April 16, 2003

Mr. P. E. Katz, Vice President
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 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE (ASME CODE) - RELIEF FOR RISK-INFORMED INSERVICE INSPECTION OF PIPING (TAC NOS. MB5305 AND MB5306)

Dear Mr. Katz:

By letter dated May 29, 2002, Calvert Cliffs Nuclear Power Plant requested approval of a risk-informed inservice inspection (RI-ISI) program for Calvert Cliffs Nuclear Power Plant, Inc., Unit Nos. 1 and 2 for ASME Class 1 and 2 piping welds. The letter included an attachment describing the proposed programs for Unit 1 and Unit 2. Additional information was provided in a letter dated November 12, 2002.

The Calvert Cliffs Nuclear Power Plant RI-ISI program was developed in accordance with Electric Power Research Institute Topical Report TR-112657, Revision B-A, using the Nuclear Energy Institute template methodology. The results of our review indicate that the proposed RI-ISI program is an acceptable alternative to the requirements of the ASME Code, Section XI for inservice inspection, and therefore, the licensee's request for relief is authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative provides an acceptable level of quality and safety.

The enclosed safety evaluation authorizes application of the proposed RI-ISI program during the third 10-year ISI interval for Calvert Cliffs Nuclear Power Plant, Units 1 and 2.

If you have questions regarding this matter, please contact Guy Vissing at 301-415-1441.

Sincerely,

/RA/

Richard J. Laufer, Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and
50-318

Enclosure: Safety Evaluation

cc w/encl: See next page

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ACCESSION NUMBER: ML030860547 *Safety evaluation provided and no major changes were made

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Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 and 2

cc:

President
Calvert County Board of
Commissioners
175 Main Street
Prince Frederick, MD 20678

James Petro, Esquire
Counsel
Constellation Power Source
111 Market Street
Baltimore, MD 21202

Jay E. Silberg, Esquire
Shaw, Pittman, Potts, and Trowbridge
2300 N Street, NW
Washington, DC 20037

Mark Geckle
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

Resident Inspector
U.S. Nuclear Regulatory
Commission
P.O. Box 287
St. Leonard, MD 20685

Mr. Richard I. McLean, Manager
Nuclear Programs
Power Plant Research Program
Maryland Dept. of Natural Resources
Tawes State Office Building, B3
Annapolis, MD 21401

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Kristen A. Burger, Esquire
Maryland People's Counsel
6 St. Paul Centre
Suite 2102
Baltimore, MD 21202-1631

Patricia T. Birnie, Esquire
Co-Director
Maryland Safe Energy Coalition
P.O. Box 33111
Baltimore, MD 21218

Mr. Loren F. Donatell
NRC Technical Training Center
5700 Brainerd Road
Chattanooga, TN 37411-4017

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF FROM AMERICAN SOCIETY OF MECHANICAL ENGINEERS

BOILER AND PRESSURE VESSEL CODE (ASME CODE) REQUIREMENTS

FOR THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM

TO IMPLEMENT A RISK-INFORMED INSERVICE INSPECTION PROGRAM

AT CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2, INC.

DOCKET NOS. 50-317 AND 50-318

1.0 INTRODUCTION

By letter dated May 29, 2002 (Reference 1), Calvert Cliffs Nuclear Power Plant, Inc. (CCNPPI or the licensee) proposed a risk-informed inservice inspection (RI-ISI) program as an alternative to a portion of their current inservice inspection (ISI) program for Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (CCNPP). The scope of the RI-ISI program is limited to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (the ASME Code) Class 1 and 2 piping (Categories B-F, B-J, C-F-1, and C-F-2 welds) only. Additional information was provided in a letter from the licensee dated November 12, 2002 (Reference 2). The licensee's letter was in response to the staff's request for additional information discussed in a phone call on September 19, 2002.

