May 20, 2005

Mr. R. T. Ridenoure
Division Manager - Nuclear Operations
Omaha Public Power District
Fort Calhoun Station, FC-2-4 Adm.
P.O. Box 550
Fort Calhoun, NE 68023-0550

SUBJECT: FORT CALHOUN STATION, UNIT NO. 1 – RELIEF REQUEST - THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN - REQUESTS FOR RELIEF RR-10 THROUGH RR-22 (TAC NO. MC3220)

Dear Mr. Ridenoure:

By letter dated May 20, 2004, Omaha Public Power District (OPPD/licensee) requested relief from the American Society of Mechanical Engineers (ASME) Code for the third 10-year interval for the Fort Calhoun Station, Unit 1 (FCS). By letter dated October 5, 2004, the staff requested additional information. OPPD provided a revised response by letter dated January 14, 2005. OPPD has cited 10 CFR 50.55a(g)(5)(iii) as the basis for requesting relief.

For the items discussed in Requests for Relief (RR) RR-10 through RR-22, the Nuclear Regulatory Commission (NRC) staff has concluded that the ASME Code requirements are impractical to meet, and that reasonable assurance of the structural integrity of the subject components has been provided by the examinations that have been completed. Granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is 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. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the third 10-year ISI interval.

The NRC staff's evaluation and conclusions are contained in the enclosed safety evaluation. Enclosure 2 is the NRC staff's consultant, Pacific Northwest National Laboratory, Technical Letter Report. All work under TAC No. MC3220 is complete.

Sincerely,

/RA/
Robert A. Gramm, Chief, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-285

Enclosures:
1. Safety Evaluation
2. Technical Letter Report

cc w/encls: See next page

May 20, 2005

Mr. R. T. Ridenoure
Division Manager - Nuclear Operations
Omaha Public Power District
Fort Calhoun Station, FC-2-4 Adm.
P.O. Box 550
Fort Calhoun, NE 68023-0550

SUBJECT: FORT CALHOUN STATION, UNIT NO. 1 – RELIEF REQUEST - THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN - REQUESTS FOR RELIEF RR-10 THROUGH RR-22 (TAC NO. MC3220)

Dear Mr. Ridenoure:

By letter dated May 20, 2004, Omaha Public Power District (OPPD/licensee) requested relief from the American Society of Mechanical Engineers (ASME) Code for the third 10-year interval for the Fort Calhoun Station, Unit 1 (FCS). By letter dated October 5, 2004, the staff requested additional information. OPPD provided a revised response by letter dated January 14, 2005. OPPD has cited 10 CFR 50.55a(g)(5)(iii) as the basis for requesting relief.

For the items discussed in Requests for Relief (RR) RR-10 through RR-22, the Nuclear Regulatory Commission (NRC) staff has concluded that the ASME Code requirements are impractical to meet, and that reasonable assurance of the structural integrity of the subject components has been provided by the examinations that have been completed. Granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is 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. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the third 10-year ISI interval.

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Docket No. 50-285

Enclosures: 1. Safety Evaluation
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cc w/encls: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM

REQUESTS FOR RELIEF NOS. RR-10 THROUGH RR-22

FORT CALHOUN STATION, UNIT NO. 1

OMAHA PUBLIC POWER DISTRICT

DOCKET NO. 50-285

1.0 INTRODUCTION

The Nuclear Regulatory Commission (NRC) staff with technical assistance from its contractor, the Pacific Northwest National Laboratory (PNNL), has reviewed and evaluated the information provided by Omaha Public Power District (licensee) in its letter dated May 20, 2004, which proposed its Third 10-Year Interval Inservice Inspection Program Plan Requests for Relief (RR) RR-10 through RR-22 for Fort Calhoun Station, Unit 1 (FCS). In response to a NRC request for additional information dated October 5, 2004, the licensee revised the requests for relief and provided additional information by its letter dated January 14, 2005.

2.0 REGULATORY REQUIREMENTS

Inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Code and applicable addenda as required by Title 10 of the *Code of Federal Regulation* (10 CFR) 50.55a(g), except where specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) of 10 CFR states that 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.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ASME Code of record for the FCS third 10-year interval inservice inspection program, which began on September 26, 1993, is the 1989 Edition of Section XI of the ASME Code, with no addenda.

3.0 TECHNICAL EVALUATION

The NRC staff, with technical assistance from PNNL, has reviewed the information concerning inservice inspection program RR-10 through RR-22 for FCS in the licensee's letter dated May 20, 2004. In response to an NRC request for additional information, the licensee revised the requests for relief and provided additional information in a letter dated January 14, 2005. The NRC staff adopts the evaluations and recommendations for granting relief contained in PNNL's technical letter report (TLR) included as enclosure 2. The status for each relief request is included with the TLR.

For FCS, the staff determined as noted in RR-10 through RR-22, the ASME Code requirement of essentially 100 percent volumetric and/or surface examination coverage is impractical to perform for these welds, because of access limitations. To gain access for complete examination of these welds, design modifications to the subject systems and components would be required. Imposition of this requirement would create an undue burden on the licensee.

As an alternative, the license proposed in lieu of the ASME Code-required examination of essentially 100 percent coverage of the subject welds and adjacent material, an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction. For the welds addressed in RR-10 through RR-22, the licensee has examined a significant portion of these welds, obtaining between 28 percent and 86 percent coverage. In addition, the licensee obtained essentially 100 percent coverage for the ASME Code-required surface examinations for the subject welds. Based on the coverage obtained, the staff determined that any existing patterns of degradation would have been detected by the examinations completed, and the examinations performed provide reasonable assurance of structural integrity of the subject welds addressed in RR-10 through RR-22. Additional technical details which further support the staff's granting of the requested reliefs is provided in PNNL's TLR.

