UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 19, 2009

Mr. James A. Spina, Vice President
Calvert Cliffs Nuclear Power Plant, LLC
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702
Buchanan, NY 10511-0249

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 – RELIEF REQUESTS FOR THE FOURTH 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM (TAC NOS. ME0293, ME0294, ME0295, ME0296, ME0298, ME0299, ME0301, AND ME0302)

Dear Mr. Spina:

By letter dated December 29, 2008, as supplemented by letters dated February 18, May 13, June 1, and June 9, 2009, Calvert Cliffs Nuclear Power Plant, Inc. (subsequently renamed Calvert Cliffs Nuclear Power Plant, LLC, the licensee), submitted relief requests, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i), for the Fourth 10-Year Interval Inservice Inspection (ISI) Program Plan for the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (CCNPP).

Relief Request ISI-04-01, "Reactor Vessel Head-to-Flange Weld Examinations as Prescribed in ASME Case N-747," was subsequently withdrawn by letter dated May 13, 2009.

Relief Request ISI-04-02, "Alternative Requirements to the Visual Acuity Demonstration Requirements of IWA-2321(a)," proposes to use the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-753, "Vision Tests" in lieu of the annual visual acuity requirements for CCNPP. Specifically, the licensee is requesting the use of Code Case N-753 in lieu of the requirements of the 2004 Edition of the ASME Code, Section XI, paragraph IWA-2321(a), "Visual Tests," for the near-distance acuity testing requirements.

The Nuclear Regulatory Commission (NRC) staff has reviewed Relief Request ISI-04-02 and concludes that the licensee's proposed alternative to use ASME Code Case N-753 in lieu of ASME Code, Section XI, paragraph IWA-2321(a) will provide an acceptable level of safety and quality. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative, Code Case N-753, is authorized for the fourth 10-year ISI interval at CCNPP or until Code Case N-753 is approved for general use by reference in Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability." After that time, if the licensee wishes to continue to use Code Case N-753, the licensee must follow all conditions and limitations place on the use of the code case, if any, that are specified in RG 1.147.

Request ISI-04-03, "Shell Circumferential Welds," proposes an alternative to the requirements of the ASME Code, Section XI, for the inspection of the replacement steam generator closure girth welds at CCNPP during the fourth 10-year ISI interval.

The NRC staff found that the licensee's proposed alternative would provide an acceptable level of quality and safety and reasonable assurance of continued structural integrity for the CCNPP steam generator pressure vessels during the fourth 10-year ISI interval. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the use of Relief Request ISI-04-03 for the fourth 10-year interval of the Steam Generator ISI Program.

Relief Request ISI-04-04, "Risk-Informed/Safety-Based Inservice Inspection Program Plan," proposes to use a risk-informed/safety-based ISI program as an alternative to a portion of its current ISI program at CCNPP. The proposed program is based, in part, on the ASME Code, Section XI, Code Case N-716 as guidance. The provisions of Code Case N-716 may define additional requirements for Class 3 piping or non-Class piping.

The NRC staff has reviewed Relief Request ISI-04-04 and concludes that the licensee's proposed RIS_B program will provide an acceptable level of quality and safety pursuant to 10 CFR 50.55a(a)(3)(i) for the proposed alternative to the piping ISI requirements with regard to (1) the number of locations, (2) the locations of inspections, and (3) the methods of inspection. Therefore, Relief Request ISI-04-04 is authorized for the CCNPP fourth 10-year ISI interval pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that this alternative will provide an acceptable level of quality and safety.

Sincerely,

John P. Boska for

Nancy L. Salgado, Chief
Plant Licensing Branch 1-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosure:
As stated

cc w/encl: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST NOS. ISI-04-02, ISI-04-03, AND ISI-04-04

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

DOCKET NOS. 50-317 AND 50-318

1.0 INTRODUCTION

By letter dated December 29, 2008 (Agencywide Document Access and Management System (ADAMS) Accession No. ML090020097), as supplemented by letters dated February 18 (ML090540061), May 13 (ML091330247), June 1 (ML091530274), and June 9, 2009 (ML091600307), Calvert Cliffs Nuclear Power Plant, Inc. (subsequently renamed Calvert Cliffs Nuclear Power Plant, LLC, the licensee), submitted relief requests, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i), for the Fourth 10-Year Interval Inservice Inspection (ISI) Program Plan for the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (CCNPP).

This safety evaluation (SE) addresses Relief Request ISI-04-02, "Alternative Requirements to the Visual Acuity Demonstration Requirements of IWA-2321(a)," Relief Request ISI-04-03, "Shell Circumferential Welds," and Relief Request ISI-04-04, "Risk-Informed/Safety-Based Inservice Inspection Program Plan." Relief Request ISI-04-01, "Reactor Vessel Head-to-Flange Weld Examinations as Prescribed in ASME Case N-747," was subsequently withdrawn by letter dated May 13, 2009.

2.0 REGULATORY EVALUATION

The ISI of the American Society of Mechanical Engineers (ASME) Code Class 1, 2 and 3 components must meet the requirements of Section XI of editions of the ASME Addenda as required by 10 CFR 50.55a(g). 10 CFR 50.55a(g)(4) states that throughout the service life of a boiling or pressurized water cooled nuclear power facility, components classified as ASME Code Class 1, 2 and 3, including supports, must meet the requirements, except design and access provisions and preservice examination requirements, specified in Section XI of editions of the ASME Boiler and Pressure Vessel Code (ASME Code) and Addenda, "Rules for Inservice Inspection of Nuclear Power Plant Components" to the extent practical within the limitations of design, geometry and materials of construction of the components. Pursuant to 10 CFR 50.55a(g)(4)(ii), inservice examination of components and system pressure tests conducted during successive 120-month inspection intervals must comply with the requirements in the latest edition and addenda of the Code incorporated by reference in 10 CFR 50.55a(b) 12 months before the start of the 120-month inspection interval, subject to the limitations and modifications listed therein. In accordance with this requirement, the Section XI ASME Code of

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Record for the fourth ISI interval at Calvert Cliffs Units 1 and 2 is the 2004 Edition which begins October 10, 2009, and ends June 30, 2019.

Pursuant to 10 CFR 50.55a(g)(6)(i), a licensee may obtain relief from these ISI requirements when written relief is granted by the NRC. Pursuant to 10 CFR 50.55a(a)(3), the alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (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.

3.0 TECHNICAL EVALUATION

3.1 Relief Request ISI-04-02

By letter dated December 29, 2008, the licensee submitted Relief Request ISI-04-02 invoking paragraph 50.55a(a)(3)(i) of 10 CFR. The licensee requested the use of the ASME Code Case N-753 "Vision Test" for CCNPP. Specifically, the licensee is requesting the use of Code Case N-753 in lieu of the requirements of the 2004 Edition of the ASME Code, Section XI, paragraph IWA-2321(a), "Visual Tests," for Non-Destructive Examination (NDE) personnel near-distance vision testing requirements.