The licensee's RI-ISI program was developed in accordance with the methodology contained in the Electric Power Research Institute (EPRI) Topical Report (TR) EPRI TR-112657, Revision B-A, which was previously reviewed and approved by the staff (Reference 3). CCNPP Units 1 and 2 are currently in their third 10-year ISI interval. The RI-ISI program proposed by the licensee is an alternative pursuant to 10 CFR 50.55a(a)(3)(i).

2.0 BACKGROUND

2.1 Applicable Requirements

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g) requires that ISI of the ASME Code Class 1, 2, and 3 components be performed in accordance with Section XI of the ASME Code, "Rules for Inservice Inspection of Nuclear Power Plant Components" and applicable addenda, except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states in part that alternatives to the requirements of paragraph (g) may be used, when authorized by the Nuclear Regulatory Commission (NRC) if the applicant demonstrates that the proposed alternatives would provide

Enclosure

an acceptable level of quality and safety or if the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements set forth in the Code to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that ISI of components conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. For CCNPP Units 1 and 2, the third 10-year ISI interval started on July 1, 1999. Pursuant to 10 CFR 50.55a(g)(4)(ii), the applicable ASME Code, Section XI for the third ISI interval was the 1989 Edition. However, by letter dated January 29, 1999, the licensee (at that time known as Baltimore Gas and Electric Company (BGE)) submitted a request for updating ISI program plans to the 1998 Edition of the ASME Code, Section XI, (except for Subsections IWE and IWL) for the third 10-year ISI interval (Reference 4). The licensee clarified, in a letter dated December 23, 1999, its intent to implement Appendix VIII, “Performance Demonstration for Ultrasonic Examination Systems,” of Section XI in conducting ISIs as required by 10 CFR 50.55a(g)(6)(ii)(C) (Reference 5). Due to the timing of the submittal, the NRC could not complete its review prior to the start of the third ISI interval. Therefore, the licensee submitted a request for the continued use of the 1983 Edition of the ASME Code, Section XI with the Summer 1983 Addenda until such time that the NRC staff completed its review. The NRC authorized the request. In a safety evaluation (SE) dated April 5, 2000, the NRC staff approved BGE’s request to use the 1998 Edition of the ASME Code subject to limitations, modifications, and exceptions discussed in the SE until such time as the 1998 Edition is incorporated by reference in a future revision of 10 CFR 50.55a (Reference 6). At such a time, the licensee would be required to follow all provisions in the Code, with limitations stated in 10 CFR 50.55a, if any, should the licensee continue to implement the relief request.

In a letter dated October 27, 2000, CCNPPI submitted Relief Request RR-RI-ISI-1, in which it requested relief from ASME Code, Section XI requirements stated in paragraphs IWB-2412 and IWC-2412, as delineated in Tables IWB-2412-1 and IWC-2412-1, regarding the minimum percentage of examinations completed during the first inspection period of the third 10-year ISI interval (Reference 7). The request sought to delay the implementation of these aspects until the licensee submitted and received approval for its RI-ISI program. In the letter, the licensee stated its intention to complete 100% of the required RI-ISI program inspections for Class 1 and 2 piping during the remaining periods of the third interval. In an SE dated March 21, 2001, the staff authorized a delay of 2 years, from July 1, 1999, for conforming to the piping weld examination requirements of the applicable Edition of the ASME Code, Section XI, for the third 10-year ISI interval at CCNPP Units 1 and 2 (Reference 8). However, the staff did not extend the authorization to October 31, 2002, to encompass the spring 2002 Unit 1 outage, nor did it apply to any augmented examination requirements.

On May 29, 2002, CCNPPI submitted Relief Request RR-RI-ISI-2, which contained the licensee’s proposed RI-ISI program (Reference 1). The submittal requests a change to the ISI program for Class 1 and 2 piping using the RI-ISI process described in EPRI TR 112657 Revision B-A, “Revised Risk-Informed Inservice Inspection Evaluation Procedure,” (Reference 3). Currently, the licensee is utilizing the 1998 Edition of the ASME Code as specified in the NRC SE dated April 5, 2000 (Reference 6).

