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

August 14, 2017

Vice President, Operations
Entergy Nuclear Operations, Inc.
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043-9530

SUBJECT: PALISADES NUCLEAR PLANT – RELIEF REQUEST NO. RR 4-25 LIMITED COVERAGE EXAMINATIONS DURING THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL (CAC NO. MF8886)

Dear Sir or Madam:

By letter dated November 30, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16335A032), as supplemented by letter dated April 5, 2017 (ADAMS Accession No. ML17095A067), Entergy Nuclear Operations, Inc. (Entergy, the licensee) submitted Relief Request No. RR 4-25 to the U.S. Nuclear Regulatory Commission (NRC) for the fourth 10-year inservice inspection (ISI) interval at Palisades Nuclear Plant (PNP). In its submittal, the licensee requested relief from the examination coverage 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), applicable to certain ASME Code Class 1 component welds.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(5)(iii), the licensee requested relief on the basis that achieving the ASME Code required examination coverage for the welds identified in RR 4-25 is impractical.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that Entergy has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(g)(iii). Therefore, the NRC grants relief from the ASME Code examination requirements for welds included in RR 4-25, for the PNP fourth 10-year ISI interval.

The NRC staff notes that all other ASME Code requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact the Project Manager, Jennivine Rankin at (301) 415-1530.

Sincerely,

David J. Wrona, Chief
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosure:
Safety Evaluation

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

FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL

RELIEF REQUEST NO. RR 4-25 REGARDING LIMITED EXAMINATION COVERAGE

PALISADES NUCLEAR PLANT

ENTERGY NUCLEAR OPERATIONS, INC

DOCKET NO. 50-255

1.0 INTRODUCTION

By letter dated November 30, 2016, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16335A032), as supplemented by letter dated April 5, 2017 (ADAMS Accession No. ML17095A067), Entergy Nuclear Operations, Inc. (Entergy, the licensee), submitted Relief Request No. RR 4-25 to the U.S. Nuclear Regulatory Commission (NRC, the Commission) for the fourth 10-year inservice inspection (ISI) interval at Palisades Nuclear Plant (PNP). In its submittal of RR 4-25, the licensee requested relief from the examination coverage 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), applicable to certain ASME Code Class 1 component welds.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(5)(iii), the licensee requested relief on the basis that achieving the ASME Code required examination coverage for the welds identified in RR 4-25 is impractical.

2.0 REGULATORY EVALUATION

As required by 10 CFR 50.55a(g)(4), throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components that are classified as ASME Code Class 1, 2, and 3 components must meet the requirements, except the design and access provisions and preservice examination requirements, as set forth in Section XI of the ASME Code, incorporated by reference in 10 CFR 50.55a(a), 12 months prior to the start of the 120-month interval, subject to the conditions listed in 10 CFR 50.55a(b).

When conformance to these requirements is determined to be impractical, relief may be granted by the NRC pursuant to 10 CFR 50.55a(g)(5)(iii). Additionally, pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee must notify the NRC and submit as specified in 10 CFR 50.4, information to support the determination. Requests for relief made in accordance with 10 CFR 50.55a(g)(5)(iii) must be submitted no later than 12 months after the expiration of the initial or

subsequent 10-year inspection interval.

Pursuant to 10 CFR 50.55a(g)(6)(i), the Commission will evaluate determinations under paragraph (g)(5) of this section that ASME Code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines are authorized by law, will not endanger life or property or the common defense and security, and are otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to grant the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

Entergy RR 4-25 is for multiple ASME Code, Class 1 component welds and is associated with several different ASME Code Examination Categories, for the PNP's fourth 10-year inspection interval. The licensee stated that the limitation for examination coverage is due to physical design and configuration of the subject components. The licensee also stated that the subject welds were examined to the maximum extent practical. The licensee further stated that when access was limited such that essentially 100 percent examination coverage of the required volume or area could not be achieved, it examined 100 percent of the accessible volume or area. The licensee stated that it is not possible to obtain the ASME Code-required examination coverage of the subject welds without extensive design modifications.

Entergy stated that the examination techniques used for each of the components in RR 4-25 were reviewed in an effort to identify improvements in examination technique which could increase examination coverage. Entergy also stated that it was not able to identify any improvements, confirming that examinations were performed to the maximum extent possible. The licensee concluded that it was impractical to obtain essentially 100 percent examination coverage for these components without the additional burden of redesigning and fabricating these components, which would also result in increased radiation exposure.

For clarity, the NRC staff's evaluation of Entergy's RR 4-25 is documented according to each of the applicable ASME Code-required Examination Categories. The code of record at PNP for the fourth 10-year ISI interval is the 2001 Edition through the 2003 Addenda of Section XI of the ASME Code. The fourth 10-year ISI interval at PNP ended on December 12, 2015.