4.0 CONCLUSION

The FCS RR-10 through RR-22 to the ASME Code requirements have been reviewed by the staff with the assistance of its contractor, PNNL. The TLR provides PNNL's evaluation of these requests for relief. The staff has reviewed the contractor's TLR and adopts the evaluations and recommendations for granting relief for RR-10 through RR-22.

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee has stated that certain inservice examinations are impractical to be performed to the extent required by the ASME Code at the FCS. For the items discussed in RR-10 through RR-22, the staff has concluded that the ASME Code requirements are impractical to meet, and that reasonable assurance of the structural integrity of the subject components has been provided by the examinations that have been completed. Therefore, the reliefs are granted pursuant to 10 CFR 50.55a(g)(6)(i) for the third 10-year ISI interval.

The NRC staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security and is 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. All other requirements of the

ASME Code, Sections III and XI for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: T. McLellan

Date: May 20, 2005

TECHNICAL LETTER REPORT

ON THE THIRD 10-YEAR INTERVAL INSERVICE INSPECTION

REQUESTS FOR RELIEF

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION

DOCKET NUMBER: 50-285

1.0 INTRODUCTION

By letter dated May 20, 2004, the licensee, Omaha Public Power District, submitted Requests for Relief, seeking relief from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*. In response to an U.S. Nuclear Regulatory Commission (NRC/the Commission) Request for Additional Information (RAI), the licensee revised the requests and provided further information in a letter dated January 14, 2005. These requests are for the third 10-year inservice inspection (ISI) interval at Fort Calhoun Station (FCS). Pacific Northwest National Laboratory (PNNL) has evaluated the revised requests for relief and supporting information submitted by the licensee in the following sections.

2.0 REGULATORY REQUIREMENTS

ISI of the ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME *Boiler and Pressure Vessel Code* (B&PV Code), and applicable addenda, as required by 10 CFR 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). The regulation at 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, which was incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ASME Code of record for the FCS third 10-year interval inservice inspection program, which began on September 26,

1993, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code, with no addenda.

3.0 TECHNICAL EVALUATION

The information provide by Omaha Public Power District in support of the requests for relief from Code requirements has been evaluated and the bases for disposition are documented below. This evaluation report includes revised Relief Requests RR-10 through RR-22, which were submitted on May 20, 2004.

3.1 Request for Relief RR-10, Examination Category B-A, Items B1.11 and B1.12, Pressure Retaining Welds in Reactor Vessel

ASME Code Requirement: Examination Category B-A, Items B1.11 and B1.12, requires essentially 100% volumetric examination, as defined by Figures IWB-2500-1 and IWB-2500-2, of the length of Class 1 circumferential and longitudinal shell welds on the reactor pressure vessel (RPV). "Essentially 100%", as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume(s) shown in Figures IWB-2500-1 or -2, as applicable, for the following RPV shell welds:

Table 3.1 - RPV Shell Welds Included in RR-10

ASME Item	Component ID	Description	Coverage
B1.11	RPV-SC-C-11	RPV lower shell-to-mid shell	76%
B1.11	RPV-SC-16-410	Lower head-to-lower shell	28%
B1.12	RPV-SL-A-3	Lower longseam at 60 degrees	86%
B1.12	RPV-SL-B-3	Lower longseam at 180 degrees	86%
B1.12	RPV-SL-C-3	Lower longseam at 300 degrees	86%

Licensee's Basis for Relief Request (as stated):

The circumferential girth weld RPV-SC-C-11 was examined using remotely controlled robots. The transducers used were a 70 degree L-wave, a 45 degree shear wave and a 45 degree L-wave. The scan plan, coverage and limitations are depicted in Attachment C[1]. The transducers used were manipulated on both sides of the weld and in four different directions, except where the reactor vessel surveillance capsules caused interference. Due to limitations, the required ultrasonic examination resulted in only 76% of the required weld volume being examined. Weld RPV-SC-C-11 had no

1. Note that figures and other information contained in licensee Attachments A through D are not included in this report.

recordable indications in the 76% of the required volume that was thoroughly examined (see Attachment B). The limitations for the circumferential girth weld RPV-SC-C-11 were the six surveillance capsules [holders] depicted on ISI Isometric drawing A-01B (Attachment D). This weld is the top circumferential weld in the lower shell section of the reactor vessel as depicted on ISI Isometric drawing A-01 (Attachment D). The locations of the six surveillance capsules [holders] are at 45 degrees, 85 degrees, 95 degrees, 225 degrees, 265 degrees and 275 degrees, as depicted on figure 4.5-1 (Attachment D), each surveillance capsule is approximately three inches wide and two and one half inches high from the reactor vessel inside surface. They are one hundred and twenty four inches in length. These six surveillance capsules [holders] are not considered removable.