2.2 Summary of Proposed Approach

The 1998 Edition of the ASME Code, Section XI requires that, for Class 1 and 2 piping, a minimum percentage of examinations in each category of welds be completed during each successive inspection period and inspection interval in accordance with Program B, Tables IWB-2412-1 and IWC-2412-1, respectively. The licensee is required to perform ISI in accordance with the ASME Code, Section XI, which specifies that for each successive 10-year ISI interval, 100% of Category B-F welds and 25% of Examination Category B-J welds in Class 1 piping greater than 1 inch in nominal diameter be selected for volumetric and/or surface examination based on existing stress analyses and cumulative usage factors. For Examination Category C-F piping welds in Class 2 piping, 7.5% of non-exempt welds shall be selected for volumetric and/or surface examination.

The licensee has proposed to use an RI-ISI program for a subset of ASME Class 1 and Class 2 piping (Examination Categories B-F, B-J, and C-F) welds, as an alternative to the ASME Code, Section XI requirements. The licensee plans to complete 100% of the required RI-ISI program inspections during the remaining periods of the third 10-year ISI interval. The proposed RI-ISI program follows a previously approved RI-ISI methodology delineated in EPRI TR-112657.

The licensee has indicated that the existing augmented ISI program implemented in response to NRC Generic Letter (GL) GL 89-08, “Flow Accelerated Corrosion (FAC),” is credited in the RI-ISI program development, but is not affected or changed by the RI-ISI program. The existing augmented inspections for Main Steam and Feedwater piping are also not affected by the proposed RI-ISI program.

3.0 EVALUATION

Pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff has reviewed and evaluated the licensee’s proposed RI-ISI program, based on guidance and acceptance criteria provided in the following documents: EPRI TR-112657, NRC’s SE to EPRI TR-112657, Regulatory Guides (RGs) 1.174 (Reference 9) and 1.178 (Reference 10), and Standard Review Plan (SRP), Chapter 3.9.8 (Reference 11).

3.1 Proposed Changes to the ISI Program

The scope of the licensee’s proposed RI-ISI program is limited to ASME Class 1 and Class 2 piping welds for the following Examination Categories: B-F for pressure retaining dissimilar metal welds in vessel nozzles, B-J for pressure retaining welds in piping, C-F-1 for pressure retaining welds in austenitic stainless steel or high alloy piping, and C-F-2 for pressure retaining welds in carbon or low alloy steel piping. The RI-ISI program is proposed as an alternative to the existing ISI requirements of the ASME Code, Section XI. A general description of the proposed changes to the ISI program is provided in Sections 3 and 5 of the licensee’s submittal. During the course of its review, the NRC staff determined that the proposed RI-ISI program is consistent with the guidelines contained in EPRI TR-112657, which states in part that industry and plant-specific piping failure information, if any, is to be utilized to identify piping degradation mechanisms and failure modes, and consequence evaluations are performed using probabilistic risk assessments to establish safety ranking of piping segments for selecting new inspection locations. Thus, the NRC staff concludes that the licensee’s

application of the EPRI TR-112657 approach is an acceptable alternative to the current CCNPP piping ISI requirements with regard to the number, locations, and methods of inspections, and provides an acceptable level of quality and safety pursuant to 10 CFR 50.55a(a)(3).

3.2 Engineering Analysis

The licensee's RI-ISI program at CCNPP Units 1 and 2, is limited to ASME Code Class 1 and 2 piping welds. The licensee stated in Reference 1 that other non-related portions of the ASME Code will be unaffected by this program. Piping systems defined by the scope of the RI-ISI program were divided into piping segments. Pipe segments are defined as lengths of pipe whose failure leads to similar consequences and are exposed to the same degradation mechanisms. That is, some lengths of pipe whose failure would lead to the same consequences may be split into two or more segments when two or more regions are exposed to different degradation mechanisms.