3.1 Examination Category B-A, Item No. B1.11, Pressure Retaining Welds in Reactor Pressure Vessel

3.1.1 Applicable Code Requirements

The examination requirement for the circumferential weld in the reactor pressure vessel (RPV) Circumferential Weld 10-112, is volumetric examination of essentially 100 percent of the weld length, as specified in Table IWB-2500-1, "Examination Categories" of the ASME Code, Section XI, Examination Category B-A. When 100 percent of the required volume cannot be examined due to interferences, obstructions, or geometrical configuration, ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds," allows reduction of the examination volume to greater than 90 percent of the required volume. ASME Code Case N-460 has been approved for use by the NRC in Regulatory Guide (RG) 1.147, Revision 17,

"Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," which is incorporated by reference in 10 CFR 50.55a(a)(3)(ii). For Examination Category B-A, the examination volume is defined in Figure IWB-2500-1.

3.1.2 Licensee's Reason for Request

The licensee could not achieve the ASME Code required examination coverage for RPV Circumferential Weld 10-112 because of interference with the RPV core stabilizing lugs, core stop lugs and flow skirt. The licensee explained in the submittal that because of this interference complying with the ASME Code-required examination coverage is impractical. In lieu of the ASME Code required examination coverage, the licensee inspected RPV Circumferential Weld 10-112 to the extent possible, achieving 77.72 percent coverage by ultrasonic testing (UT) examination.

3.1.3 NRC Staff Evaluation

For RPV Circumferential Weld 10-112, the licensee achieved less than 90 percent examination coverage of the required examination due to obstructions from the RPV core stabilizing lugs, core stop lugs and flow skirt, which are attached to the RPV. As such, obtaining the ASME Code required examination volume would require modification of the RPV. The NRC staff finds that such a modification constitutes a burden upon the licensee.

The licensee examined RPV Circumferential Weld 10-112 by UT to the extent possible. The licensee stated that it reviewed the UT examination to determine if additional coverage could be achieved. Attempts for additional coverage included using a smaller transducer wedge thus reducing the distance from the exit point to the front of the wedge, changing angles, or reducing the search unit element size. The examined volumes included the weld and base materials near the inside surface of the weld joint, which are regions of high stress, and where one would expect degradation to be manifested, should it occur.

The UT examination of RPV Circumferential Weld 10-112 revealed two recordable indications, but the licensee did not provide further information about them in the submittal dated November 30, 2016. The NRC staff was concerned that if these two indications are service-induced, they could grow to a size that could challenge the structural integrity of the weld. By email dated March 10, 2017 (ADAMS Accession No. ML17072A275), the NRC requested additional information regarding these two indications. By letter dated April 5, 2017, in its response to the NRC staff's request for additional information, the licensee described how it dispositioned the two recorded indications. The licensee stated that both indications are fabrication discontinuities and meet the acceptance standards of IWB-3510.1, "Allowable Planar Flaws" of Section XI of the ASME Code. The licensee also stated that it detected one of the indications during previous ISI intervals, but not the other indication. The licensee stated that it detected the other indication because of revisions to the examination techniques in Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems" to Section XI of the ASME Code. Since the licensee dispositioned both indications as fabrication discontinuities and determined that they were sufficiently small to be acceptable under the ASME Code, the NRC staff determined that the two indications are not evidence of service-induced cracking in the weld and therefore will not grow to a size that could challenge the structural integrity of the weld. The NRC staff accepts the reason the licensee provided for not having detected one of the indications in previous ISI intervals, because the revisions in the examination techniques in

Appendix VIII to Section XI of the ASME Code would now screen in indications for reporting that previously did not require reporting. This is consistent with a similar examination coverage relief request for an RPV weld that required the examination techniques of Appendix VIII to Section XI of the ASME Code, as documented in a 2015 NRC safety evaluation (ADAMS Accession No. ML15328A240). Therefore, the licensee has adequately addressed the NRC staff's concerns about the two recordable indications in RPV Circumferential Weld 10-112.

The NRC staff notes that in addition to the UT examinations, this weld is also subject to the system leakage testing requirement of ASME Code, Section XI, IWB-2500 (Table IWB-2500-1, Examination Category B-P, All Pressure Retaining Components), during each refueling outage. The NRC staff finds that the licensee's leakage testing provides further assurance that significant degradation, if it is present, would be detected.

Additionally, the licensee stated in the submittal, referring to all the welds in RR 4-25, that there is no plant-specific or known industry operating experience regarding failure of welds in similar service.

Based on the above discussion, the NRC staff determined that obtaining the ASME Code required examination volume for RPV Circumferential Weld 10-112 is impractical because it would impose a burden upon the licensee. The staff determined that the volumetric UT examination performed to the extent possible provides reasonable assurance of the structural integrity of RPV Circumferential Weld 10-112 for the following reasons:

- The licensee properly dispositioned the two indications that were recorded.
- There has been no plant-specific or known industry operating experience regarding failure of welds in similar service.
- The licensee's leakage testing provides further assurance that significant degradation, if present, would be detected.
- Evidence of significant service-induced degradation in the weld, if it were to occur, would likely be detected in the examined coverage of 77.72 percent of the required volume because the examined volume is the same material as the unexamined volume, is under the same loading conditions, and is exposed to the same reactor coolant environment.