The circumferential girth weld RPV-SC-16-410 was examined using remotely controlled robots. The transducers used were a 70 degree L-wave, a 45 degree shear wave and a 45 degree L-wave. The scan plan, coverage and limitations are depicted in Attachment C. The transducers used were manipulated on only the upper shell portion of the weld and in three different directions, except where the reactor vessel flow skirt and support lugs caused interference. There was no scanning performed from the lower reactor vessel head side of the weld because of the close proximity of the flow skirt. Due to limitations, the required ultrasonic examination resulted in only 28% of the required weld volume being examined. Weld RPV-SC-16-410 had no recordable indications in the 28% of the required volume that was thoroughly examined (see Attachment B). The limitations for the circumferential girth weld RPV-SC-16-410 were the six core stabilizing support lugs depicted on ISI Isometric drawings A-01B and Figure 20 (Attachment D); and the flow skirt depicted on Figure 21 (Attachment D). This weld is the bottom circumferential weld in the lower shell section of the reactor vessel as depicted on ISI Isometric drawing A-01 (Attachment D). The locations of the six core stabilizing support lugs are at 30 degrees, 90 degrees, 150 degrees, 210 degrees, 270 degrees and 330 degrees, as depicted on ISI Isometric A-01B (Attachment D). These stabilizing support lugs and the flow skirt are not considered removable.

The longseam weld RPV-SL-A-3 was examined using remotely controlled robots. The transducers used were a 70 degree L-wave, a 45 degree shear wave and a 45 degree L-wave. The scan plan, coverage and limitations are depicted in Attachment C. The transducers used were manipulated on both sides of the weld and in four different directions, except where the reactor vessel core support stabilizing lugs and flow skirt caused interference. Due to limitations, the required ultrasonic examination resulted in only 86% of the required weld volume being examined. Weld RPV-SL-A-3 had two recordable indications in the 86% of the required volume that was thoroughly examined, but these were all found to be Code acceptable per ASME Section CI IWB-3510-1 (see Attachment B). The limitations for the longseam weld RPV-SL-A-3 were the core stabilizing support lugs depicted on ISI Isometric drawings A-01B and Figure 20 (Attachment D); and the flow skirt depicted on Figure 21 (Attachment D). This weld is the longseam weld in the lower shell section of the reactor vessel at 60 degrees as depicted on ISI Isometric drawing A-01 (Attachment D). The locations of the core stabilizing support lugs are at 30 degrees and 90 degrees, as depicted on ISI Isometric A-01B (Attachment D). These stabilizing support lugs and the flow skirt are not considered removable.

The longseam weld RPV-SL-B-3 was examined using remotely controlled robots. The transducers used were a 70 degree L-wave, a 45 degree shear wave and a 45 degree L-wave. The scan plan, coverage and limitations are depicted in Attachment C. The transducers used were manipulated on both sides of the weld and in four different directions, except where the reactor vessel core support stabilizing lugs and flow skirt caused interference. Due to limitations, the required ultrasonic examination resulted in only 86% of the required weld volume being examined. Weld RPV-SL-B-3 had one recordable indication in the 86% of the required volume that was thoroughly examined, but this was found to be Code acceptable per ASME Section XI IWB-3510-1 (see Attachment B). The limitations for the longseam weld RPV-SL-B-3 were the core stabilizing support lugs depicted on ISI Isometric drawings A-01B and Figure 20 (Attachment D); and the flow skirt depicted on Figure 21 (Attachment D). This weld is the longseam weld in the lower shell section of the reactor vessel at 180 degrees as depicted on ISI Isometric drawing A-01 (Attachment D). The locations of the core stabilizing support lugs are at 150 degrees and 210 degrees, as depicted on ISI Isometric A-01B (Attachment D). These stabilizing support lugs and the flow skirt are not considered removable.

The longseam weld RPV-SL-C-3 was examined using remotely controlled robots. The transducers used were at 70 degree L-wave, a 45 degree shear wave and a 45 degree L-wave. The scan plan, coverage and limitations are depicted in Attachment C. The transducers used were manipulated on both sides of the weld and in four different directions, except where the reactor vessel core support stabilizing lugs and flow skirt caused interference. Due to limitations, the required ultrasonic examination resulted in only 86% of the required weld volume being examined. Weld RPV-SL-C-3 had thirteen recordable indications in the 86% of the required volume that was thoroughly examined, but these were all found to be Code acceptable per ASME Section XI IWB-3510-1 (see Attachment B). The limitations for the longseam weld RPV-SL-C-3 were the core stabilizing support lugs depicted on ISI Isometric drawings A-01B and Figure 20 (Attachment D); and the flow skirt depicted in Figure 21 (Attachment D). This weld is the longseam weld in the lower shell section of the reactor vessel at 300 degrees as depicted on ISI Isometric drawing A-01 (Attachment D). The locations of the core stabilizing support lugs are at 270 degrees and 330 degrees, as depicted on ISI Isometric A-01B (Attachment D). These stabilizing support lugs and the flow skirt are not considered removable.

The examinations were all performed during the third ten year interval at the Fort Calhoun Station. Although these examinations had some limitations, it is believed that they adequately covered the primary areas of interest and provided and acceptable level of quality and safety. The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible ultrasonic testing (UT) exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance processes were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions, and not the four directions described in the ASME

Section XI Code. Thus much of the exam volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

Additionally, there was one other reactor vessel circumferential weld item number B1.11 that had essentially 100% of the required volume examined, with no rejectable flaws detected. The component ID for this weld is RPV-SC-B-11. This weld is shown on ISI Isometric drawing A-01 in Attachment D.