3.1.2 Applicable Code Requirements

ASME Code, Section XI, 2004 Edition, paragraph IWA-2321(a), "Visual Tests," states that the following test shall be administered annually to NDE personnel:

(a) Personnel shall demonstrate natural or corrected near-distance acuity of 20/25 or greater Snellen fraction, with at least one eye, by reading words or identifying characters on a near-distance test chart, such as a Jaeger chart, that meets the requirements of IWA-2322. Equivalent measures of near-distance acuity may be used. In addition, personnel performing VT-2 or VT-3 visual examinations shall demonstrate natural or corrected far-distance acuity of 20/30 or greater Snellen fraction or equivalent with at least one eye.

3.1.3 Licensee's Reason for Request

The licensee requests to allow the use of ASME Code Case N-753, "Visual Tests," during the fourth CCNPP ISI 10-year interval as an acceptable alternative method for NDE personnel near-distance acuity testing.

3.1.4 Licensee's Proposed Alternative and Basis for Use

Code Case N-753 provides an alternative to the visual acuity demonstration requirements of IWA-2321(a) that will allow the testing to be administered and documented by an optometrist, ophthalmologist, or other health care professional who administers vision tests. The visual acuity testing for NDE personnel performing ASME Code, Section XI examinations is required to be administered annually. In addition to vision testing, which is typically administered by utility personnel, many NDE personnel also have annual visual acuity testing in conjunction with routine eye examinations administered by an optometrist, an ophthalmologist, or other health care professional who administers vision tests. Optometrists, ophthalmologist, and other health care professionals who administer vision tests are typically educated and experienced in the proper techniques for vision testing, such as the Snellen fraction or Jaeger chart methods required by ASME Code, Section XI. This training and expertise provides a level of confidence that the visual acuity testing administered will be a reliable indicator that the tested NDE personnel can satisfactorily perform Section XI NDEs.

The testing performed by optometrists, ophthalmologist, and other health care professionals who administer vision tests will satisfy IWA-2321(a) requirements, including documentation which details the tests performed, compliance with IWA-2321(a) criteria and the date the testing was administered. The use of the Code Case N-753 alternative requirements allows the utilities to accept visual acuity testing performed by outside health care professionals in lieu of the visual acuity testing performed by in-house personnel. In many instances, this flexibility will eliminate duplicate testing and thus provide a reduction in the costs and manpower associated with qualifying NDE personnel. Because Code Case N-753 does not change the qualification criteria in IWA-2321(a), the implementation of the licensee's proposed alternative requirements does not affect the level of quality and safety provided by NDE personnel.

3.1.5 NRC Staff Evaluation

The licensee is requesting relief from the requirements of the ASME Code, Section XI, 2004 Edition, paragraph IWA-2321(a) to use ASME Code Case N-753, "Vision Test," as an alternative to near-distance acuity testing for the fourth 10-year ISI interval at CCNPP. Code Case N-753 was approved by ASME on July 14, 2006, and provides an alternative to the existing ASME Code requirements.

Code Case N-753 allows for tests administered by an optometrist, ophthalmologist, or other eye care professionals who administer vision tests and documents compliance with the acuity requirements of IWA-2321(a) to be acceptable. This allows the licensee to use examinations performed by outside health care professionals in lieu of those performed by in-house personnel. Consequently, any NDE personnel administered an acuity test as a routine eye examination would also fulfill the near-distance visual acuity examination requirements set forth by the ASME Code. The requirements of paragraph IWA-2321(a) call for personnel performing NDE examinations to have an annual visual acuity test. The NDE personnel taking the test shall be able to demonstrate natural or corrected near-distance acuity of 20/25 or greater Snellen fraction, with at least one eye, by reading words or identifying characters on a near-distance test chart such as a Jaeger chart. Equivalent measures (i.e., optometrist, ophthalmologist) of near-distance acuity may be used.

A Snellen chart is an eye chart typically used by eye care professionals to measure visual acuity. A typical acuity test administered by an eye care professional requires a patient to cover one eye, and read aloud the letters in each of the rows of the Snellen chart. The smallest row that can be read accurately indicates the patient's visual acuity in that eye. The letters used in a Snellen chart have a specific geometry in which the thickness of the lines equals the thickness of the white spaces between lines and the thickness of the gap in the letter "C". The height and width of each letter consist of five times the thickness of the line. The Jaeger chart is a similar method but it is specifically used to determine near vision acuity.

The licensee stated that many NDE personnel take annual vision acuity tests as routine eye examinations performed by an optometrist, ophthalmologist, or another health care professional who administers vision tests. As with any other health care profession, eye care professionals must go through education, certification and regulated practice. Health care professionals are required to participate in courses to stay current on the standardization of eye care. Therefore, health care professionals who perform such vision acuity examinations are educated and experienced in the proper techniques. Furthermore, the licensee stated that allowing routine eye exams will eliminate duplicate testing and provide a reduction in cost associated with in-house testing. Code Case N-753 does not change the requirements of IWA-2321(a), but provides an alternative for a qualified practitioner to perform the required near-distance examinations to NDE personnel. The NRC staff concludes that the requirements of ASME Code Case N-753 provide an acceptable level of quality and safety for administering near-distance acuity examinations.

3.1.6 Conclusion

Based on the above evaluation, the NRC staff concludes that the licensee's proposed alternative to use ASME Code Case N-753 in lieu of ASME Code, Section XI, paragraph IWA-2321(a) will provide an acceptable level of safety and quality. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative, Code Case N-753, is authorized for the fourth 10-year ISI interval at CCNPP or until Code Case N-753 is approved for general use by reference in Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability." After that time, if the licensee wishes to continue to use Code Case N-753, the licensee must follow all conditions and limitations place on the use of the code case, if any, that are specified in RG 1.147.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

3.2 Relief Request ISI-04-03

3.2.1 Component for Which the Proposed Alternative is Requested

The licensee has submitted the proposed alternative for the ASME Code Class 2 Replacement Steam Generator Closure Girth Welds at CCNPP. This request applies to all four steam generators at CCNPP.

3.2.2 ASME Code Requirement

The 2004 Edition (no addenda) of the ASME Code, Section XI, Table IWC-2500-1, Examination Category C-A, requires, in part, that pressure vessel shell circumferential welds be volumetrically examined when the welds are located at a gross structural discontinuity, as defined by the ASME Code, Section III, Paragraph NB-3213.2. Examples include junctions between shells of different thickness, cylindrical shell-to-conical shell junctions, shell (or head)-to-flange welds, and head-to-shell welds.

3.2.3 Licensee's Proposed Alternative

Pursuant to 10 CR 50.55a(a)(3)(i), the licensee proposed that the CCNPP steam generator closure girth welds not be categorized as a structural discontinuity during the fourth 10-year ISI interval. This would eliminate the need for the volumetric examinations specified for these welds in the ASME Code, Section XI.