3.2 Examination Category B-B, Item No. B2.12, Pressure Retaining Welds in Vessels Other than Reactor Pressure Vessel

3.2.1 Applicable Code Requirements

The examination requirement for the longitudinal weld in the pressurizer vessel (PZR) Weld 2-982A, is volumetric examination of one foot of the weld, as specified in Table IWB-2500-1 of the ASME Code, Section XI, Examination Category B-B. When 100 percent of the required volume cannot be examined due to interferences, obstructions, or geometrical configuration, ASME Code Case N-460 allows reduction of the examination volume to 90 percent of the required volume. For Examination Category B-B, the examination volume is defined in Figure IWB-2500-2.

3.2.2 Licensee's Reason for Request

The licensee could not achieve the ASME Code required examination coverage for PZR Weld

2-982A because of the interference with permanent insulation on the shell of the pressurizer. The licensee explained in the submittal that because of this interference, complying with the ASME Code required examination coverage is impractical. The licensee stated that it inspected the PZR Weld 2-982A to the extent possible, achieving 66.6 percent coverage by UT examination.

3.2.3 NRC Staff Evaluation

For PZR Weld 2-982A, the licensee achieved less than 90 percent examination coverage of the required examination due to obstructions from the permanent insulation on the shell of the pressurizer. As such, obtaining the ASME Code-required examination volume would require modification of the pressurizer shell, which impose a burden upon the licensee.

The licensee examined PZR Weld 2-982A by UT to the extent possible. The licensee stated that it reviewed the UT examination to determine if additional coverage could be achieved. Attempts for additional coverage included using a smaller transducer wedge thus reducing the distance from the exit point to the front of the wedge, changing angles, or reducing the search unit element size. Although the licensee did not provide a cross-sectional diagram of the examined volume for PZR Weld 2-982A, the licensee stated in Figure C of the submittal that for the 8 inches of the 12 inches of required length coverage (8/12 = 66.6 percent achieved coverage), "CRV [code required volume] coverage" was 100 percent. The NRC staff finds it reasonable to infer from this information that for the 66.6 percent achieved coverage, the licensee examined the volume defined in Figure IWB-2500-2, "Vessel Shell Longitudinal Weld Joints" of Section XI of the ASME Code. The defined volume included the weld and base materials near the inside surface of the weld joint, which are regions of high stress, and where one would expect degradation to be manifested should it occur. Additionally, the UT examination of PZR Weld 2-982A revealed no recordable indications.

The NRC staff notes that in addition to the UT examinations, this weld is also subject to the system leakage testing requirement of ASME Code, Section XI, IWB-2500 (Table IWB-2500-1, Examination Category B-P, All Pressure Retaining Components), during each refueling outage. The NRC staff finds that the licensee's leakage testing provides further assurance that significant degradation, if it is present, would be detected.

Based on the above discussion, the NRC staff determined that obtaining the ASME Code required examination volume for PZR Weld 2-982A is impractical because it would impose a burden upon the licensee. The staff determined that the volumetric UT examination performed to the extent possible provides reasonable assurance of the structural integrity of PZR Weld 2-982A for the following reasons:

- The licensee detected no relevant indications.
- There has been no plant-specific or known industry operating experience regarding failure of welds in similar service.
- The licensee's leakage testing provides further assurance that significant degradation, if present, would be detected.
- Evidence of significant service-induced degradation in the weld, if it were to occur, would likely be detected in the examined coverage of 66.6 percent of the required volume because the examined volume is the same material as the unexamined volume, is under the same loading conditions, and is exposed to the same reactor coolant environment.

3.3 Examination Category B-J, Item Nos. B9.11 and B9.31, Pressure Retaining Welds in Piping

3.3.1 Applicable Code Requirements

ASME Code, Section XI, Table 2500-1, Examination Category B-J, requires essentially 100 percent volumetric examination. "Essentially 100 percent," as clarified by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume, or surface area, as applicable. For Examination Category B-J, the examination volume is defined in Figure IWB-2500-8.

Additionally, pursuant to 10 CFR 50.55a(b)(2)(xv)(A)(1) and 10 CFR 50.55a(b)(2)(xv)(A)(2), piping must be examined in two axial directions, and when examination in the circumferential direction is required, the circumferential examination must be performed in two directions, provided access is available. Where examination from both sides is not possible for austenitic or dissimilar metal welds, full coverage credit from a single side weld may be claimed only after completing a successful single-sided Appendix VIII demonstration using flaws on the opposite side of the weld.