There were also six other reactor vessel longseam welds, item number B1.12 that had essentially 100% of the required volume examined, with no service-induced flaws detected. Three of these longseam welds were in the upper shell section. These component ID's are RPV-SL-A-1, RPV-SL-B-1 and RPV-SL-C-1. The other three longseam welds were located in the middle shell section. These component ID's are RPV-SL-A-2, RPV-SL-B-2, and RPV-SL-C-2. All these welds are shown on ISI Isometric drawing A-01 Attachment D.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the five welds listed in this relief request. It would also be impractical to perform radiographic or surface examination to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWB-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires essentially 100% volumetric examination of the length of Class 1 pressure retaining circumferential girth and longitudinal RPV welds. However, 100% volumetric coverage for the subject welds cannot be performed due to interferences caused by adjacent RPV core support and internal appurtenances. For the licensee to achieve the required volumetric coverage, these RPV internal components would have to be redesigned and modified. This would place a significant burden on the licensee, thus the ASME Code-required 100% volumetric examinations are impractical.

As shown on the sketches and technical descriptions[2] provided by the licensee, volumetric coverage levels obtained ranged from approximately 28% to 86% (see Table 3.1). The locations and proximity of surveillance capsule holders, core stabilizing support lugs, and the design of the flow skirt restrict access for ultrasonic scans on the subject welds.

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2. Sketches and technical descriptions provided by the licensee are not included in this report.

For lower shell-to-mid shell Weld RPV-SC-C-11 and lower head-to-lower shell Weld RPV-SC-16-410, accessible ultrasonic examination volumes were found to be free of service-induced flaws. Even though 100% examination coverage could not be credited due to access restrictions caused by RPV surveillance capsule holders, the flow skirt and core stabilizing supports, approximately 76% and 28% of the required volumes were completed for Welds RPV-SC-C-11 and RPV-SC-16-410, respectively. In addition, the remaining RPV circumferential girth Weld RPV-SC-B-11(mid-to-upper shell weld), was completed in accordance with ASME Code requirements with no rejectable flaws being detected.

For longitudinal seam Welds RPV-SL-A-3, RPV-SL-B-3, and RPV-SL-C-3, the licensee was able to obtain approximately 86% of the ASME Code-required volumes. The RPV flow skirt supports and core stabilizing lugs prevent access to increase coverage for these welds. Accessible portions of Welds RPV-SL-A-3, RPV-SL-B-3, and RPV-SL-C-3 were examined in accordance with ASME Code ultrasonic scanning requirements and were found to contain two, one, and thirteen recordable flaw indications, respectively. However, these flaws were found to be ASME Code-acceptable per IWB-3510-1. Additionally, six other RPV longitudinal seam welds (located on the mid and upper shell courses), were examined to the full extent of ASME Code requirements with no service-induced flaws being detected.

The licensee has shown that it is impractical to meet the ASME Code-required 100% volumetric examination coverage for the subject welds due to the design and proximity of other RPV internal components. Based on the limited examinations performed, along with the full examination of ASME Code-required volumes in other RPV pressure retaining welds, it is concluded that if significant service-induced degradation were occurring in the subject welds, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.2 Request for Relief RR-11, Examination Category B-A, Item B1.40, Pressure Retaining Welds in Reactor Vessel

ASME Code Requirement: Examination Category B-A, Item B1.40 requires essentially 100% volumetric and surface examination, as defined by Figure IWB-2500-5, of the length of Class 1 reactor pressure vessel (RPV) head-to-flange welds. “Essentially 100%”, as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable.

Licensee’s ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume and surface area shown in Figure IWB-2500-5 for RPV closure head-to-flange Weld RPVCH-HF-1.

Licensee’s Basis for Relief Request (as stated):

The examinations performed applied all the current knowledge and techniques to obtain the maximum amount of coverage to the extent practical within the limitations of design, geometry and materials of construction of the components. However, these

examinations nonetheless obtained less than the coverage dictated by the ASME Code per Table IWB-2500-1.

The head-to-flange weld RPVCH-HF-1 was examined using manual ultrasonic techniques from the outside surface. The transducers used were a 70 degree shear wave, a 60 degree shear wave, a 45 degree shear wave, a 30 degree shear wave and a 0 degree L-wave. The transducers used were manipulated on both sides of the weld and in four different directions, except where the reactor vessel seismic skirt, seismic skirt lugs, and the actual head-to-flange geometry caused interference. The additional 30 degree and 70 degree transducers were used to increase the coverage of the areas not examined due to the limitations noted.

Due to limitations, the required ultrasonic examination resulted in only 77.9% of the required weld volume being examined. Weld RPVCH-HF-1 had recordable indications in the 77.9% of the required volume that was thoroughly examined, but these were all found to be Code acceptable per ASME Section XI IWB-3510-1. The limitations for the head-to-flange weld RPVCH-HF-1 were the twelve evenly spaced seismic skirt lugs, as well as the seismic skirt and the actual head-to-flange geometry. Each seismic skirt lug is approximately six inches wide. These twelve seismic skirt lugs and seismic skirt are not considered removable.

The examinations were all performed during the third ten year interval at the Fort Calhoun Station. Although these examinations had some limitations, it is believed that they adequately covered the primary areas of interest and provided an acceptable level of quality and safety. The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance processes were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one of two directions, and not the four directions described in the ASME Section XI Code. Thus much of the exam volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

Surface examination of this weld was required by the Code. A surface examination was performed except where limited by the seismic support lugs. The seismic skirt and the actual flange geometry posed no limitation on the surface examination areas. No surface or sub-surface flaws were noted during the surface examination.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the head-to-flange weld RPVCH-HF-1 listed in this relief request. It would also be impractical to perform radiographic examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if

present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWB-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires 100% volumetric and surface examination of the length of Class 1 RPV closure head-to-flange welds. However, 100% volumetric and surface examinations for circumferential head-to-flange Weld RPVCH-HF-1 cannot be performed due to the geometry of the head-to-flange transition region and the presence of a seismic skirt and welded support lugs, which limit access to the subject weld. For the licensee to achieve 100% volumetric and surface coverage, the head-to-flange geometry and the seismic skirt and lugs would need to be re-designed and modified. This would place a significant burden on the licensee, thus the ASME Code-required 100% volumetric and surface examinations are impractical.