3.2.4 Licensee's Basis for Proposed Alternative

The licensee submitted a similar request for the steam generator closure girth welds during the third 10-year ISI interval for CCNPP, in a letter dated October 22, 2002, from Mr. P. E. Katz (Calvert Cliffs) to the NRC. The NRC approved the alternative in letter dated March 6, 2003, from Mr. R. J. Laufer (NRC) to Mr. P. E. Katz (Calvert Cliffs) (ML030650013).

During the third 10-year ISI interval at CCNPP, the Calvert Cliffs Steam Generator Replacement Project replaced the steam generator lower assembly section containing the steam generator tubes and completely refurbishing the original steam drum in accordance with ASME Code, Section III, 1989 Edition (no Addenda) and ASME Code, Section XI, 1998 Edition (no Addenda). Both sections were joined by the closure girth weld. The secondary side of the steam generators (both the original Combustion Engineering parts, and replacement parts from Babcock & Wilcox Canada) are classified as ASME Code Class 2 for the purposes of ISI but was constructed in accordance with ASME Code Class 1 requirements. As such, a stress and fatigue analysis of the secondary side was performed which determined the predicted maximum stress intensity ranges and cumulative usage factors at specific junctions throughout the vessel shells. The junctions evaluated included the closure girth welds and other shell circumferential welds currently inspected as part of the units' ISI program. In lieu of categorizing the closure girth welds as welds subject to volumetric examination requirements solely due to the weld being classified by definition as gross structural discontinuities (since the welds form a junction between shells of different thicknesses), the licensee proposed to utilize the stress and fatigue analysis to show that susceptibility of these welds to fatigue cracking is significantly less than the steam generator welds currently in the ISI program. Therefore, categorization of the closure girth welds as welds subject to the volumetric examination requirements of the ASME Code, Section XI provides no added value in monitoring and maintaining the structural integrity of the steam generator pressure vessels.

The CCNPP ISI program for the secondary side of the steam generators currently includes the following circumferential welds:

- Head Circumferential Welds
- Upper Steam Drum-To-Transition Cone Welds
- Tubesheet-to-Shell Welds

The head circumferential welds and the upper steam drum-to-transition cone welds are welds in the original steam drum sections. These circumferential welds have been subjected to two 10-year ISI inspection intervals. The tubesheet-to-shell welds are part of the replacement lower assemblies, and, therefore are new welds in the ISI program. The licensee's stress and fatigue analysis performed for the replacement steam generators evaluated the entire vessel for a design life of 40 years from the time the replacement was done taking into account the operating history of the steam drum section prior to replacement. A summary of the stress analysis is tabulated below:

Junction	Range of Stress Intensity (ksi)	Allowable Stress Intensity (ksi) 3Sm	Allowable Stress Intensity (ksi) 1.5Sm	Fatigue Usage Factor	Fatigue Usage Limit Factor
Head Circumferential Weld	20.3	80.1	40.1	0.04	1.0
Tubesheet-to-Shell Weld	71.6	90.0	45.0	0.03	1.0
Upper Steam Drum-to-Transition Cone Weld	36.0	80.1	40.1	0.02	1.0
Replacement Steam Generator Closure Girth Weld	26.0	80.1	40.1	0.002	1.0

The data tabulated above shows that the susceptibility of the closure girth weld to fatigue cracking is very low in comparison to the other circumferential welds listed that are currently in the ISI program. Of particular note is the comparison between the upper steam drum-to-transition cone welds and the closure girth welds. Per the ASME Code, Section XI, Table IWC-2500-1, the upper steam drum-to-transition cone welds are also subject to volumetric examination requirements solely due to the welds being classified as a gross structural discontinuities since these welds are at cylindrical shell-to-conical shell junctions. The upper steam drum-to-transition cone welds have both a higher stress intensity range and fatigue usage factor than the closure girth welds. The upper steam drum-to-transition cone welds are part of the original steam drums and have undergone two 10-year ISI inspections with no flaws detected. These welds will continue to be inspected as part of the units' ISI program. Based on the stress analysis performed for the replacement steam generators, the probability of the upper steam drum-to-transition cone welds developing a fatigue crack is significantly higher than the closure girth welds. Therefore, subjecting the closure girth welds to future volumetric examinations will not provide any added value in monitoring the structural integrity of the steam generators.

3.2.5 NRC Staff Evaluation

The licensee's proposed alternative involves the steam generator ISI Program for the fourth 10-year ISI interval. As previously stated, the CCNPP Steam Generator Replacement Project and the fourth 10-year interval ISI Program Plan meet the requirements of the ASME Code, Section

XI, 2004 Edition (except for Subsections IWE and IWL). The ASME Code, Section XI, Table IWC-2500-1, Examination Category C-A requires a volumetric examination of welds when the welds are located at a gross structural discontinuity as defined by ASME Code, Section III, NB-3213.2. Examples are junctions between shells of different thicknesses, cylindrical shell-to-conical shell junctions, shell (or head)-to-flange welds, and head-to-shell welds. As an alternative to the generic criteria of gross structural discontinuity for categorizing welds for ISI, the licensee proposed to utilize the associated stress and fatigue analysis for the entire replacement steam generator to show that susceptibility of the closure girth welds to fatigue cracking is significantly less than the steam generator welds currently in the ISI program. As shown in the summary of stress analysis (table above), the fatigue usage factor is listed as 0.002 for the replacement steam generator closure girth welds at CCNPP. This value is very low in comparison with the fatigue usage factor values for the other steam generator circumferential welds. Therefore, requiring a volumetric examination of the girth welds for the steam generators will provide little value in monitoring the structural integrity of the steam generators because the susceptibility of the closure girth welds to fatigue cracking is very low. Furthermore, the secondary side of the steam generator (both the original Combustion Engineering parts, and replacement parts from Babcock & Wilcox Canada) is classified as ASME Code Class 2 for the purposes of ISI, but was constructed in accordance with ASME Code Class 1 requirements. The construction Code for ASME Code Class 1 components requires that the girth welds be examined using radiographic and surface examination methods. Those examinations revealed no structural defects in the completed girth welds. In addition, the upper steam drum-to-transition cone welds, which have significantly higher fatigue usage, have undergone two volumetric examinations with no flaws detected. Based on the higher fatigue usage experienced by the immediate adjacent welds as well as the configuration of the new closure girth welds, the NRC staff finds that service-induced degradation would most likely exhibit itself first at these adjacent welds rather than the closure girth welds. Therefore, the NRC staff concludes that the CCNPP replacement steam generator closure girth welds need not be categorized as welds subject to volumetric examination requirements.

3.2.6 Conclusion

The NRC staff concludes that the licensee has provided an acceptable alternative to the requirements of ASME Code, Section XI, Table IWC-2500-1. Requiring volumetric examination of the girth welds for the steam generators at CCNPP will provide little value in monitoring and maintaining the structural integrity of the steam generators because the susceptibility of the closure girth welds to fatigue cracking is very low. Therefore, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year interval of the Steam Generator Inservice Inspection Program. All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested and approved, remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

3.3 Relief Request ISI-04-04

Relief Request ISI-04-04, "Risk-Informed/Safety-Based Inservice Inspection Program Plan," proposes to use a risk-informed/safety-based inservice inspection (RIS_B) program as an alternative to a portion of its current ISI program at CCNPP. The proposed program is based, in part, on the ASME Code, Section XI, Code Case N-716 as guidance. The provisions of Code Case N-716 may define additional requirements for Class 3 piping or non-Class piping.