In accordance with the guidance provided in RGs 1.174 and 1.178 (References 9 and 10), the licensee provided the results of an engineering analysis of the proposed changes, using a combination of traditional engineering analysis and supporting insights from the probabilistic risk assessment (PRA). The licensee performed an evaluation to determine susceptibility of components (i.e., a weld on a pipe) to a particular degradation mechanism that may be a precursor to leak or rupture, and then performed an independent assessment of the consequence of a failure at that location. The results of this analysis assure that the proposed changes are consistent with the principles of defense-in-depth because the EPRI methodology requires that the population of welds with high consequences following failure will always have some weld locations inspected regardless of the failure potential.

Augmented programs for flow accelerated corrosion (FAC, GL 89-09), and high energy line break (USNRC Branch Technical Position MEB 3-1) are not subsumed into the RI-ISI program and remain unaffected. Elements in the CCNPP that are covered by these augmented programs were included in the consequence assessment, degradation assessment, and risk categorization evaluations to determine whether the affected piping was subject to damage mechanisms other than those addressed by the augmented program.

Tables 3.1-1 and 3.1-2 of the submittal (Reference 1) summarize the results of the segmentation scheme for Units 1 and 2, respectively. The licensee's submittal states that failure potential assessment, presented in Tables 3.3-1 (for Unit 1) and Table 3.3-2 (for Unit 2) of Reference 1, were generated utilizing industry failure history, plant-specific failure history, and other relevant information using the guidance provided in EPRI TR-112657. The degradation mechanisms identified in the submittal include thermal fatigue including thermal stratification, cycling and striping (TASCS) and thermal transients (TT), intergranular stress corrosion cracking (IGSCC), and FAC. The licensee stated in Section 2.2 of its submittal that the augmented inspection program for FAC is relied upon to manage this mechanism and is not changed by the RI-ISI program.

Section 3 of the submittal describes a deviation from the EPRI RI-ISI methodology for assessing the potential for TASCS that was implemented by the licensee for CCNPP Units 1 and 2. In response to the staff's request for additional information, the licensee stated that the methodology for assessing TASCS potential was in conformance with the updated criteria described in an EPRI letter to the NRC dated March 28, 2001. The licensee's description of its

deviation is identical to other licensee submittals that have been reviewed and accepted by the staff. Specifically, the staff has reviewed the guidance for evaluating TASCS, as described in Materials Reliability Program (MRP) methodology in EPRI Report 1000701, Interim Thermal Fatigue Management Guideline (MRP-24). Further, the licensee stated in its November 12, 2002, letter that it will update the RI-ISI program based on the final EPRI MRP guidance, as appropriate (Reference 2).

The staff concludes that the licensee has met the SRP 3.9.8 guidelines to confirm that a systematic process was used to identify the components' (i.e., pipe segments) susceptibility to common degradation mechanisms, and to categorize these degradation mechanisms into the appropriate degradation categories with respect to their potential to result in a postulated leak or rupture.

Additionally, the licensee stated that the consequences of pressure boundary failures were evaluated and ranked based on their impact on core damage and large early release, and that the impact due to both direct and indirect effects was considered using guidance provided in the EPRI TR-112657.

3.3 Probabilistic Risk Assessment

As stated in Reference 2, the licensee used Revision A of the CCNPP PRA to evaluate the consequences of pipe rupture for the RI-ISI assessment. Revision A of the PRA, which was completed in March of 1999, represents the fifth update to the original individual plant examination (IPE) model. This version is one version older than the current PRA model. The current PRA model (referred to as "Revision 0" by the licensee) was completed in May of 2002 (Reference 2). Revision 0 of the PRA addresses accidents initiated by internal and external events at full power. The base core damage frequency (CDF) and base large early release frequency (LERF) from the current PRA model (Revision 0) is 9E-5 per year and 5E-6 per year, respectively. A peer review of Revision 0 of the PRA was performed in November 2001. Several issues were identified during the review and the licensee stated that these issues were reviewed and found to have no impact on the ISI analysis.

