December 19, 2001

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

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 - RELIEF REQUEST FROM AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE, SECTION XI (TAC NOS. MB3073 AND MB3074)

Dear Mr. Cruse:

By letter dated September 27, 2001, Calvert Cliffs Nuclear Power Plant, Inc. (CCNPPI), submitted a relief request from the requirements of Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for the third 10-year inservice inspection (ISI) interval. Specifically, the request for relief is associated with the use of wire-type image quality indicators for radiography examinations as provided for in ASME Section III, 1992 Edition with 1993 Addenda. The NRC staff reviewed the proposed alternative. The results are provided in the enclosed safety evaluation.

The NRC staff has concluded that the proposed alternative to the ASME Code requirements provides an acceptable level of quality and safety and is acceptable. Pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized for the third 10-year ISI interval.

If you should have any questions, please contact Donna Skay at 301-415-1322.

Sincerely,

/RA/

L. Raghavan, Acting Chief, Section 1
Project Directorate 1
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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*Input provided by safety evaluation dated November 20, 2001

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION

CALVERT CLIFFS NUCLEAR POWER PLANT, INC.

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

DOCKET NUMBERS 50-317 AND 50-318

1.0 INTRODUCTION

By letter dated September 27, 2001, Calvert Cliffs Nuclear Power Plant, Inc. (CCNPPI, the licensee) submitted a relief request to use wire type image quality indicators as an alternative to the American Society of Mechanical Engineers (ASME) Section III, 1992 Edition Code requirements. The NRC staff has reviewed the information submitted by the licensee in support of the request for relief. The NRC staff's basis for disposition is documented below.

2.0 BACKGROUND

Inservice inspection (ISI) of the ASME Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (ASME Code) and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Pursuant to 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements 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, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests 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) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. In accordance with 10 CFR 50.55a(b), the applicable version of the ASME Code is the 1989 Edition. However, Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 proposed an alternative to use the ASME

Code, Section XI, 1998 Edition (except for Subsections IWE and IWL) for the third 10-year ISI interval. The alternative was approved by the NRC staff with some clarifications noted in a safety evaluation dated April 5, 2000. Therefore, the ASME Section XI Code of record for the third 10-year ISI interval is the 1998 Edition of the ASME Code.

Regulatory Guide 1.147, Revision 12, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," finds the use of Code Case N-416-1, "Alternative Pressure Test Requirements for Welded Repairs of Installation of Replacement Items by Welding, Class 1, 2, and 3, Section XI, Division 1," acceptable. Code Case N-416-1 invokes the 1992 Edition of the ASME Code, Section III in the performance of nondestructive examinations of welded repairs or installation or replacement components by welding.

3.0 LICENSEE'S RELIEF REQUEST

3.1 The Components for Which Relief is Requested:

> Class 1, 2, and 3 components with welded repairs or replacements installed by welding.

3.2 Code Requirement (as stated):

> American Society of Mechanical Engineers Code, Section III, 1992 Edition, no Addenda, Articles NB-5111 and NC-5111, require that "...Radiographic examination shall be in accordance with Section V, Article 2, except that ...the penetrameters of Table NB-5111-1 (NC-5111-1) shall be used in lieu of those shown in Table T-276" (of ASME Section V). Tables NB-5111-1 and NC-5111-1 specify only plaque-type penetrameters.

3.3 Licensee's Proposed Alternative (as stated):

> Use of wire type IQIs [Image Quality Indicators] as incorporated into Tables NB-5111-1 and NC-5111 in the 1993 Addenda of the 1992 Edition of the ASME Section III Code.

3.4 Licensee's Basis for Requesting Relief (as stated):

> Plaque type penetrameters are difficult to use due to placement and shim requirements. Plaque type penetrameters are suited for use on flat plate and on objects with a geometry such that the penetrameter hole image is not distorted. This is not the case in many nuclear piping components. In these instances the wire type IQIs are superior in that they are placed directly across the area of interest, thus encompassing the object's range of density and geometry. Use of plaque type penetrameters can be difficult because the essential T hole is often obscured or distorted due to specimen anomalies, part geometry, or film artifacts outside the area of interest. This creates a re-shoot condition and requires the radiography crew to reenter the radiation area and thus receive extra dose. The one inch minimum length of the essential IQI wire eliminates the problem of indicator loss due to distortion, anomalies, and part geometry that is commonly found with the target hole in plaque type penetrameters. The wire type IQIs

provide the same function as the plaque type penetrameters by indicating a change in thickness and spatial resolution of the image without the use of shim blocks and pipe standards often required for the plaque type penetrameters.