By letter dated December 29, 2008, as supplemented by letters dated February 18, June 1, and June 9, 2009, the licensee submitted a RIS_B program as an alternative to a portion of its current ISI program at CCNPP. The licensee proposed the use of the RIS_B process for the ISI of the ASME Code, Class 1 and Class 2 piping, Examination Categories B-F, B-J, C-F-1, and C-F-2 piping welds. The licensee requested implementation of this alternative during the fourth 10-year ISI interval.

The licensee requests to implement an RIS_B program based, in part, on ASME Code Case N-716, "Alternative Piping Classification and Examination Requirements, Section XI Division 1" (CC N-716). The provisions of CC N-716 may be used in lieu of the requirements of IWB-2420, IWB-2430, Table IWB-2500-1 (Examination Categories B-F and B-J), IWC-2420, IWC-2430, and Table IWC-2500-1 (Examination Categories C-F-1 and C-F-2) for ISI of Class 1 or 2 piping and IWB-2200 and IWC-2200 for preservice inspection of Class 1 or 2 piping, or as additional requirements for Class 3 piping or Non-Class piping, for plants issued an initial operating license prior to December 31, 2000. The CC N-716 requirements are expected to reduce the number of inspections required but also define additional requirements for Class 3 piping or non-Class piping.

CC N-716 has not been endorsed for generic use by the NRC. The licensee's relief request refers to the methodology described in CC N-716 instead of describing the details of the methodology in the relief request. The licensee has, however, modified the methodology described in CC N-716 while developing its proposed RIS_B program. When the methodology used by the licensee is accurately described in CC N-716, this SE refers to the details found in CC N-716. When the methodology used by the licensee deviates or expands upon the methodology described in CC N-716, this SE refers to the licensee's submittals cited above. Therefore, CC N-716 is incorporated in this SE only as a source for some of the detailed methodology descriptions as needed and the NRC staff is not endorsing the use of Code Case N-716.

Pursuant to 10 CFR 50.55a(g), a certain percentage of ASME Code Category B-F, B-J, C-F-1, and C-F-2 pressure retaining piping welds must receive ISI during each 10-year ISI interval. The ASME Code requires 100 percent of all B-F welds and 25 percent of all B-J welds greater than 1-inch nominal pipe size be selected for volumetric or surface examination, or both, on the basis of existing stress analyses. For Categories C-F-1 and C-F-2 piping welds, 7.5 percent of non-exempt welds are selected for volumetric or surface examination, or both. According to 10 CFR 50.55a(a)(3), the NRC may authorize alternatives to the requirements of 10 CFR 50.55a(g), if an applicant demonstrates that the proposed alternatives would provide an acceptable level of quality and safety, or that compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee has proposed to use an RIS_B program for ASME Code Class 1 and Class 2 piping (Examination Categories B-F, B-J, C-F-1, and C-F-2 piping welds), as an alternative to the ASME Code, Section XI requirements. As previously stated, the provisions of CC N-716 are expected to reduce the number of required examinations but also may define additional requirements for Class 3 piping or non-Class piping. The application states that this proposed program will be substituted for the current program in accordance with 10 CFR 50.55a(a)(3)(i) by alternatively providing an acceptable level of quality and safety.

The licensee states that CC N-716 is founded in large part on the risk-informed inservice inspection (RI-ISI) process as described in Electric Power Research Institute (EPRI) Topical

Report (TR)-112657, which was previously reviewed and approved by the NRC. The licensee further states that the risk-informed application based upon CC N-716 meets the intent and principles of RG 1.174, "An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis", and RG 1.178, "An Approach For Plant-Specific Risk-Informed Decisionmaking - Inservice Inspection of Piping." RG 1.174 provides guidance on the use of probabilistic risk analysis (PRA) findings and risk insights in support of licensee requests for changes to a plant's licensing basis. RG 1.178 describes a RI-ISI program as one that incorporates risk insights that can focus inspections on more important locations while at the same time maintaining or improving public health and safety.

The NRC staff has reviewed and evaluated the licensee's proposed RIS_B program based on guidance and acceptance criteria provided in the following documents:

> RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,"
>
> RG 1.178, "An Approach for Plant-Specific Risk-Informed Decision making for Inservice Inspection of Piping,"
>
> NRC NUREG-0800, Chapter 3.9.8 Standard Review Plan For the Review of Risk-Informed Inservice Inspection of Piping,
>
> EPRI TR-112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure,"

Since the issuance of the SE on the EPRI TR, several instances of primary water stress-corrosion cracking (PWSCC) of alloy 82/182 dissimilar metal welds have occurred at pressurized-water reactors (PWRs). This prompted the NRC to send a letter (Reference 8) to the Chairman of the ASME Subcommittee on Nuclear Inservice Inspection, stating that the operating experience with leakage and flaws caused by PWSCC at PWRs supports a position that current ASME Code inspection requirements are not sufficient for managing PWSCC-susceptible butt welds in the reactor coolant pressure boundary of PWRs. This letter represents a departure from the NRC staff's conclusions about PWSCC in the EPRI TR's SER. The NRC staff is including this information to demonstrate that, as issues arise, modifications to RI-ISI programs may be warranted as required in the NRC approval of the RIS_B program. The nuclear power industry, through the Materials Reliability Program (MRP), developed guidance for inspection and evaluation of primary system piping butt welds in MRP-139 (Reference 10). The licensee states in Reference 4 that an augmented inspection program has been implemented at CCNPP to meet the requirements of MRP-139.

3.3.1 NRC Staff Evaluation

CC N-716 is founded, in large part, on the RI-ISI process described in EPRI TR 112657 Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," December 1999 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML013470102), which was previously reviewed and approved by the NRC. In general, the licensee simplified the EPRI TR method because it does not evaluate system parts that have been generically identified as high-safety-significant (HSS), and uses screening PRA to evaluate in detail only system parts that cannot be screened out as low-safety-significant (LSS).

This SE describes and evaluates the differences between the endorsed EPRI TR methodology and the proposed RIS_B methodology to reach a conclusion about the acceptability of the proposed method.

An acceptable RI-ISI program replaces the number and locations of NDE inspections based on ASME Code, Section XI requirements with the number and locations of these inspections based on the RI-ISI guidelines. The proposed RIS_B program permits alternatives to the requirements of IWB-2420, IWB3-2430, and IWB-2500 (Examination Categories B-F and B-J) and IWC-2420, IWC-2430, and IWC-2500 (Examination Categories C-F-1 and C-F-2), or as additional requirements for Subsection IWD, and may be used for ISI and preservice inspection of Class 1, 2, 3, or Non-Class piping. All piping components, regardless of risk classification, will continue to receive ASME Code-required pressure and leak testing, as part of the current ASME Code, Section XI program.