As shown on the sketches and technical descriptions provided by the licensee[3], approximately 78% coverage of the ASME Code-required examination volume and surface area, as applicable, was obtained for head-to-flange Weld RPVCH-HF-1. The design of the seismic skirt and location of welded support lugs limit access to the entire weld length, and the geometry of the head-to-flange welded assembly limits scanning access for the subject weld. The licensee reported that several ASME Code-acceptable volumetric flaws were detected during this examination. Based on the mid-wall location of these reflectors, it is concluded that they are most probably the result of fabrication welding activities.

While it is impractical for the licensee to meet the ASME Code-required 100% volumetric and surface examination coverages, it is concluded that if significant service-induced degradation were occurring in the subject weld, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.3 Request for Relief RR-12, Examination Category B-B, Items B2.11 and 2.12, Pressure Retaining Welds in Vessels Other Than Reactor Vessels

ASME Code Requirement: Examination Category B-B, Item B2.11 requires essentially 100% volumetric examination, as defined by Figure IWB-2500-1, of the length of Class 1 circumferential head-to-shell welds. Item B2.12 requires essentially 100% volumetric examination, as described by Figure IWB-2500-2, of one linear foot of the longitudinal weld intersecting the circumferential head-to-shell weld. "Essentially 100%", as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable.

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3. Sketches and technical descriptions provided by the licensee are not included in this report.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume shown in Figure IWB-2500-1 for circumferential head-to-shell Weld PRZ-SC-5-403 and intersecting longitudinal Weld PRZ-SL-2-403A on the pressurizer (PRZ).

Licensee's Basis for Relief Request (as stated):

The circumferential girth weld PRZ-SC-5-403 was examined using manual ultrasonic techniques from the outside surface. The transducers used were a 60 degree shear wave, a 45 degree shear wave an a 0 degree L-wave. The transducers used were manipulated on both sides of the weld and in four different directions, except where the insulation support and lugs caused interference. Due to limitations, the required ultrasonic examination resulted in only 77% of the required weld volume being examined. Weld PRZ-SC-5-403 had no recordable indications in the 77% of the required volume that was thoroughly examined.

The limitations for the circumferential girth of PRZ-SC-5-403 were the insulation support ring and its support lugs as depicted on ISI Isometric drawing A-03. This weld is the top circumferential weld in the upper shell section of the pressurizer vessel as depicted on ISI Isometric drawing A-03. The locations of the insulation support ring and support lugs is depicted on A-03. There is a full size drawing of the weld and insulation support ring and support lugs depicted on page 15 of 15 in ultrasonic report number UT-99. The support ring goes 360 degrees around the girth of the vessel and the support lugs are at approximately every 45 degrees. These insulation support ring and support lugs are not considered removable.

The longseam weld PRZ-SL-2-403A was examined using manual ultrasonic techniques from the outside surface. The transducers used were a 60 degree shear wave, a 45 degree shear wave and a 0 degree L-wave. The transducers used were manipulated on both sides of the weld and in four different directions, except where the insulation support lugs caused interference. As prescribed in the ASME Code Table IWB-2500-1, only the twelve inches were examined of the longseam PRZ-SL-2-403A that intersect the girth weld PRZ-SC-5-403. Due to limitations, the required ultrasonic examination resulted in only 66% of the required weld volume being examined. Weld PRZ-SL-2-403A had no recordable indications in the 66% of the required volume that was thoroughly examined.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance processes were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions, and not the four directions described in the ASME Section XI Code. Thus much of the exam volume reported as inaccessible in this relief request was partially examined

without detecting any service-induced flaws. Surface examinations of these welds were not required by the Code. Surface examination was not performed.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the welds listed in this relief request. It would also be impractical to perform radiographic or surface examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWB-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires 100% volumetric examination of Class 1 circumferential head-to-shell welds, including a one foot length of intersecting longitudinal welds in the PZR. However, 100% volumetric examination coverage for PZR circumferential head-to-shell Weld PRZ-SC-5-403 and upper shell longitudinal Weld PRZ-SL-2-403A cannot be performed due to the location of an insulation support ring and welded support lugs. For the licensee to achieve 100% volumetric coverage, the insulation support system would need to be redesigned and modified. This would place a significant burden on the licensee, thus the ASME Code-required 100% volumetric examinations are impractical.

As shown on the sketches and technical descriptions[4] provided by the licensee, volumetric coverages of approximately 77% for Weld PRZ-SC-5-403 and 66% for Weld PRZ-SL-2-403A were obtained. Interferences caused by the proximity of welded insulation support lugs and ring limit scanning access from the shell side of the subject welds. However, the licensee was able to obtain both 45 and 60 degree ultrasonic shear wave scans for a large portion of the subject weld, and adjacent base material. The accessible examination volumes were obtained in accordance with ASME Code requirements and were found to be free of service-induced flaws. Round robin tests, as reported in NUREG/CR-5068, have demonstrated that ultrasonic examinations of ferritic material from a single side provide high probabilities of detection (usually 90% or greater) for both near- and far-side cracks in blind inspection trials.