In justifying the applicability of the current PRA model (Revision 0) to the RI-ISI analysis results, which were based on Revision A, the licensee reevaluated consequence assessment using Revision 0 of the PRA. According to licensee's letter dated November 12, 2002 (Reference 2), had Revision 0 of the PRA been applied to the RI-ISI analysis, the risk of several pipe segments would have been lower than what was reported in the submittal (Reference 1). The licensee concludes, and the staff concurs, that the risk impact assessment of the RI-ISI analysis using Revision A is therefore bounding.

The original IPE was submitted to the NRC on December 30, 1993. The IPE estimated a CDF of 2.4E-4/year including the contribution from internal floods. The SE of the IPE, dated April 16, 1996, concluded that the licensee's IPE satisfied the intent of GL 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities." The staff's SE did not report any significant weaknesses found in the review of the IPE.

The NRC staff did not review the PRA model to assess the accuracy of the quantitative estimates reported by the licensee in its RI-ISI submittal (Reference 1). The staff recognizes that the quantitative results of the PRA model are used as order of magnitude estimates to

support the assignment of segments into three broad consequence categories. Inaccuracies in the models or in assumptions large enough to invalidate the broad categorizations developed to support the RI-ISI should have been identified during the staff's review of the IPE and by the licensee's model update control program that included peer review of the PRA model by a peer review team. Minor errors or inappropriate assumptions will affect only the consequence categorization of a few segments and will not invalidate the general results or conclusions.

As required by Section 3.7 of the EPRI-TR, the licensee evaluated the change in risk expected from replacing the current ISI program with the RI-ISI program. The calculations estimated the change in risk due to removing locations and adding locations to the inspection program. The licensee used the "Simplified Risk Quantification Method," described in Section 3.7.2 of Reference 3, to quantitatively estimate expected change in risk. For high consequence category segments, the licensee used the conditional core damage probability (CCDP) and the conditional large early release probability (CLERP) based on the highest estimated CCDP and CLERP. For medium consequence category segments, bounding estimates of CCDP and CLERP were used. The licensee assessed the change in risk with and without taking credit for an increased probability of detection (POD). In Reference 1, the licensee reported the aggregate change in CDF and LERF for both units. These estimates are shown in the table below. A negative aggregate change in CDF and LERF indicates a reduction in risk as a result of transitioning from ASME Code, Section XI based ISI to the RI-ISI program.

Estimated Change in Risk Associated with Replacing the Section XI ISI Program with a Risk-Informed ISI Program				
	ΔCDF		ΔLERF	
	With POD	Without POD	With POD	Without POD
Unit 1	-3.03E-08	-1.04E-08	-6.72E-09	-2.32E-09
Unit 2	-2.61E-08	-7.39E-09	-5.81E-09	-1.65E-09

The NRC staff finds the licensee's process to evaluate and bound the potential change in risk reasonable because it (1) accounts for the change in the number and location of elements inspected, (2) recognizes the difference in degradation mechanism related to failure likelihood, and (3) considers the effects of enhanced inspection. System level and aggregate estimates of the changes in CDF and LERF are less than the corresponding guideline values in the EPRI-TR. The staff finds that re-distributing the welds to be inspected with consideration of the safety significance of the segments provides assurance that segments whose failure have a significant impact on plant risk receive an acceptable and often improved level of inspection.

3.4 Integrated Decision Making

The licensee used an integrated approach in defining the proposed RI-ISI program by considering in concert the traditional engineering analysis, the risk evaluation, the implementation of the RI-ISI program, and performance monitoring of piping degradation. This is consistent with the guidelines given in RG 1.178.