The EPRI TR RI-ISI process includes the following steps which, when successfully applied, satisfy the guidance provided in References RGs 1.174 and 1.178.

Scope definition
Consequence evaluation
Degradation mechanism evaluation
Piping segment definition
Risk categorization
Inspection/NDE selection
Risk impact assessment
Implementation monitoring and feedback

These processes result in a program consistent with the concept that, by focusing inspections on the most safety-significant welds, the number of inspections can be reduced while at the same time maintaining protection of public health and safety. In general, the methodology in CC N-716 replaces a detailed evaluation of the safety significance of each pipe segment with a generic population of high safety-significant segments, followed by a screening flooding analysis to identify any plant-specific high safety-significant segments. The screening flooding analysis is performed in accordance with the flooding analysis described in Section 4.5.7 of ASME RA-Sb-2005, Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications, Addendum B to ASME RA-S-2002.

As described below, the acceptability of the licensee's proposed RIS_B program is evaluated by comparing the processes it has applied to develop its program with the steps from the EPRI-TR process.

3.3.2 Scope Definition

The scope of evaluation to support RIS_B program development and of the proposed changes includes ASME Code Class 1, 2, 3 and Non-Class piping welds. Standard Review Plan (SRP) 3.9.8 and Reference 7 address scope issues. The primary acceptance guideline in the SRP is that the selected scope needs to demonstrate that any proposed increase in core damage frequency (CDF) and risk are small. The scope of the licensee's evaluation included all piping where ASME inspections could be discontinued providing assurance that the change in risk estimate would, as a minimum, capture the risk increase associated with implementing the

RIS_B program in lieu of the ASME program. Reference 7, RG 1.178, identifies different groupings of plant piping that should be included in a RI-ISI program, and also clarifies that a "full-scope" risk-informed evaluation is acceptable. The scope of the RIS_B program as defined in CC N-716 is consistent with the definition of full-scope in RG 1.178. Therefore, the NRC staff concludes that the "full-scope" extent of the piping included in the RIS_B program changes satisfies the SRP and RG guidelines and is acceptable.

3.3.3 Consequence Evaluation

The methodology described in RG 1.178 and the EPRI TR divide all piping within the scope of the proposed EPRI RI-ISI program into piping segments. The consequence of each segment failure must be estimated as a conditional core damage probability (CCDP) and conditional large early release probability (CLERP) or by using a set of tables in the EPRI TR that yield equivalent results. The consequences are used to determine the safety significance of the segments.

In contrast to the EPRI TR methodology, CC N-716 does not require that the consequence of each segment failure be estimated to determine the safety-significance of piping segments. Instead, CC N-716 identifies portions of systems that should be generically classified as HSS at all plants. A consequence analysis is not required for system parts generically classified as HSS because there is no higher safety significance category to which the system part can be assigned and degradation mechanisms, not consequence, are used to select inspection locations in the HSS weld population. The licensee's PRA is subsequently used to search for any additional, plant-specific HSS segments that are not included in the generic HSS population.

Sections 2(a)(1) through 2(a)(4) in CC N-716 provide guidance that identifies the portions of systems that should be generically classified as HSS based on a review of almost 50 RI-ISI programs. These previous RI-ISI programs were all developed by considering both direct and indirect effects of piping pressure boundary failures and the different failure modes of piping. This is consistent with the guidelines for evaluating pipe failures with PRA described in RG 1.178, the EPRI TR, and SRP 3.9.8., and, therefore, the generic results are derived from acceptable analyses.

Section 2(a)(5) in CC N-716 provides guidance that defines additional, plant-specific HSS segments that should be identified using a plant-specific PRA of pressure boundary failures. The licensee stated that it used its PRA of pressure boundary failures (flooding analysis) that considers both direct and indirect effects of pressure boundary failure and the different failure modes of the piping. This is consistent with the guidelines for evaluating pipe failures with PRA described in RG 1.178, the EPRI TR, and SRP 3.9.8.

Each of the licensee's consequence evaluations (the generic and the plant-specific flooding analysis) considers both direct and indirect effects of piping pressure boundary failures and the different piping failure modes to systematically use risk insights and PRA results to characterize the consequences of piping failure. This is consistent with the guidelines for evaluating pipe failures with PRA described in RG 1.178 and SRP 3.9.8 and is, therefore, acceptable.

3.3.4 Degradation Mechanism Evaluation

The EPRI TR requires a determination of the susceptibility to all degradation mechanisms of every weld within the scope of the proposed program. The degradation mechanisms which should be identified are described in the EPRI TR. This information is used to support the safety significance determination for all segments, to target inspections toward the locations with damage mechanisms in the segments that require inspections, and to provide estimates of weld failure frequencies to support the change in risk calculation. Once a segment is placed in the LSS category, the degradation mechanisms at the welds in that segment are not further used in the development of an EPRI RI-ISI program because inspections are not required in LSS segments and the discontinued inspections in LSS segments are not included in the change in risk estimate.

CC N-716 identifies a generic population of HSS welds, followed by a search for plant-specific HSS welds. CC N-716 requires a determination of the susceptibility to all degradation mechanisms of all welds assigned to the HSS category. The degradation mechanisms to be considered in the CC N-716 are consistent with those identified in the EPRI TR which the staff has previously concluded is a sufficiently comprehensive list of the applicable mechanisms except for PWSCC at PWR units as stated earlier in this SE.

As described above, CC N-716 augments the generic HSS welds with a search for plant-specific HSS welds based on the flooding analysis. The flooding analysis first identifies areas that may be sensitive to floods (i.e., potential HSS areas) and then used qualitative and quantitative screening to identify safety-significant flood events. As discussed in Reference 3, the licensee extensively reviewed plant experience from current augmented inspection programs and concluded that operating experience illustrates that, there were no cases where CCNPP would be an outlier and would require the use of more conservative failure rates. Therefore, the plant specific susceptibility to degradation mechanisms is included in the failure frequencies consistent with the requirements in the EPRI TR methodology.

Pipe failure frequencies are used in the screening analysis searching for HSS welds described above, and then in the change in risk estimate. In Reference 1, the licensee stated that a review was conducted to further verify that LSS piping was not susceptible to flow accelerated corrosion (FAC) or water hammer, the two degradation mechanisms that would assign a high failure frequency to a weld. In lieu of conducting a degradation mechanism evaluation for all the LSS piping, all locations were conservatively assigned to the medium failure potential for the purpose of assigning a failure frequency to be used to calculate the change in risk. This results in an equal or greater estimated increase in risk from discontinued inspections because the failure frequencies would always be equal to or less than those used in the licensee's analysis if the susceptibility of all LSS welds to all degradation mechanism was determined.