While it is impractical for the licensee to meet the ASME Code-required 100% volumetric coverage, it is concluded that if significant service-induced degradation were occurring in the subject welds, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

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4. Sketches and technical descriptions provided by the licensee are not included in this report.

3.4 Request for Relief RR-13, Examination Category B-D, Item B3.130, Full Penetration Welds of Nozzles in Vessels

ASME Code Requirement: Examination Category B-D, Item B3.130 requires volumetric examination, as defined by Figure IWB-2500-7(a), of Class 1 steam generator (SG) nozzle-to-vessel welds. ASME Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume shown in Figure IWB-2500-7(a) for the following lower head-to-nozzle welds on Steam Generators (SGs) A and B:

Table 3.4 - SG Nozzle-to-Vessel Welds Included in RR-13

Component I.D.	SG	Description	Coverage
SG-1-N-1	A	Lower head-to-outlet (cold leg) nozzle	72.4%
SG-1-N-3	A	Lower head-to-outlet (cold leg) nozzle	72.4%
SG-2-N-1	B	Lower head-to-outlet (cold leg) nozzle	72.4%
SG-2-N-3	B	Lower head-to-outlet (cold leg) nozzle	72.4%

Licensee's Basis for Relief Request (as stated):

The steam generator lower head-to-nozzle welds SG-1-N-1, SG-1-N-3, SG-2-N-1 and SG-2-N-3 were examined using manual ultrasonic techniques from the outside surface. The transducers used were a 60 degree shear wave, a 45 degree shear wave and a 0 degree L-wave. The transducers used were manipulated on both sides of the weld and in four different directions, except where the nozzle geometry caused interference. Due to limitations, the required ultrasonic examination resulted in only 72.4% of the required weld volume(s) being examined. Welds SG-1-N-1, SG-1-N-3, SG-2-N-1 and SG-2-N-3 had no recordable indications in the 72.4% of the required volume that was thoroughly examined. The limitations for these circumferential girth welds were the nozzle geometry as depicted on ISI Isometric drawing A-05. These welds are the steam generator outlet nozzles as depicted on ISI Isometric drawing A-05.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance process were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions,

and not the four directions described in the ASME Section XI Code. Thus much of the exam volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the four welds listed in this relief request. It would also be impractical to perform radiographic or surface examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWB-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires volumetric examination of Class 1 full penetration welds of nozzles in vessels. However, volumetric examination to the extent required by the ASME Code for steam generator lower head-to-outlet nozzle Welds SG-1-N-1, SG-1-N-3, SG-2-N-1, and SG-2-N-3 cannot be performed due to the nozzles' outside geometry, which limits ultrasonic scanning. For the licensee to achieve the ASME Code-required volumetric coverage, the nozzles would need to be redesigned and modified. This would place a significant burden on the licensee, thus the ASME Code-required volumetric examinations are impractical.

As shown on the sketches and technical descriptions[5] provided by the licensee, approximately 72% coverage of the required examination volumes were obtained for Welds SG-1-N-1, SG-1-N-3, SG-2-N-1, and SG-2-N-3. These nozzles are typically examined from the outside surface of the component. The surface geometry of the nozzle blend area (the transition region from nozzle-to-SG lower head), has a concave shape that causes ultrasonic beam re-direction and loss of coupling in this region. Therefore, these welds must be examined from the shell and nozzle sides, up to, but not across, the transition region. The accessible volumetric coverage from the shell and nozzle sides includes most of the inner portion of the weld and base materials, where one would expect service-induced degradation to occur, using 45 and 60 degree shear wave methods. No service-related flaws were detected in any of the SG lower head-to-nozzle welds included in this request.

While it is impractical for the licensee to obtain 100% of the ASME Code-required volumetric coverage, it is concluded that if significant service-induced degradation were occurring in the subject welds, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

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5. Sketches and technical descriptions provided by the licensee are not included in this report.

3.5 Request for Relief RR-14, Examination Category B-D, Item B3.150, Full Penetration Welds of Nozzles in Vessels

ASME Code Requirement: Examination Category B-D, Item B3.150 requires volumetric examination, as defined by Figure IWB-2500-7(a), of Class 1 full penetration nozzle-to-vessel welds in heat exchangers. ASME Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume shown in Figure IWB-2500-7(a) for nozzle-to-shell Welds RHE-N-6 and RHE-BC-8 on the regenerative heat exchanger.

Licensee's Basis for Relief Request (as stated):

The regenerative heat exchanger nozzle-to-shell weld RHE-N-6 was examined using manual ultrasonic techniques from the outside surface. The transducers used were a 70 degree refracted L-wave, and a 45 degree refracted L-wave. The transducers used were manipulated on only the shell side of the weld and in three different directions. There was no scanning performed from the nozzle side due to the geometry. Due to limitations, the required ultrasonic examination resulted in only 46.4% of the required weld volume being examined. Weld RHE-N-6 had intermittent recordable root geometry indications in the 46.4% of the required volume that was thoroughly examined. The limitations for the nozzle-to-shell weld RHE-N-6 were the nozzle geometry as depicted on ISI Isometric drawing A-07 and the drawings in the ISI ultrasonic examination report.

