes were inspected . . ." We propose to revise this wording to state "If at least 20 percent of the tubes were inspected . . ." and "if at least 40 percent of the tubes were inspected . . ." to make clear that the listed percentages are the minimum inspection requirements. As BG&E frequently inspects 100 percent of the steam generator tubes, this change is necessary to avoid confusion.

2. The proposed revisions to Technical Specification 3.4.6.2, "Reactor Coolant System Leakage," reduce the Standard Technical Specifications primary-to-secondary leakage limit of 500 gallons-per-day per steam generator to 100 gallons-per-day for operation beyond 24 months since the last inspection. The Calvert Cliffs Technical Specifications do not currently contain a primary-to-secondary leakage limit per steam generator. However, BG&E does have an administrative procedure which recommends plant shutdown if primary-to-secondary leakage exceeds 100 gallons-per-day. Therefore, BG&E proposes to adopt a primary-to-secondary leakage limit of 100 gallons-per-day per steam generator.
3. The proposed Bases of Technical Specification 4.4.5.3.a states that an engineering assessment of steam generator tube integrity must be performed prior to exceeding 24 months between steam generator inspections. The Bases list three elements to be considered. The second element of the proposed Bases consists of an assessment of the maximum flaw size that can be expected before the next inspection and the corresponding structural margins relative to the criteria of Regulatory Guide 1.121.

Pressurized Water Reactor steam generator tube inspections are typically conducted using an eddy current bobbin coil device. While this device is capable of determining the depth of a tube defect, it is not capable of determining the length or width of the defect. Therefore, there is insufficient information to determine the current size of a detected flaw or the maximum flaw size that can be expected before the next inspection, nor is that information necessary in order to determine the structural margins relative to Regulatory Guide 1.121. That determination is currently made using only depth information from eddy current testing. Baltimore Gas and Electric Company proposes to reword the Bases to eliminate the unnecessary assessment of maximum flaw size and to require that the engineering assessment determine the structural margins relative to the criteria of Regulatory Guide 1.121 for the operating period.

The following items are necessary to implement the proposed changes:

1. The wording of the current Technical Specification 4.4.5.3.b has been revised to agree with the Standard Technical Specifications wording in order to facilitate the inclusion of the changes proposed by the Generic Letter. These wording changes do not alter the intent of the existing technical specification.
2. Surveillance 4.4.6.2.c is used to determine the Reactor Coolant System leakage for comparison to the current 1 gallon-per-minute primary-to-secondary limit and the proposed 100 gallons-per-day per steam generator limit. The surveillance currently states that the leakage is determined by performing a "water inventory balance." While the leakage measurement for comparison to the 1 gallon-per-minute limit is determined using a water inventory balance, the leakage measurement for comparison to the 100 gallons-per-day per steam generator limit will be determined using an analysis of secondary coolant radiochemistry. This analysis cannot be considered a "water inventory balance." Therefore, we propose to revise the surveillance to use the more generic phrase, "Determining the Reactor Coolant System leakage." This change does not alter the intent of the surveillance and eliminates possible confusion regarding what measurement techniques are acceptable.
3. The Bases for Technical Specification 3.4.6.2 have been revised to incorporate a description of the new primary-to-secondary leakage limit.

CHANGE NO. 2

A one-time variance from the proposed requirements is requested for Unit 2 only. The proposed Technical Specification 4.4.5.3.a states "If at least 20 percent of the tubes were inspected and the results were in the C-1 category ... during the previous inspection, the next inspection may be extended up to a maximum of 30 months in order to correspond with the next refueling outage if the results of the two previous inspections were not in the C-3 category."

We propose to add a footnote to the Unit 2 Technical Specification 4.4.5.3.a which states that for Cycle 9, a steam generator inspection of 15 percent of the tubes with results in the C-1 category is acceptable for extending the inspection interval up to 30 months.