The approach proposed by the licensee used failure frequency estimates that reflected applicable degradation mechanisms while searching for plant-specific HSS piping. Failure frequency estimates are further refined for use in the change in risk estimate by identifying degradation mechanisms at all HSS welds and in LSS segments with potential high failure frequency (i.e., susceptible to FAC or water hammer). Therefore, the NRC staff concludes that the screening evaluation relying on a plant specific update of generic failure frequencies, followed by a bounding analysis for specific welds where inspections will be added or discontinued, is acceptable because the process fulfills the requirements for identifying locations that should be inspected (i.e., identifying plant-specific HSS segments) and developing a bounding estimate for the change in risk respectively.

3.3.5 Piping Segment Definition

Previous guidance on RI-ISI, including RG 1.178 and SRP 3.9.8, approved industry methodologies centered on defining and using piping segments. RG 1.178 states, for example, that the analysis and definition of a piping segment must be consistent and technically sound. The primary purpose of segments is to group welds so that consequence analyses can be done for the smaller number of segments instead of for each weld. Sections 2(a)(1) to 2(a)(4) in CC N-716 identifies system parts (segments and groups of segments) that are generically assigned HSS without requiring a plant-specific consequence determination. Thus, any subdivision of these system parts is unnecessary. Section 2(a)(5) in CC N-716 uses a PRA to identify plant-specific piping that might be assigned HSS. The process described by the licensee to search for plant-specific HSS piping first identifies zones that may be sensitive to flooding, and then evaluates the failure potential of piping in these zones. Lengths of piping whose failure impacts the same plant equipment within each zone are equivalent to piping segments. Therefore, piping segments are either not needed to reduce the number of consequence analyses required (for the generic HSS piping) or, when needed during the plant-specific analysis, the length of pipe included in the analysis is consistent with the definition of a segment in RG 1.178 and SRP 3.9.8.

An additional purpose of piping segments in the EPRI TR serves as an accounting/tracking tool. In the EPRI methodology, all parts of all systems within the selected scope of the RI-ISI program are placed in segments and the safety significance of each segment is developed. For each safety-significant category, a fixed percentage of welds within all the segments of that class are selected. Additional selection guidelines ensure that this fixed percentage of inspections is distributed throughout the segments to ensure that all damage mechanisms are targeted and all piping systems continue to be inspected. CC N-716 generically defines a large population of welds as HSS. An additional population of welds may be added based on the risk-informed search for plant-specific HSS segments. When complete, the CC N-716 process yields a well defined population of HSS welds from which inspections must be selected. This accomplishes the same objective as accounting for each weld throughout the analysis by using segments. CC N-716, as applied by the licensee, provides additional guidelines to ensure that this fixed percentage is appropriately distributed throughout the population of welds subject to inspection, all damage mechanisms are targeted, and all piping systems continue to be inspected.

The NRC staff concludes that the segment identification in RG 1.178 as used as an accounting tool is not needed within the generic population of HSS welds. The risk-informed search for HSS segments based on a flooding PRA divides up piping systems into segments based on consequences, which is consistent with the segment definition in RG 1.178. Therefore, the licensee's proposed method accomplishes the same objective as the approved methods without requiring that segments be identified and defined for all piping within the scope of the RIS_B program.

3.3.6 Risk Categorization

Sections 2(a)(1) through 2(a)(4) in CC N-716 identify the portions of systems that should be generically classified as HSS, and Section 2(a)(5) requires a search for plant-specific HSS segments. Application of the guideline in Section 2(a)(5) in CC N-716 identifies plant-specific piping segments that are not assigned to the generic HSS category but that are risk-significant at a particular plant. CC N-716 requires that any segment with a total estimated CDF greater than 1E-6/year be assigned the HSS category. The licensee augmented this CC N-716 metric on CDF with the requirement to also assign the HSS category to any segment with a total estimated large early release frequency (LERF) greater than 1E-7/year. The licensee stated that these guideline values are suitably small and consistent with the decision guidelines for acceptable changes in CDF and LERF found in Reference 6.

In Reference 1, the licensee clarified that these ancillary metrics were added as a defense-in-depth measure to provide a method of ensuring that any plant-specific locations that are important to safety are identified. All piping that has inspections added or removed per CC N-716 is required to be included in the change in risk assessment and an acceptable change in risk estimate is used to demonstrate compliance with Reference 6 acceptance criteria. The ancillary metrics and guidelines on CDF and LERF are only used to add HSS segments and not, for example, to remove system parts generically assigned to the HSS in Sections 2(a)(1) through 2(a)(4).

The NRC staff concurs that a plant-specific analysis to identify plant-specific locations that are important to safety is a necessary element of RI-ISI program development. The results of the plant-specific risk categorization analysis provide confidence that the goal of inspecting the more risk-significant locations is met while permitting the use of generic HSS system parts to simplify and standardize the evaluation. Any evaluation that categorizes the safety significance of structures, systems, and components requires metrics and guideline values, such as the Fussel-Vessley and risk achievement worth guidelines endorsed in RG 1.201, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to their Safety Significance." Such metrics are subordinate to the change in risk metrics in Reference 6 which are used to determine whether the increase in risk associated with a proposed change is small and consistent with the intent of the Commission's Safety Goal Policy Statement.

Satisfying the guidelines in Sections 2(a)(5) requires confidence that the flooding PRA is capable of successfully identifying all, or most, of the significant flooding contributors to risk that are not included in the generic results. RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," states that compliance with the requirements of an NRC-endorsed industry PRA standard (currently ASME RA-Sb-2005) may be used to demonstrate that a PRA analysis is adequate to support a risk-informed application. RG 1.200 further states that an acceptable approach that can be used to ensure technical adequacy is to perform a peer review of the PRA.

In Reference 3, the licensee states that it has assessed its flooding analyses against RG 1.200, Revision 1, Appendix A requirements. The licensee summarized the major outstanding issues identified during this assessment, described their resolution of those issues, and reported that final resolution of the issues is not expected to impact the RI-ISI program. The ASME standard permits, as Category II, to not include all failure modes from pipe ruptures and screening out some ruptures based on operator actions. These attributes are not consistent with the RI-ISI methodology. With respect to including all failure modes, the licensee included all modes except for some areas for which it described its evaluation determining that some failure modes were not applicable in those areas. The licensee also described those scenarios where it used human actions to screen out flooding scenarios. The NRC staff concurs that the licensee's evaluation adequately demonstrates that the resulting RI-ISI program is consistent with the RI-ISI methodology.

The NRC staff concurs that the CDF and LERF metrics proposed by the licensee are acceptable because they address the risk elements that form the basis for risk-informed applications (i.e., core damage and large early release). The NRC staff accepts the proposed guideline values because these ancillary guidelines are applied in addition to the change in risk acceptance guidelines in Reference 6, and only add plant-specific HSS segments to the RIS_B program, i.e., they may not be used to reassign any generic HSS segment into the LSS category.

The NRC staff finds that the risk categorization performed at CCNPP provides confidence that HSS segments have been identified. Sections 2(a)(1) through 2(a)(4) in CC N-716 which identify generic HSS portions of systems were applied to CCNPP piping. The licensee's PRA analysis used to fulfill the guideline in Sections 2(a)(5) was performed using a PRA of adequate technical quality based on consistency between the PRA and the applicable characteristics of the NRC-endorsed industry standard ASME RA-Sb-2005. The licensee reviewed the results of its flooding analysis and did not identify any segments that had a CDF greater than 1E-6/year or a LERF greater than 1E-7/year.