The regenerative heat exchanger nozzle-to-shell weld RHE-BC-8 was examined using manual ultrasonic techniques from the outside surface. The transducers used were a 70 degree refracted L-wave, and a 45 degree refracted L-wave. The transducers used were manipulated on only the shell side of the weld and in three different directions. There was no scanning performed from the nozzle side due to the geometry. Due to limitations, the required ultrasonic examination resulted in only 50% of the required weld volume being examined. Weld RHE-BC-8 had intermittent recordable root geometry indications in the 50% of the required volume that was thoroughly examined. The limitations for the nozzle-to-shell weld RHE-BC-8 were the nozzle geometry as depicted on ISI Isometric drawing A-07 and the drawings in the ISI ultrasonic examination report.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT examination volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The examination results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance process were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions, and not the four directions described in the ASME Section XI Code.

Thus much of the examination volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the four welds listed in this relief request. It would also be impractical to perform radiographic or surface examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWB-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires volumetric examination of Class 1 full penetration welds of nozzles in vessels. However, volumetric examination coverage to the extent required by the ASME Code cannot be performed for regenerative heat exchanger nozzle-to-shell Welds RHE-N-6 and RHE-BC-8 due to the nozzles' geometry, which limits scanning coverage to the shell side only of these welds. For the licensee to achieve the ASME Code-required volumetric coverage, the nozzles would need to be redesigned and modified. This would place a significant burden on the licensee, thus the ASME Code-required volumetric examinations are impractical.

As shown on the sketches and technical descriptions[6] provided by the licensee, approximately 46% and 50% aggregate coverage of the required examination volumes was obtained for Welds RHE-N-6 and RHE-BC-8, respectively. The set-in design and tapered outside surface geometry of these nozzles limits ultrasonic scanning access for the subject welds to the shell side only. While only limited coverage could be credited, based on ASME Code-requirements, for examining the weld in two beams paths and four directions, the licensee was able to examine greater than 90% of the weld volumes from the shell side with 45 and 70 degree longitudinal wave probes. The welds were found to be free of service-induced flaws, although geometrical reflectors originating from weld root conditions were observed intermittently along the weld length. These reported geometrical reflectors provide evidence that the sound fields being used would have been capable of detecting planar flaws such as service-related cracking that could initiate near the inner surface heat affected zone of theses welds, if present.

While it is impractical for the licensee to obtain 100% of the ASME Code-required volumetric coverage, it is concluded that if significant service-induced degradation were occurring in the subject welds, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

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6. Sketches and technical descriptions provided by the licensee are not included in this report.

3.6 Request for Relief RR-15, Examination Category B-D, Item B3.90, Full Penetration Welds of Nozzles in Vessels

ASME Code Requirement: Examination Category B-D, Item B3.90 requires volumetric examination, as defined by Figure IWB-2500-7(a), of Class 1 reactor pressure vessel (RPV) nozzle-to-shell welds. ASME Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume shown in Figure IWB-2500-7(a) for RPV nozzle-to-vessel Welds RPV-N-1-A and RPV-N-1-B.

Licensee's Basis for Relief Request (as stated):

The reactor vessel nozzle weld RPV-N-1-A was examined using remotely controlled robots. The transducers used were an 80 degree L-wave, a 70 degree L-wave, a 45 degree L-wave, a 45 degree shear wave and a 15 degree L-wave. The transducers used were manipulated on the shell side of the weld and in three different directions, except where the nozzle inner radius buildup interfered. There was no scanning performed from the nozzle side due to the geometry. Due to limitation, the required ultrasonic examination resulted in only 82% of the required weld volume being examined. Weld RPV-N-1-A had intermittent recordable root geometry indications in the 82% of the required volume that was thoroughly examined. The limitations for the reactor vessel weld RPV-N-1-A were the nozzle inner radius buildup area as depicted in ISI Isometric drawing A-01 and the scan plan drawings.

The reactor vessel nozzle weld RPV-N-1-B was examined using remotely controlled robots. The transducers used were an 80 degree L-wave, a 70 degree L-wave, a 45 degree L-wave, a 45 degree shear wave and a 15 degree L-wave. The transducers used were manipulated on the shell side of the weld and in three different directions, except where the nozzle inner radius buildup interfered. There was no scanning performed from the nozzle side due to the geometry. Due to limitation, the required ultrasonic examination resulted in only 82% of the required weld volume being examined. Weld RPV-N-1-B had intermittent recordable root geometry indications in the 82% of the required volume that was thoroughly examined. The limitations for the reactor vessel weld RPV-N-1-B were the nozzle inner radius buildup area as depicted in ISI Isometric drawing A-01 and the scan plan drawings.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance process were applicable to both. Many areas of inaccessibility were so designated not because they could not be

examined at all, but because the UT sound beam only traveled in one or two directions, and not the four directions described in the ASME Section XI Code. Thus much of the exam volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the four welds listed in this relief request. It would also be impractical to perform radiographic or surface examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWB-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires volumetric examination of Class 1 full penetration welds of nozzles in the reactor pressure vessel (RPV). However, volumetric examination coverage, to the extent required by the ASME Code, for RPV nozzle-to-vessel Welds RPV-N-1-A and RPV-N-1-B cannot be performed due to the nozzles' inner radius buildup area, which limits scanning to the shell side of the weld and the nozzle bore only. For the licensee to achieve the ASME Code-required volumetric coverage, the inside geometry of the nozzles would need to be redesigned and modified. This would place a significant burden on the licensee, thus the ASME Code-required volumetric examinations are impractical.