Components for which relief is requested are provide in the table below, along with a description of the limitation and the actual examination coverage obtained.

	Table 1 – Examination Category B-J Welds with Limited Volumetric Coverage				
Item No.	**Component Identification**	**Limitation/Coverage**	**Pipe Size (inch)**	**Material 1 (Component)**	**Material 2 (Component)**
B9.11	ESS-12-SIS-1A1-10	Single side Tee-to-Valve, 50% coverage obtained	12	ASTM A-403, WP-316 or ASTM A-182, F-316 (Fitting)	18-8 SMO (Valve)
B9.11	ESS-12-SIS-1B1-13	Single side Valve-to-Tee, 50% coverage obtained	12	18-8 SMO (Valve)	ASTM A-403, WP-316 or ASTM A-182, F-316 (Fitting)
B9.11	ESS-12-SIS-1B1-14	Single side Tee-to-Valve, 50% coverage obtained	12	ASTM A-403, WP-316 or ASTM A-182, F-316 (Fitting)	18-8 SMO (Valve)
B9.11	ESS-6-SIS-1A1-13	Single side Elbow-to-Tee, 50% coverage obtained	6	ASTM A-403, WP-316 or ASTM A-182, F-316 (Fitting)	ASTM A-403, WP-316 or ASTM A-182, F-316 (Fitting)
B9.11	ESS-6-SIS-1B1-14	Single side Pipe-to-Tee, 50% coverage obtained	6	ASTM A-376, Type 316 (Pipe)	ASTM A-403, WP-316 or ASTM A-182, F-316 (Fitting)

	Table 1 – Examination Category B-J Welds with Limited Volumetric Coverage				
Item No.	**Component Identification**	**Limitation/Coverage**	**Pipe Size (Inch)**	**Material 1 (Component)**	**Material 2 (Component)**
B9.31	PCS-30-RCL-1B-10/12	Physical Obstruction, 68% coverage obtained	12 and 30	SA-264, SS Clad Plate (Pipe)	SA-508-64, Cl 1 (Forging)
B9.31	PCS-42-RCL-1H-3/12	Physical Obstruction, 85% coverage obtained	12 and 42	SA-264, SS Clad Plate (Pipe)	SA-508-64, Cl 1 (Forging)

3.3.2 Licensee's Reason for Request

As stated by Entergy and summarized by the above table, for the ASME Examination Category B-J, Item Nos. B9.11 and B9.31, the limitations for examination coverage are due to component design and it was not possible to obtain the ASME Code-required examination coverage on the examination volume for the components identified in Table 1, without extensive design modifications. The licensee stated that the subject welds were examined to the maximum extent practical. The licensee further stated that 100 percent of the accessible weld were examined. The UT examinations were performed using personnel, equipment, and procedures qualified in accordance with ASME Code, Section XI, Appendix VIII, as implemented by the Performance Demonstration Initiative (PDI). The licensee stated that the subject examinations were performed in accordance with ASME Code, Section XI, Appendix VIII, and applicable PDI requirements. The ASME code required examination volume for these welds were examined ultrasonically to the maximum extent possible.

Specifically, the austenitic stainless steel welds identified in Table 1, as ESS-12-SIS-1A1-10, ESS-12-SIS-1B1-13, ESS-12-SIS-1B1-14, ESS-6-SIS-1A1-13, and ESS-6-SIS-1B1-14 consist of valve-to-tee, elbow-to-tee, and pipe-to-tee configurations of austenitic stainless steel piping materials with corresponding austenitic stainless steel weld metal. Due to the absence of sufficient distance between the weld and the associated valve or fitting, circumferential and axial scanning was performed from one side only. This resulted in credited UT examination coverage of 50 percent, with no recordable indications.

For the ferritic welds of the components identified in Table 1, as PCS-30-RCL-1B-10/12 and PCS-42-RCL-1H-3/12, the limitation was due to the component's obstruction by the presence of permanent insulation. This resulted in 68 percent UT examination coverage for PCS-30-RCL-1B-10/12 and 85 percent UT examination coverage for PCS-42-RCL-1H-3/12, with no recordable indications for either weld.

3.3.3 NRC Staff Evaluation

The ASME Code, Section XI, Table IWA-2500-1, Examination Category B-J, requires essentially 100 percent volumetric and surface examinations. However, as stated by the licensee, complete volumetric examinations are restricted by component design, materials, and weld configurations. These conditions precluded the licensee from obtaining full volumetric examinations from both sides of these welds. To gain access for examination, the subject

welds would require design modifications. This would place a burden on the licensee, therefore, obtaining 100 percent of ASME Code-required volumetric examinations for the subject welds is considered impractical. Additionally, the licensee used ASME Code Case N-663, "Alternative Requirements for Class 1 and 2 Surface Examinations, Section XI, Division 1," which permits the elimination of the surface examination requirements of IWB-2500-1. Use of this Code Case is permitted by NRC RG 1.147, "Inservice Inspection Code Case Acceptability, ASME Code, Section XI, Division 1," Revision 17, which identifies ASME Code Case N-663 as an approved alternative that licensees may use without requesting prior authorization from the NRC.