The selection of pipe segments to be inspected is described in Section 3.5 of the submittal using the results of the risk category ranking and other operational considerations. Tables 3.3-1 and 3.3-2 of the submittal provide the failure potential assessment summary for Unit 1 and 2, respectively. Tables 3.4-1 and 3.4-2 of the submittal identify on a per system basis, the number of segments and number of elements (welds), respectively, by risk category for Units 1 and 2, respectively. The risk impact analysis results for each system are provided in Tables 3.6-1 and 3.6-2 of the licensee's submittal (Reference 1), for Units 1 and 2 respectively. Tables 5.1-1 and 5.1-2 of the submittal provide a summary table for each unit comparing the number of inspections required under the existing ASME Code, Section XI ISI program with the alternative RI-ISI program. The licensee states that the failure estimates and the selection of examination elements with high and medium risk ranked piping segments were determined using the guidance provided in EPRI TR-112657. According to the submittal, the EPRI requirements for performing inspections on at least 25% of the locations in the high-risk region and 10% of the locations in the medium-risk region are met. The submittal also states that a 10% sampling of the Class 1 elements will be achieved for both units. The 10% figure will be achieved based on welds that are subject to volumetric examination rather than just a VT-2 visual examination. According to Tables 5.2-1 and 5.2-2 of the submittal, the inspection locations are selected on a system-by-system basis.

The licensee states in their submittal that for any examination location where greater than 90% volumetric coverage cannot be obtained, the process outlined in the EPRI TR-112657 will be followed. As required by Section 6.4 of the EPRI TR, the licensee has completed an evaluation of existing relief requests to determine if any should be withdrawn or modified due to changes that occur from implementing the RI-ISI program. In its submittal, the licensee has identified three relief requests pertaining to the third ISI interval that could be withdrawn. The table below summarizes those relief requests along with the reasons for withdrawing.

Relief Requests identified by the licensee for withdrawing		
Relief Request	Brief Description	Reason for withdrawing
ISI-01	Pertains to alternative surface examination criteria for examination category B-J piping welds located in the reactor vessel annulus.	A hot leg (two welds) and a cold leg (two welds) per Unit were selected for volumetric examination.
ISI-12	Pertains to alternative criteria for the selection of examination category B-J piping welds.	Alternative selection criteria requested will be replaced by the application of RI-ISI process
IDI-13	Pertains to alternative criteria for the selection of examination category C-F-1 piping welds in Class 2 stainless steel systems less than 3/8 inch nominal wall thickness.	Alternative selection criteria requested will be replaced by the application of RI-ISI process

The methodology described in this EPRI TR requires that existing augmented programs be maintained, with the exception of thermal fatigue and IGSCC Category A piping welds, which

the RI-ISI program supersedes. Also, the EPRI report describes targeted examination volumes (typically associated with welds) and methods of examination based on the type(s) of degradation expected. The staff has reviewed these guidelines and has determined that, if implemented as described, the RI-ISI examinations should result in improved detection of service-related degradations over that currently required by the ASME Code, Section XI.

The objective of ISI as required by ASME Code, Section XI is to identify conditions (i.e., flaw indications) that are precursors to leaks and ruptures in the pressure boundary that may impact plant safety. The RI-ISI program is judged to meet this objective. Further, the risk-informed selection process is a technically sound “inspection for cause” program. This process not only identifies the risk important areas of the piping systems, but also defines the appropriate examination methods, examination volumes, procedures, and evaluation standards necessary to address the degradation mechanism(s) of concern and the ones most likely to occur at each location to be inspected. Thus, the location selection process is acceptable since it is consistent with the process described in EPRI TR-112657, which takes into account defense-in-depth and includes coverage of systems subjected to degradation mechanisms in addition to those covered by augmented inspection programs.

Section 3.5.1 of the licensee’s submittal and Section 3.6.6.2 of EPRI TR-112657 address the scope of additional examinations. The time frame for the completion of the additional examinations is not clearly stated. Therefore, the staff finds the Section XI Code requirements applicable for defining when the additional examinations are to be performed. The ASME Code directs licensees to perform sample expansions during the outage that the flaws or relevant conditions are identified. The licensee has confirmed their understanding of the ASME Code requirements.