3.3.7 Inspection/NDE Selection

The licensee's submittals discuss the impact of the proposed RIS_B application on the various augmented inspection programs.

CC N-716 contains no provisions for changing the FAC augmented program developed in response to NRC Generic Letter 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning." CCNPP's FAC program is relied upon to manage this damage mechanism but is not otherwise affected or changed by the RIS_B program.

MRP-139 will be used as an augmented inspection program for the inspection and management of PWSCC susceptible dissimilar metal welds and will supplement the RI-ISI program.

Section 4 in CC N-716 requires that 10 percent of HSS welds shall be selected for examination. Sections 4(b)(1) through 4(b)(3) in CC N-716 describe how the inspection locations will be selected. The selection process includes guidance that ensures that inspection locations are distributed physically throughout the HSS piping systems and that all degradation mechanisms will be represented in the selected locations. The guidance provides some flexibility in the distribution of locations to satisfy all the guidelines but the number of inspections must be increased beyond 10 percent, if necessary, to meet the quantitative risk acceptance guidelines in Section 5(b).

In contrast to the EPRI TR which only changed the types of ISI inspections and the locations of inspections, CC N-716 also discontinues preservice inspection requirements for LSS welds. These preservice examinations are performed to obtain a baseline inspection using the examination method that will be used for subsequent ISI examinations. Similar to the ASME Code which requires preservice examination of all Class 1 welds, CC N-716 requires preservice examination of all HSS welds. Preservice examinations are performed on ASME Code Class 2 welds that are initially selected for ISI, which is 7.5 percent of Class 2 piping welds. Any Class 2, Class 3 or non-code welds that are selected for inspection in the RIS_B program will be HSS welds. Therefore, preservice examinations will continue to be performed on all welds selected for examination using CC N-716 to obtain a baseline inspection using the examination method that will be used for subsequent ISI examinations.

In addition to the preservice exams as required, repair/replacement activities involving welding or brazing areas and welded joints made for installation of items shall be examined in accordance with the Construction Code identified in the licensee's Repair/Replacement Plan. The licensee's use of CC N-716 does not affect the examinations required to verify the integrity of welds associated with repair/replacement activities. Therefore, the NRC staff finds that there is no effect on the change in risk calculations associated with repair activities under the RIS_B program because the examinations required to verify the integrity of repaired or replaced welds are not affected and will continue to be performed.

3.3.8 Risk Impact Assessment

The licensee uses a change in risk estimation process approved by the NRC staff in the EPRI TR. The change in risk assessment in the EPRI TR permits using each segment's CCDP and CLERP or, alternatively, placing each segment into high-, medium-, or low-consequence "bins" and using a single bounding CCDP and CLERP for all segments in each consequence bin. CC N-716 also includes both alternatives, and the bounding values to be used in the bounding analysis are the same as those approved for use in the EPRI TR. The licensee uses the alternative of placing each segment into consequence bins and using the associated bounding values for all segments in each bin during the change in risk assessment.

In the submittal, the licensee identified the different types of piping failures that cause major plant transients such as those causing loss-of-coolant accidents (LOCAs), isolable LOCAs, potential LOCAs, and corresponding types of feedwater and steam piping breaks. Conservative CCDP estimates were developed from the PRA for these initiating events. The licensee assumed a conditional containment failure probability of 0.1 to convert CCDP to CLERP unless the pipe break could both cause an initiating event and fail the containment barrier. For these scenarios, the CLERP was assigned the same value as the CCDP. The NRC staff concludes that the scenarios described are reasonable because they are modeled in the PRA or include the appropriate equipment failure modes that cause each sequence to progress. The NRC staff also concludes that the licensee uses generally acceptable values for any required additional failure modes, including the conservative 0.1 conditional containment failure probability for a non-bypassed containment.

The licensee relied on its flooding analysis to identify the appropriate consequence bin for welds whose failure does not cause a major plant transient and for which a consequence estimate is required. As discussed above, the licensee performed its flooding analysis consistent with Reference 9. The licensee stated that its flooding analysis did not identify any high consequence segments (lower bound CCDP and CLERP of 1E-4 and 1E-5, respectively) for LSS Class 2 piping that was being inspected under the ASME ISI program. Only segments with locations at which an inspection is being discontinued need to be included in the change in risk calculation so limiting the consequence evaluation to segments that are inspected is acceptable. Instead of performing additional screening analysis to identify medium (as opposed to low) risk contributors, the licensee placed all previously inspected LSS Class 2 piping into the medium-consequence bin and used the bounding CCDPs and CLERPs (CCDP and CLERP of 1E-4 and 1E-5, respectively) to estimate the risk increase for all discontinued inspections in this piping.

Section 5 of CC N-716 requires that any piping that has NDE inspections[1] added or removed per CC N-716 be included in the change in risk assessment. The licensee used nominally the upper-bound estimates for CCDP and CLERPs. The licensee also performed a sensitivity study where lower bound estimates were used whenever new examination locations were identified. Acceptance criteria provided in Section 5(d) of CC N-716 include limits of 1E-7/year and 1E-8/year for increase in CDF and LERF for each system, and limits of 1E-6/year and 1E-7/year for the total increase in CDF and LERF associated with replacing the ASME Code, Section XI program with the RIS_B program. These guidelines and guideline values are consistent with those approved by the NRC staff in the EPRI TR and are, therefore, acceptable.

The change in risk evaluation approved in the EPRI TR method is a final screening to ensure that a licensee replacing the Section XI program with the risk-informed alternative evaluates the potential change in risk resulting from that change and implements it only upon determining with reasonable confidence that any increase in risk is small and acceptable. The licensee's method is consistent with the approved EPRI TR method with the exception that the change in risk calculation in CC N-716 includes the risk increase from discontinued inspection in LSS locations. Based on the detailed analysis of every segment required by the EPRI TR, the staff concluded that there is a high confidence that the total increase in risk from all discontinued inspections in LSS segments would be negligible and does not need to be quantified. The staff concludes that the licensee's method described in the submittal is acceptable because the deviation from the approved EPRI TR method expands the scope of the calculated change in risk providing confidence that the less detailed analyses of LSS segments required by CC N-716 does not result in an unanticipated and potentially unacceptable risk increase.

The licensee provided the results of the change in risk calculations in the submittals and noted that most of the results indicate a decrease in risk and that all the estimates satisfy both the system level and the total guidelines. The licensee reported that the results using the lower bound estimates for new inspection locations also met the acceptance criteria. Therefore, the NRC staff finds that any increase in risk is small and acceptable.