Entergy stated that volumetric examinations on the subject welds were conducted with personnel that were qualified to a performance demonstration process outlined in the ASME Code, Section XI, Appendix VIII. These techniques have been qualified through the industry's PDI, which meets the intent of the ASME Code, Section XI, Appendix VIII, requirements for flaws located on the near-side of the welds; far-side detection of flaws is considered to be a "best effort," for austenitic welds. Because welds ESS-12-SIS-1A1-10, ESS-12-SIS-1B1-13, ESS-12-SIS-1B1-14, ESS-6-SIS-1A1-13, and ESS-6-SIS-1B1-14 are austenitic stainless steel welds, there are currently no PDI qualified single-side examination procedures that demonstrate equivalency to two-sided examination on austenitic piping welds. Additionally, while these techniques have been demonstrated for both near-side and far-side detection of flaws for ferritic materials, due to physical obstructions, licensee's examination coverage was limited. Therefore, the NRC staff finds that the licensee's claim that it examined the subject welds to the extent practical constitutes a "best effort," and is considered justified.

As shown in the sketches and technical descriptions included in the licensee's submittal, examinations of the subject pipe-to-tee, pipe-to-valve, and pipe-to-elbow connection welds have been completed to the maximum extent practical. The volumetric coverage ranged from to 50 to 86 percent of the ASME Code-required volumes as shown in Table 1 above. The examination volume was limited because these welds could not be examined from both sides of the weld due to the geometric configuration of these components (i.e., the tee side or near side). The UT techniques employed for these welds meets the ASME Code, Section XI, Appendix VIII, requirements for austenitic stainless steel welds. These techniques have been qualified for flaws located on the near-side, not the far-side, of the welds; far-side detection of flaws is considered to be a "best effort." However, L-waves have been shown to provide enhanced detection on the far-side of austenitic stainless steel welds. Therefore, while the licensee has only taken credit for obtaining limited volumetric coverage, the NRC staff expects that the techniques employed by the licensee would have provided some coverage beyond the near-side, into the far-side of the welds.

The NRC staff notes that in addition to volumetric examinations, these welds are also subject to system leakage testing requirements of ASME Code, Section XI, IWB-2500 (Table IWB-2500-1, Examination Category B-P, All Pressure Retaining Components), during each refueling outage. The NRC staff finds that the licensee's leakage testing provides additional assurance that significant degradation, if it is present, would have been detected.

The licensee has demonstrated that due to geometric limitations it was impractical to meet the ASME Code-required "essentially 100 percent" volumetric examination coverage for the subject piping welds for its fourth ISI interval. Although the ASME Code-required coverage could not be obtained, the UT techniques employed by the licensee provided nearly full volumetric coverage from the near-side of the welds, which provides some limited volumetric coverage for the weld materials on the opposite (far) side of these welds. Based on the aggregate coverage obtained

for the subject welds, the extent of the examinations, and considering the licensee's performance of essentially 100 percent examination coverage of the accessible portions of these welds, it is reasonable to conclude that if significant service-induced degradation is present in these welds, some evidence of the degradation would have been detected.

Based on its review, the NRC staff determined that obtaining the ASME Code-required examination volume is impractical because it would imposes a burden upon the licensee. The NRC staff also determined that the ultrasonic examinations performed, despite the limited coverage obtained by the licensee, provide reasonable assurance of the structural integrity for the welds ESS-12-SIS-1A1-10, ESS-12-SIS-1B1-13, ESS-12-SIS-1B1-14, ESS-6-SIS-1A1-13, ESS-6-SIS-1B1-14, PCS-30-RCL-1B-10/12, and PCS-42-RCL-1H-3/12.

3.4 Examination Category R-A, Item Nos. R1.11 and R1.16, Pressure Retaining Welds in Piping

3.4.1 Applicable Code Requirements

The examination requirements for Examination Category R-A, Item Nos. R1.11 and R1.16, are derived from the licensee's risk-informed ISI program and ASME Code Case N-716-1, "Alternative Piping Classification and Examination Requirements, Section XI, Division 1." ASME Code Case N-716-1, has been approved for use by the NRC in RG 1.147, Revision 17. For Items Nos. R1.11 and R1.16, the required examination consist of essentially 100 percent volumetric examination of examination volumes as shown in Figures IWB-2500-8(c), IWB-2500-9, IWB-2500-10, and IWB-2500-11.