Chapter 4 of EPRI TR-112657 provides guidelines for the areas and/or volumes to be inspected as well as examination methods, acceptable standards, and evaluation standards for each degradation mechanism. Based on the review of the cited portion of the EPRI report, the staff concludes that the examination methods for the proposed RI-ISI program are acceptable since they are selected based on specific degradation mechanisms, pipe sizes, and materials of concern.

3.5 Implementation and Monitoring

Implementation and performance monitoring strategies require careful consideration by the licensee and are addressed in Element 3 of RG 1.178 and the SRP 3.9.8. The objective of Element 3 is to assess performance of the affected piping systems under the proposed RI-ISI program by utilizing monitoring strategies that confirm the assumptions and analyses used in the development of the RI-ISI program. Pursuant to 10 CFR 50.55a(a)(3)(i), a proposed alternative, in this case the implementation of the RI-ISI program, including inspection scope, examination methods, and methods of evaluation of examination results, must provide an acceptable level of quality and safety.

The licensee states that upon approval of the RI-ISI program, procedures that comply with the EPRI TR-112657 guidelines will be prepared to implement and monitor the RI-ISI program. The licensee confirms that the applicable aspects of the ASME Code not affected by the proposed RI-ISI program would be retained. In response to the staff’s request for additional information (Reference 2), the licensee states that the time between examinations of a given location will

not extend beyond the 10 years required by the ASME Code. The licensee specifically commits to meeting the following:

- 100% of the RI-ISI examination in the second and third periods of the third interval for both units;
- the period percentage requirements of IWB-2412 and IWC-2412; and
- repeat of risk-informed examinations during subsequent intervals per IWB-2420(a) and IWC-2420(a) to the extent practical.

The licensee states in Section 4 of the submittal that the RI-ISI program is a living program and its implementation will require feedback of new relevant information to ensure the appropriate identification of safety significant piping locations. The submittal also states that, as a minimum, risk ranking of piping segments will be reviewed and adjusted on an ASME period basis and that significant changes may require more frequent adjustment as directed by NRC bulletin or GL requirements, or by industry and plant-specific feedback.

The proposed periodic reporting requirements meet existing ASME Code requirements and applicable regulations, and therefore, are considered acceptable. The staff finds that the proposed process for RI-ISI program updates meets the guidelines of RG 1.174 which provide that risk-informed applications should include performance monitoring and feedback provisions; therefore, the licensee's proposed process for program updates is acceptable.

4.0 CONCLUSION

Pursuant to 10 CFR 50.55a(a)(3)(i), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that the proposed alternatives will provide an acceptable level of quality and safety. In this case, the licensee has proposed an alternative to use the risk-informed process described in the NRC-approved EPRI TR-112657. As discussed in Section 3.0 above, the staff concludes that the licensee's proposed RI-ISI program, which is consistent with the methodology described in EPRI TR-112657, will provide an acceptable level of quality and safety with regard to the number of inspections, location of inspections, and method of inspections.

In accordance with RGs 1.174 and 1.178 guidelines, the elements of traditional engineering analysis and PRA of an RI-ISI program are part of an integrated decision-making process that assesses the acceptability of the program. The primary objective of this process is to confirm that the proposed program change will not compromise defense-in-depth, safety margins, and other key principles described in these RGs. The EPRI TR-11256 RI-ISI methodology is a process-driven approach, that is, the process identifies high risk-significant pipe segment locations to be inspected. The CCNPP RI-ISI program demonstrates that unacceptable risk impacts will not occur, and thus, implementation of the RI-ISI program satisfies the acceptance guidelines of RG 1.174.