SAFETY ANALYSES / JUSTIFICATION

CHANGE NO. 1:

The event which must be considered when revising the steam generator inspection intervals is the steam generator tube rupture event as discussed in Section 14.15 of the Updated Final Safety Analysis Report. The steam generator tubes provide a heat transfer boundary between the primary reactor coolant and the secondary feedwater and steam, and the current inspection intervals provide an acceptable confidence level that the steam generator tubes will have structural integrity until the next inspection. The integrity of the barrier is significant to radiological safety in that a leaking or ruptured tube would allow the transfer of reactor coolant into the main steam system with possible release to the environment.

The proposed revision to the inspection intervals would maintain an acceptable confidence level in the structural integrity of the steam generator tubes through an increase in the required sample size, an engineering analysis of any C-2 category results prior to operation beyond 24-months, and a lower limit for primary-to-secondary leakage.

Currently, a minimum of 3 percent of the total number of tubes in both steam generators are required to be inspected during each inspection interval. Results in the C-1 category would require no additional tube inspections during that interval. Under the proposed technical specifications, the inspection interval may be extended beyond 24 months if the last inspection examined at least 20 percent of the tubes and the results were in the C-1 category or at least 40 percent of the tubes and the results were in the C-2 category. This increased sample size is a compensating measure to offset the extension in surveillance intervals.

Under the proposed technical specifications, if the results of either of the previous two inspections were in the C-2 category an engineering assessment is required prior to operation beyond 24 months. This assessment will determine whether all tubes will retain adequate structural margins against burst throughout normal operating, transient, and accident conditions until the end of the fuel cycle or 30-months, whichever occurs first. The assessment would include a review of the flaws found during the previous inspection and a comparison of the structural margins to the criteria in Regulatory Guide 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes." Also, the assessment model will be updated, as appropriate, based on comparison of the predicted results of the steam generator tube integrity assessment with actual results from inspections.

Finally, lower primary-to-secondary leakage limits would be imposed. The current Calvert Cliffs technical specifications limit primary-to-secondary leakage to one gallon per minute. This leakage rate is assumed in all safety analyses except the Main Steam Line Break (Updated Final Safety Analysis Report Section 14.1.4.3.d). The Main Steam Line Break Analysis makes no assumption on tube leakage prior to the tube rupture but assumes that the primary and secondary coolant activities are at the technical specifications limits. The proposed requirement would impose a leakage limit of 100 gallons-per-day from any steam generator to ensure the plant does not operate with degraded steam generator tubes. Calvert Cliffs currently has an administrative procedure which recommends that the plant be shutdown if primary-to-secondary leakage exceeds 100 gallons-per-day.

CHANGE NO. 2.

A one-time variance to the proposed technical specifications is also requested for Unit 2 only. In order for Calvert Cliffs Unit 2 to take advantage of the proposed inspection interval extension for the current cycle, the last inspection should have sampled at least 20 percent of the steam generator tubes with results in the C-1 category.

The last two bobbin coil steam generator tube inspections for Unit 2 were conducted in April 1989, and October 1990. The April 1989 inspection was of 100 percent of the tubes (16,947 tubes) in both steam generators. Only 22 tubes were plugged. As reported on February 21, 1990 (Reference b), only 11 of these 22 tubes were found to have indications of imperfections which exceeded the plugging limit of 40 percent loss of nominal wall thickness. An additional 11 tubes were plugged as a preventive measure. The results of this inspection were in the C-2 category.

A Motorized Rotating Pancake Coil (MRPC) examination of the Unit 2 steam generator tubes was performed in July 1990. The tube-to-tubesheet expansion region was examined on 35% of the hot leg tubes. No cracking was detected.

In October 1990, 15 percent of the tubes in both steam generators were inspected in preparation for the resumption of power operation following an extended shutdown. No power operation occurred on Unit 2 between the April 1989 and this inspection and during this period steam generator chemistry conditions were maintained consistent with the recommendations in Electric Power Research Institute (EPRI) Report NP-6239-S405-2, "PWR Secondary Water Chemistry Guidelines," Revision 2. The inspection resulted in no tubes being plugged and the results were in the C-1 category.