Table 2 – Examination Category R-A Welds with Limited Volumetric Coverage					
Item No.	**Component Identification**	**Limitation/Coverage**	**Pipe Size (Inch)**	**Material 1 (Component)**	**Material 2 (Component)**
R1.11	PCS-4-PRS-1P2-3	Single side Pipe-to-Fitting, 50% coverage	4	SA-376, Gr 316 1.125 (pipe)	ASTM A-182, F-316 (Fitting)
R1.11	PCS-4-PRS-1P2-4	Single side Flange-to-Pipe, 50% coverage	4	ASTM A-182, F-316 (Flange)	SA-376, Gr 316 (pipe)
R1.16	ESS-6-SIS-1B1-13	Limitation due to elbow side geometry for Elbow-Pipe-to-, 80% coverage	6	ASTM A-403, WP-316 or ASTM A-182, F-316 (Fitting)	SA-376, Gr 316 (pipe)

3.4.2 Licensee's Reason for Request

As stated by Entergy, and summarized in the above table, the limitations for examination coverage are due to component design and it is not possible to obtain the ASME Code required examination coverage on the examination volume for the components identified in Table 2, without extensive design modifications. The licensee stated that the subject welds were examined to the maximum extent practical. The licensee further stated that 100 percent of the

accessible weld were examined. The UT examinations were performed using personnel, equipment, and procedures qualified in accordance with ASME Code, Section XI, Appendix VIII, as implemented by the PDI. The ASME Code-required volume of these welds was interrogated ultrasonically to the maximum extent possible.

Welds PCS-4-PRS-1P2-3 and PCS-4-PRS-1P2-4, which are primary coolant system piping welds, and low pressure safety injection system piping weld (ESS-6-SIS-1B1-13) consist of pipe-to-fitting configurations, where the taper of the fitting is within close proximity of the weld. Due to the absence of sufficient distance between the weld and the fitting, circumferential and axial scanning was performed from the pipe side only for the welds PCS-4-PRS-1P2-3 and PCS-4-PRS-1P2-4. This resulted in credited UT examination coverage of 50 percent, with no recordable indications. During the examinations of weld ESS-6-SIS-1B1-13, due to the physical configuration of the elbow volumetric examinations resulted in limited scans from the elbow side, which yielded credited examination coverage of 80 percent. These examinations only recorded indications of root geometry for this location.

3.4.3 NRC Staff Evaluation

Examination requirements of ASME Code Case N-716-1, Examination Category R-A, Items Nos. R1.11 and R1.16, require essentially 100 percent volumetric examinations. However, complete volumetric examinations are restricted by component design, materials, and weld configurations. These conditions precluded the licensee from obtaining full volumetric examinations from both sides of these welds. To gain access for examination, the subject welds would require design modifications. This would place a burden on the licensee, therefore, obtaining essentially 100 percent of ASME Code-required volumetric examinations for the subject welds is considered impractical.

As shown in the sketches and technical descriptions included in the licensee's submittal, the subject ASME Code Class 1, austenitic stainless steel piping welds have geometric limitations that restricted performing complete ultrasonic scanning from both sides of the welds. However, volumetric examinations on the subject welds were conducted with equipment, procedures, and personnel that were qualified to a performance demonstration process outlined in the ASME Code, Section XI, Appendix VIII. These techniques have been qualified through the industry's PDI, which meets the intent of the ASME Code, Section XI, Appendix VIII, requirements for flaws located on the near-side of the welds; far-side detection of flaws is considered to be a "best effort." Because the subject welds are austenitic stainless steel, and there are currently no PDI qualified single-side examination procedures that demonstrate equivalency to two-sided examination on austenitic piping welds, the NRC staff finds that the licensee's achieved examination coverage constitutes a "best effort," and is considered justified.

As shown in the sketches and technical descriptions included in the licensee's submittal, examinations of the subject pipe-to-fitting, and pipe-to-elbow connection welds have been completed to the maximum extent practical. The volumetric coverage ranged from to 50 to 80 percent of the ASME Code-required volumes (Table 2). The examination volume for PCS-4-PRS-1P2-3 and PCS-4-PRS-1P2-4 was limited because these welds could only be examined from a single side (i.e., the pipe side or near side) due to the geometric configuration of the fittings; therefore, the achieved coverage was 50 percent. The examination volume for weld ESS-6-SIS-1B1-13, was partially limited from the elbow side; therefore, the achieved coverage was 80 percent. The UT techniques employed for these welds meets the ASME Code, Section XI, Appendix VIII, requirements for austenitic stainless steel welds. These

techniques have been qualified for flaws located on the near-side, not the far-side of the welds; far-side detection of flaws is considered to be a "best effort." However, as stated earlier L-waves have been shown to provide enhanced detection on the far-side of austenitic stainless steel welds. Therefore, while the licensee has only taken credit for the near side of the weld (i.e., limited volumetric coverage), the NRC staff expects that the techniques employed by the licensee would have provided some coverage beyond the near-side, into the far-side of these welds.