Wire type IQIs have been shown to provide quality and sensitivity equivalent to plaque type penetrameters as documented in Table 4 of America Society for Testing and Materials [ASTM] E747-87. Additionally, use of plaque type penetrameters, with their associated stringent placement and shim requirements, has a direct ALARA [as low as reasonably achievable] impact when performing radiography in a nuclear power environment. This impact is created by the extended time spent in the radiation field due to the set-up time associated with the use of shim blocks or pipe standards. When the plaque type penetrameters do not have a good fit adjacent to or across the area of interest, movement of the shim or plaque can occur. Movement renders the exposure useless, making it necessary to set-up again and re-shoot a weld view. This has a negative ALARA impact on the radiography crew.

In addition, the use of wire type IQIs eliminates re-shoots due to density variations in the area of interest due to thickness changes in the part because the wires extend across areas of density variations, providing information across a larger area of the radiograph.

Equivalent sensitivity has been demonstrated in ASME Section V, Article 22, Standard SE-747. Because of the equivalent sensitivity, the proposed testing alternative (wire type IQIs) provides equivalent testing results to the current testing method (plaque-type penetrameters). Therefore, the quality of the inspection and resulting safety of the plant, based on the inspection results, are not impacted by the proposed relief request. [...]

4.0 EVALUATION

IWA-4700 and IWA-5000 require a hydrostatic test following repairs. However, Code Case N-416-1, “Alternative Pressure Test Requirement for Welded Repairs or Installation of Replacement Items by Welding, Class 1, 2, and 3 Section XI, Division 1,” which the NRC has approved for use, allows the use of a system leakage test in lieu of the hydrostatic test provided certain requirements are met. One of those requirements states, “NDE shall be performed in accordance with the methods and acceptance criteria of the applicable Sub-section of the 1992 Edition of Section III.” With respect to radiography, the pertinent articles of Section III are NB-5111 and NC-5111 and Tables NB-5111-1 and NC-5111-1. The 1992 Edition of Section III did not include the use of wire type IQIs. Wire penetrameters were not included in Section III of the ASME Code until the 1992 Edition with 1993 Addenda. The 1992 Edition with 1993 Addenda of the ASME Code has been endorsed by NRC in 10 CFR 50.55a.

Volume 17 of the Ninth Edition of the American Society of Materials (ASM) Handbook Series, published in 1989, states that wire-type penetrameters are widely used in Europe, including the United Kingdom, Germany, the Netherlands and Scandinavia. International organizations have also incorporated the use of wire penetrameters such as the International Organization for Standardization and the International Institute of Welding. The ASM handbook goes on to state

that wire penetrameters specified in ASTM E 747-87 are widely used in the United States. ASTM developed this specification using a public forum with approval by public consensus. The ASTM Standard E 747 referenced in the ASM Handbook is the same as ASME's Standard SE-747.

The NRC staff made a comparison to determine the equivalency of the previously allowed plaque-type penetrameters with the proposed alternative of wire-type penetrameters. The comparison showed that the wire diameters were essentially the same. Of the 18 wire diameters compared, two wire diameters were more conservative (smaller diameters), two wire diameters interpolated from two known values were less conservative (larger diameters), and 14 wire diameters were identical to the wire diameters in Table NB-5111-1 (NC-5111-1) to the 1992 Edition with 1993 Addenda of the ASME Code. Based on the above comparison of commonly used industry references and the widespread use of wire penetrameters in industry, the staff believes that the wire penetrameters listed in Table NB-5111-1 (NC-5111-1) to the 1992 Edition with 1993 Addenda of the ASME Code will provide an acceptable level of quality and safety.

5.0 CONCLUSION

Based on the above evaluation, the NRC staff concludes that the proposed alternative to use IQIs for radiography examinations as provided for in ASME Section III, 1992 Edition with 1993 Addenda, provides an acceptable level of quality and safety. Therefore, the NRC staff authorizes the proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at CCNPP, Unit Nos. 1 and 2.

Principal Contributor: A. Keim

Date: December 19, 2001