3.3.9 Implementation Monitoring and Feedback

The objective of this element of References 6 and 7 is to assess performance of the affected piping systems under the proposed RI-ISI program by implementing monitoring strategies that

[1]Code Case N-716 requires no estimated risk increase for discontinuing surface examinations at locations that are not susceptible to outside diameter attack [e.g., external chloride stress-corrosion cracking]. The NRC staff determined during the review and approval of the EPRI TR that the surface exams do not appreciably contribute to safety and need not be included in the change in risk quantification and, therefore, exclusion of surface examinations from the change in risk evaluations is acceptable.

conform with the assumptions and analysis used in developing the RIS_B program. In Reference 1, the licensee states that upon approval of the RIS_B program, procedures that comply with the guidelines described in CC N-716 will be prepared to implement and monitor the program.

This list of possible changes includes all changes at the facility or in the PRA that could affect the evaluation used to develop the RIS_B program and performing the reevaluation every ISI period coincides with the inspection periods in the inspection program requirements contained in ASME Code, Section XI. The NRC staff finds that the proposed procedures are consistent with the performance monitoring guidelines described in RG 1.178 and are, therefore, acceptable.

3.3.10 Examination Methods

In accordance with CC N-716, LSS welds will be exempt from the volumetric, surface, VT-1, and VT-3 visual examination requirements of Section XI. Ten percent of the HSS welds will be selected for examination as addressed in Section 3.6 of this SE. Section 4 of CC N-716 directs users to Table 1 for the examination requirements of the welds selected for examination. The examination method is based on the postulated degradation for the selected weld. Table 1 of CC N-716 is consistent with the traditional RI-ISI approach for examination methods as approved in EPRI TR-112657. The examination methods are based on an inspection-for-cause philosophy so that when there is a potential for a certain degradation mechanism, the examination method selected would be one that would be able to detect that type of degradation. This is consistent with the guidelines for inspection strategies described in SRP 3.9.8 and is, therefore, acceptable.

3.3.11 Conclusion

Pursuant to 10 CFR 50.55a(a)(3)(i), alternatives to the requirements of 10 CFR 50.55a(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 proposed to use an alternative to the risk-informed process described in CC N-716 which is based, in large part, on NRC-approved EPRI TR-112657. The implementation strategy is consistent with the Reference 7 guidelines because the number and location of inspections is a product of a systematic application of the risk-informed process. Other aspects of the licensee's ISI program, such as 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 ASME Code, Section XI. This provides a measure of continued monitoring of areas that are being eliminated from the NDE portion of the ISI program. As required by the EPRI TR methodology, the existing ASME Code performance measurement strategies will remain in place. In addition, the CC N-716 methodology provides for increased inspection volumes for those locations that are included in the NDE portion of the program.

RG 1.174 establishes requirements for risk-informed decisions involving a change to a plant's licensing basis. RG 1.178 establishes requirements for risk-informed decisions involving alternatives to the ISI program requirements of 10 CFR 50.55a(g), and its directive to follow the requirements of the ASME Code, Section XI. The EPRI RI-ISI methodology contains details for developing an acceptable RI-ISI program. CC N-716, modified as described by the licensee in its submittals, describes a methodology similar to the EPRI methodology but with several differences as described above in this SE. The NRC staff has evaluated each of the differences and determined that the licensee's proposed methodology, when applied as described, meets the intent of all the steps endorsed in the EPRI TR, is consistent with the guidance provided in RG 1.178, and therefore, satisfies the guidelines established in RG 1.174.

The NRC staff concludes that the licensee's proposed RIS_B program will provide an acceptable level of quality and safety pursuant to 10 CFR 50.55a(a)(3)(i) for the proposed alternative to the piping ISI requirements with regard to (1) the number of locations, (2) the locations of inspections, and (3) the methods of inspection. Therefore, the proposed RI-ISI program is authorized for the CCNPP fourth 10-year ISI interval pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that this alternative will provide an acceptable level of quality and safety.

4.0 REFERENCES

1. Letter, Mark D. Flaherty (Constellation Energy) To U.S. Nuclear Regulatory Commission containing Request for Alternative ISI-04-04, Request to Use ASME Code Case N-716, Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2, December 29, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090020097)

2. Letter, Mark D. Flaherty (Constellation Energy) To U.S. Nuclear Regulatory Commission containing Response to NRC Acceptance Review Concern, February 18, 2009 (ADAMS Accession No. ML090540061)

3. Letter, Mark D. Flaherty (Constellation Energy) To U.S. Nuclear Regulatory Commission containing Response to Request for Additional Information on Relief Request ISI-04-04, June 1, 2009 (ADAMS Accession No. ML091530275)

4. Letter, Mark D. Flaherty (Constellation Energy) To U.S. Nuclear Regulatory Commission containing Response to Request for Additional Information on Relief Request ISI-04-04, June 9, 2009 (ADAMS Accession No. ML091600309)

5. ASME Code Case N-716, Alternative Piping Classification and Examination Requirements, Section XI Division 1, ASME, New York, New York, April 19, 2006.

6. RG 1.174, An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis, November 2002 (ADAMS Accession No. ML023240437).

7. RG 1.178, An Approach for Plant-Specific Risk-Informed Decision making for Inservice Inspection of Piping, September 2003 (ADAMS Accession No. ML032510128).

8. Letter from J.E. Dyer, U.S. Nuclear Regulatory Commission to G.C. Park, ASME Subcommittee on Nuclear Inservice Inspection, related to codification of inspection requirements of reactor coolant system dissimilar metal welds at pressurized water reactors, dated December 20, 2005 (ADAMS Accession No. ML053480359).

9. ASME RA-Sb-2005, Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications, Addendum B to ASME RA-S-2002, ASME, New York, New York, December 30, 2005.

10. MRP-139, Materials Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline, Revision 1, December 2008, Electric Power Research Institute, Palo Alto, California.

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Date: November 19, 2009

The NRC staff found that the licensee's proposed alternative would provide an acceptable level of quality and safety and reasonable assurance of continued structural integrity for the CCNPP steam generator pressure vessels during the fourth 10-year ISI interval. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the use of Relief Request ISI-04-03 for the fourth 10-year interval of the Steam Generator ISI Program.

Relief Request ISI-04-04, "Risk-Informed/Safety-Based Inservice Inspection Program Plan," proposes to use a risk-informed/safety-based ISI program as an alternative to a portion of its current ISI program at CCNPP. The proposed program is based, in part, on the ASME Boiler and Pressure Vessel Code, Section XI, Code Case N-716 as guidance. The provisions of Code Case N-716 may define additional requirements for Class 3 piping or non-Class piping.

The NRC staff has reviewed Relief Request ISI-04-04 and concludes that the licensee's proposed RIS_B program will provide an acceptable level of quality and safety pursuant to 10 CFR 50.55a(a)(3)(i) for the proposed alternative to the piping ISI requirements with regard to (1) the number of locations, (2) the locations of inspections, and (3) the methods of inspection. Therefore, Relief Request ISI-04-04 is authorized for the CCNPP fourth 10-year ISI interval pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that this alternative will provide an acceptable level of quality and safety.

Sincerely,
/RA/
Nancy L. Salgado, Chief
Plant Licensing Branch 1-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

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