The NRC staff notes that in addition to the UT examinations, these welds are also subject to system leakage testing requirements of ASME Code, Section XI, IWB-2500 (Table IWB-2500-1, Examination Category B-P, All Pressure Retaining Components), during each refueling outage. The NRC staff finds that the licensee's leakage testing provides further assurance that significant degradation, if it is present, would be detected.

The licensee has demonstrated that due to geometric limitations it was impractical to meet the ASME Code-required "essentially 100 percent" volumetric examination coverage for the subject piping welds for its fourth ISI interval. Although the ASME Code-required coverage could not be obtained, the UT techniques employed provided nearly full volumetric coverage from the near-side of the welds, which also provides some limited volumetric coverage for the weld materials on the opposite (far) side of these welds. Based on the aggregate coverage obtained for the subject welds, the extent of the examinations, and considering the licensee's performance of essentially 100 percent examination coverage of the accessible portions of these welds, it is reasonable to conclude that if significant service-induced degradation is present in these welds, some evidence of degradation would have been detected.

Based on its review, the NRC staff determined that obtaining the ASME Code-required examination volume is impractical because it would imposes a burden upon the licensee. The NRC staff also determined that the UT examinations performed, despite the limited coverage obtained by the licensee, provide reasonable assurance of the structural integrity for the welds PCS-4-PRS-1P2-3, PCS-4-PRS-1P2-4, and ESS-6-SIS-1B1-13.

3.5 Examination Category B-K, Item No. B10.30, Welded Attachments for Vessels, Piping, Pumps, and Valves

3.5.1 Applicable Code Requirements

ASME Code Section XI, Table 2500-1, Examination Category B-K, Item No. B10.30, requires essentially 100 percent surface examination. "Essentially 100 percent," as clarified by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume, or surface area, as applicable. For Examination Category B-K, Item No. B10.30, the examination areas are defined by Figures IWB-2500-13, IWB-2500-14, and IWB-2500-15.

	Table 3 – Examination Category B-K Welds with Limited Surface Examination Coverage			
Item No.	**Component Identification**	**Limitation/Coverage**	**Material 1 (Component)**	**Material 2 (Component)**
B10.30	1A-S-A	Permanent obstruction to pump casing, 83% coverage	SA-351, Gr CF8M (Pump Casing)	(Support)

	Table 3 – Examination Category B-K Welds with Limited Surface Examination Coverage			
Item No.	Component Identification	Limitation/Coverage	Material 1 (Component)	Material 2 (Component)
B10.30	1A-S-B	Permanent obstruction to pump casing, 58% coverage	SA-351, Gr CF8M (Pump Casing)	(Support)
B10.30	1A-S-C	Permanent obstruction to pump casing, 83% coverage	SA-351, Gr CF8M (Pump Casing)	(Support)
B10.30	1A-S-D	Permanent obstruction to pump casing, 58% coverage	SA-351, Gr CF8M (Pump Casing)	(Support)

3.5.2 Licensee's Reason for Request

As stated by Entergy and summarized in the above table, the limitations for examination coverage are due to component design. It was not possible to obtain the ASME Code required examination coverage for the components identified in Table 3, without extensive design modifications. The licensee further stated when there was a limitation due to access or design configuration which prevented getting the required essentially 100 percent examination coverage, and that 100 percent of the accessible welds were examined. Specifically, pump casing to support welds 1A-S-A, 1A-S-B, 1A-S-C, and 1A-S-D, for primary coolant pump P-50A, were inaccessible on portions of the welded side of the supports due to obstruction by the permanent insulation. Due to these obstructions it was not possible to obtain the ASME Code required examination coverage for the subject welds. The subject welds received surface examination by the liquid penetrant methods, which resulted in 58 percent examination coverage for the required examination area for welds 1A-S-B and 1A-S-D, and 83 percent examination coverage for welds 1A-S-A and 1A-S-C. These surface examinations did not reveal any recordable indications.

3.5.3 NRC Staff Evaluation

Examination requirements of ASME Code, Examination Category B-K, Item No. B10.10, requires essentially 100 percent visual examination of attachment welds to pump casings. However, performing essentially 100 percent surface examinations for attachment welds 1A-S-A, 1A-S-B, 1A-S-C, and 1A-S-D was not possible due restricted access by component design. This condition precluded the licensee from obtaining full surface examinations of the pump casing and support welds. To gain access for examination, the subject component and the adjacent structures would require design modifications. This would place a burden on the licensee, therefore, obtaining essentially 100 percent of ASME Code-required surface examinations for the subject welds are considered impractical.

The subject Class 1, pump casing and support welds have obstructions from permanent insulation that restrict completing essentially 100 percent surface examinations of the required examination areas. However, surface examinations on the subject welds were conducted to the extent possible, and licensee examined 100 percent of the accessible welds. As shown in the sketches and technical descriptions included in the licensee's submittal, examinations of the subject welds were completed to the maximum extent practical. The licensee obtained 58 to 83

percent coverage for the attachment welds, with no recordable indications (Table 3). Specifically, the four attachment welds consist of 180 linear inches of weld, and the licensee was able to successfully perform surface examinations on 128 linear inches of weld, with no recordable indications.