Had the recommendations in Generic Letter 91-04 been known when the October 1990 inspection was performed, we are confident that we would have examined 20 percent of the tubes as required by the proposed technical specifications. However, based upon the previous 100 percent inspection and the results of the 15 percent inspection, we are confident that if an additional 5 percent of the tubes had been examined that the results would still have been in the C-1 category. This would have allowed operation of up to 30 months under the proposed technical specifications. Therefore, a one-time variance of the 20 percent sample size is requested based on the 15 percent inspection of October 1990. The performance of an engineering assessment and the imposition of lower leakage limits will be done as required by the proposed technical specifications.

DETERMINATION OF SIGNIFICANT HAZARDS

CHANGE NO. 1:

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 amendment:

- (1) *Would not involve a significant increase in the probability or consequences of an accident previously evaluated.*

The only previously evaluated accident affected by a change in the steam generator inspection interval is a steam generator tube rupture. The probability of such an accident could be increased with this change by allowing imperfections to increase in size during the extended inspection period and thereby further degrade the structural integrity of the tubes. However, the additional actions proposed in Generic Letter 91-04 and included in this request; i.e., a larger steam generator tube inspection sample size and an engineering assessment of the structural integrity of the tubes, provide assurance that the probability of a steam generator tube rupture is not significantly increased. In addition, lower limits are placed on primary-to-secondary leakage to ensure the plant does not operate with significantly degraded steam generator tubes. Therefore, the probability of a steam generator tube rupture is not significantly increased.

According to the Updated Final Safety Analysis Report (UFSAR), the design basis steam generator tube rupture event is the double-ended break of a single tube. The basis for this assumption is the periodic inspection of the steam generator tubes to verify that the structural integrity of the tubes is not compromised. The compensatory measures in this change will ensure that the structural integrity margins for the steam generator tubes are not significantly reduced during operation greater than 24 months between inspections. Therefore, the current design basis event is still valid and the consequences of this event are unchanged.

In conclusion, this change would 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.*

This requested revision to increase the steam generator tube inspection interval does not involve a change in the design or operation of the plant. Therefore, this change would 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 margin of safety provided by steam generator inspections is the assurance that the structural integrity of this portion of the reactor coolant system pressure boundary will be maintained. This margin of safety is maintained by the proposed requirement that an engineering assessment be performed demonstrating that the tubes maintain adequate structural margins against burst prior to exceeding 24 months between inspections. Therefore, this change would not involve a significant reduction in a margin of safety.

CHANGE NO. 2:

The proposed one-time variance to the Unit 2 Technical Specifications 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 amendment:

- (i) *Would not involve a significant increase in the probability or consequences of an accident previously evaluated.*

The requested one-time variance from the minimum sample size for steam generator tube inspections for Unit 2 could increase the probability of a steam generator tube rupture as previously analyzed. This increase results from the inspection of 15 percent versus 20 percent of the steam generator tubes as required by the proposed amendment, and the possibility that a significantly degraded tube, which would have otherwise been inspected and subsequently plugged, has been left in operation. The possibility of this event is small, however, because of the 100 percent inspection performed on Unit 2 during the previous inspection, the controlled secondary water chemistry in the steam generators between inspections, and the results of the 15 percent of the tubes examined in the latest inspection. As required by the proposed technical specification, BG&E must perform an engineering assessment and conclude that the structural margin against tube burst will be maintained during all normal operating, transient and accident conditions prior to exceeding 24 months between inspections. Therefore, this one-time variance does not represent a significant increase in the probability of a previously analyzed accident.

According to the Updated Final Safety Analysis Report (UFSAR), the design basis steam generator tube rupture event is the double-ended break of a single tube. As discussed above, this one-time variance does not invalidate that assumption nor does it increase the consequences of such a break. Therefore, there is no increase in consequences.

In conclusion, this change would 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.*

This requested one-time variance in the steam generator inspection sample size does not involve a change in the design or operation of the plant. Therefore this change would 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 margin of safety provided by steam generator inspections is the assurance that the structural integrity of this portion of the RCS will be maintained. This change would allow a one-time variance to the proposed requirement that the previous inspection examine at least 20 percent of the tubes with results in the C-1 category. This margin of safety is maintained by the proposed requirement that an engineering assessment be performed demonstrating that the tubes maintain adequate structural margins against burst prior to exceeding 24 months between inspections. Therefore, this change would not involve a significant reduction in a margin of safety.

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