The methodology used by the licensee also considers implementation and performance monitoring strategies. Inspection strategies ensure that failure mechanisms of concern have been addressed and there is adequate assurance of detecting damage before structural integrity is affected. The risk significance of piping segments is taken into account in defining the inspection scope for the RI-ISI program.

System pressure tests and visual examination of piping structural elements will continue to be performed on all Class 1, 2, and 3 systems in accordance with the ASME Code, Section XI. The RI-ISI program applies the same performance measurement strategies as the existing ASME Code requirements and, in addition, increases the inspection volumes at weld locations that are susceptible to thermal fatigue.

The CCNPP's methodology includes an engineering analysis of the proposed changes using a combination of engineering analysis with supporting insights from a PRA. Defense-in-depth quality is not degraded, in that, the methodology provides reasonable assurance that any reduction in inspections will not lead to degraded piping performance when compared to the existing performance levels. Inspections are focused on locations with active degradation mechanisms as well as selected locations that monitor the performance of system piping.

As discussed above, the staff concludes that the licensee's proposed RI-ISI program is an acceptable alternative to the current ISI program for Class 1 and 2 piping welds at CCNPP Units 1 and 2, and therefore, the proposed alternative of Relief Request RR-RI-ISI-2 is authorized for the remaining periods of the third 10-year ISI interval pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative would provide an acceptable level of quality and safety. This authorization is predicated on licensee's commitment to perform 100% of RI-ISI examinations in the second and third periods of the third interval for both units. Activities associated with this alternative are subject to third party review by the Authorized Nuclear Inservice Inspector.

5.0 REFERENCES

1. Letter from Charles H. Cruse, CCNPPI, dated May 29, 2002, to U.S. Nuclear Regulatory Commission, on Risk-Informed Inservice Inspection Alternative to the ASME Section XI Requirements.

2. Letter from P.E. Katz, CCNPPI, dated November 12, 2002, to U.S. Nuclear Regulatory Commission, on Response to Request for Additional Information concerning a Proposed Alternative Associated with the Risk-Informed Inservice Inspection Program.

3. EPRI TR-112657, Revision B-A, Revised Risk-Informed Inservice Inspection Evaluation Procedure, Final Report, December 1999.

4. Letter from Charles H. Cruse, Baltimore Gas and Electric, dated January 29, 1999, to U.S. Nuclear Regulatory Commission, on Proposed Alternate American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI Edition for Unit Nos. 1 and 2, Third 10-Year Inservice Inspection Interval.

5. Letter from Charles H. Cruse, Baltimore Gas and Electric, dated December 23, 1999, to U.S. Nuclear Regulatory Commission, requesting to update the inservice inspection plans to the 1998 Edition of ASME Code, Section XI .

6. Letter from M. K. Gamberoni, U. S. Nuclear Regulatory Commission, dated April 5, 2000, to C. H. Cruse (BGE). Subject: Safety Evaluation of Proposed Alternate American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI, 1998 Edition for the Third 10-Year Inspection Interval - Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (TAC Nos. MA4647 and MA4648).

7. Letter from Charles H. Cruse, Constellation Energy Group, LLC, dated October 27, 2000, to U.S. Nuclear Regulatory Commission, Request for Relief from Certain ASME Code Requirements for Inservice Inspection; Relief Request RR-RI-ISI-1.

8. Letter from M. K. Gamberoni, U. S. Nuclear Regulatory Commission, dated March 21, 2001, from to C. H. Cruse (BGE), Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 - Request for Relief from American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI (TAC Nos. MB0390 and MB0391).

9. NRC Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” July 1998.

10. NRC Regulatory Guide 1.178, “An Approach for Plant-Specific Risk-Informed Decision Making: Inservice Inspection of Piping,” September 1998.

11. NRC NUREG-0800, Chapter 3.9.8, Standard Review Plan for Trial Use for the Review of Risk-Informed Inservice Inspection of Piping, September 1998.

Principal Contributors: S. Dinsmore
A. Keim

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