The licensee has demonstrated that due to component design and presence of permanent insulation it was impractical to meet the ASME Code-required "essentially 100 percent" surface examination coverage for the subject pump casing attachment welds for its fourth ISI interval. Although the ASME Code-required coverage could not be obtained, the licensee performed surface examinations on 128 inches of the subject pump casing attachment welds with no recordable indications at four separate locations. Based on number of welds and the aggregate length of welds examined, it is reasonable to conclude that if significant service-induced degradation was present, some evidence of degradation would have been detected by these surface examinations.

Based on its review, the NRC staff determined that obtaining the ASME Code-required examination is impractical because it would imposes a burden upon the licensee. The NRC staff also determined that the surface examinations performed, despite the limited coverage obtained by the licensee, provide reasonable assurance of the structural integrity for attachment welds 1A-S-A, 1A-S-B, 1A-S-C, and 1A-S-D.

3.6 Category B-L-1, Pressure Retaining Welds in Pump Casings

3.6.1 Applicable Code Requirements

The examination requirement for primary coolant pump (P-50B) casing Weld 1B-02, is essentially 100 percent visual examination, specifically VT-1, of the weld area, as specified in Table IWB-2500-1 of the ASME Code, Section XI, Examination Category B-L-1, Item No. B12.10. When 100 percent of the required volume or area cannot be examined due to interferences, obstructions, or geometrical configuration, ASME Code Case N-460 allows reduction of the examination volume or area, provided greater than 90 percent of the required volume or area is examined.

3.6.2 Licensee's Reason for Request

The licensee could not achieve the ASME Code-required examination coverage for the primary coolant pump (P-50B) casing Weld 1B-02, because of obstruction caused by permanent insulation support structure, grating, and adjacent piping. The licensee explained in its submittal that because of the noted interferences, it was impractical to obtain the ASME Code-required examination coverage. In lieu of the ASME Code required examination coverage, the licensee inspected Weld 1B-02 to the extent possible, and achieved 14 percent coverage by visual examination (VT-1).

3.6.3 NRC Staff Evaluation

Examination requirements of ASME Code, Examination Category B-L-1, Item No. B12,10, require essentially 100 percent visual examination of pressure retaining welds in pump casings. However, complete visual examination for Weld 1B-02 are restricted by component design, configuration, and the presence of a radiological hot spot. These conditions preclude the licensee from obtaining full visual examinations for the entire length of the pump casing weld. To gain access for essentially 100 percent visual examination, the subject component and the

adjacent structures would require design modifications. This would place a burden on the licensee, therefore, obtaining essentially 100 percent of ASME Code-required visual examinations for the subject welds is considered impractical.

As shown in the sketches and technical descriptions included in the licensee's submittal, examinations of the subject weld have been completed to the maximum extent practical. The licensee obtained 14 percent coverage of the weld with no recordable indications.

Additionally, NRC staff notes that in addition to the visual examinations, these welds are also subject to system leakage testing requirements of ASME Code, Section XI, IWB-2500 (Table IWB-2500-1, Examination Category B-P, All Pressure Retaining Components), during each refueling outage. The NRC staff finds that the licensee's leakage testing provides additional assurance that significant degradation, if present, would have been detected.

The licensee has demonstrated that due to component design and radiological limitations it was impractical to meet the ASME Code-required "essentially 100 percent" visual examination coverage for the subject pump casing weld for its fourth ISI interval. Although the ASME Code-required coverage could not be obtained, the licensee performed a VT-1 examination on approximately 90 inches of the subject pump casing weld with no recordable indications. Based on the aggregate length of weld examined, it is reasonable to conclude that if significant service-induced degradation is present, some evidence of degradation would have been detected. Additionally, because industry operating experience suggests the absence of significant degradation mechanisms for these welds, the 2008 Addenda of ASME Code was revised to eliminate these VT-1 examinations.

Based on its review, the NRC staff determined that obtaining the ASME Code-required examination is impractical because it would imposes a burden upon the licensee. The NRC staff also determined that the visual examinations performed, despite the limited coverage obtained by the licensee and industry operating experience, provide reasonable assurance of the structural integrity for weld 1B-02.

4.0 CONCLUSIONS

As set forth above, the NRC staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(5)(iii) is authorized by law and will not endanger life or property, or the common defense and security, and is otherwise in the public interest, given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Furthermore, the NRC staff concluded that the examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject components. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(5)(iii). Therefore, the NRC staff grants relief from the ASME Code examination requirements for welds included in RR 4-25 for the PNP fourth 10-year ISI interval.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and approved in RR 4-25 remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

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