As shown on the drawings and technical descriptions[7] provided by the licensee, approximately 82% volumetric coverage was obtained for each nozzle-to-shell Weld(s) RPV-N-1-A and RPV-N-1-B. The examinations were remotely performed using automated equipment from the inside diameter surface of the RPV. These nozzles are of a set-in design that includes an extension, or nozzle inner radius build-up area (as described by the licensee), that slightly protrudes beyond the RPV shell inside surface. This geometry does not allow ultrasonic scans to be made from the nozzle side of these carbon steel welds. However, the licensee obtained substantial volumetric weld coverage from the shell side, and from the bore, of the nozzles with an automated inspection device having multiple angle beam transducers.

While the licensee may not have achieved complete examination coverage (from both sides) as required by the ASME Code, the ultrasonic examinations performed from the shell side of the carbon steel nozzle-to-vessel welds meet the inspection procedure guidelines documented in NUREG/CR-5068. Based on the limited examinations performed, it is concluded that if significant service-induced degradation were occurring

7. Drawings and technical descriptions provided by the licensee are not included in this report.

in the subject welds, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.7 Request for Relief RR-16, Examination Category B-F, Item B5.70, Pressure Retaining Dissimilar Metal Welds

ASME Code Requirement: Examination Category B-F, Item B5.70 requires volumetric and surface examination, as defined by Figure IWB-2500-8, of Class 1 nozzle-to-safe end dissimilar metal welds. ASME Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume shown in Figure IWB-2500-8 for the following dissimilar metal welds on Steam Generators (SGs) A and B:

Table 3.7 - Steam Generator Nozzle Dissimilar Metal Welds in RR-16

Component I.D.	SG	Description	Coverage
MRC-1/06	A	Nozzle-to-safe end (inlet - hot leg)	83%
MRC-1/07	A	Nozzle-to-safe end (outlet - cold leg)	73%
MRC-1/19	A	Nozzle-to-safe end (outlet - cold leg)	62%
MRC-2/06	B	Nozzle-to-safe end (inlet - hot leg)	76%

Licensee's Basis for Relief Request (as stated):

The steam generator A nozzle-to-safe end weld MRC-1/06 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a dual focused 45 degree refracted L wave. The transducer used was manipulated on both sides of the weld and in four different directions, except where the adjacent elbow geometry interfered. Due to limitations, the required ultrasonic examination resulted in only 83% of the required weld volume being examined. Weld MRC-1/06 had no recordable indications in the 83% of the required volume that was thoroughly examined. The limitations for the steam generator A nozzle-to-safe end weld MRC-1/06 were the adjacent elbow geometry as depicted on ISI Isometric drawing A-08, and the detail drawing on page 5 of 11 in the ultrasonic report number FC-96-UT-056 dated 11/06/96.

The steam generator A nozzle-to-safe end weld MRC-1/07 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a dual focused 45 degree refracted L wave. The transducer used was manipulated on both sides of the weld and in four different directions, except where the adjacent elbow geometry interfered. Due to limitations, the required ultrasonic examination resulted in only 73% of the required weld volume being examined. Weld MRC-1/07 had no

recordable indications in the 73% of the required volume that was thoroughly examined. The limitations for the steam generator A nozzle-to-safe end weld MRC-1/07 were the adjacent elbow geometry as depicted on ISI Isometric drawing A-08, and the detail drawing on page 10 of 11 in the ultrasonic report number FC-96-UT-056 dated 11/06/96.

The steam generator A nozzle-to-safe end weld MRC-1/19 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a dual focused 45 degree refracted L wave. The transducer used was manipulated on both sides of the weld and in four different directions, except where the adjacent elbow geometry interfered. Due to limitations, the required ultrasonic examination resulted in only 62% of the required weld volume being examined. Weld MRC-1/19 had no recordable indications in the 62% of the required volume that was thoroughly examined. The limitations for the steam generator A nozzle-to-safe end weld MC-1/19 were the adjacent elbow geometry as depicted on ISI Isometric drawing A-08, and the detail drawing on page 11 of 11 in the ultrasonic report number FC-96-UT-056 dated 11/06/96.

The steam generator B nozzle-to-safe end weld MC-2/06 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a dual focused 45 degree refracted L wave. The transducer used was manipulated on both sides of the weld and in four different directions, except where the adjacent elbow geometry interfered. Due to limitations, the required ultrasonic examination resulted in only 76% of the required weld volume being examined. Weld MC-2/06 had no recordable indications in the 76% of the required volume that was thoroughly examined. The limitations for the steam generator B nozzle-to-safe end weld MC-2/06 were the adjacent elbow geometry as depicted on ISI Isometric drawing A-09, and the detail drawing on page 13 of 17 in the ultrasonic report number 24 dated 10/27/99.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required examination volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The examination results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance processes were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions and not the four directions described in the ASME Section XI Code. Thus much of the examination volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

Surface examinations of these welds were required by the Code. Surface examinations found no indications.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the welds listed in this relief request. It would also be impractical to perform radiographic examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality

and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWB-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires volumetric and surface examination of Class 1 pressure retaining dissimilar metal welds. However, volumetric examination coverage, to the extent required by the ASME Code, for steam generator nozzle-to-safe end Welds MRC-1/06, MRC-1/07, MRC-1/19, and MRC-2/06 cannot be performed due to the adjacent piping elbow geometry, which limits scanning coverage for the four nozzle-to-safe end welds from the elbow side. For the licensee to achieve the ASME Code-required volumetric coverage, the configurations of the steam generator nozzle-to-safe end welds would need to be modified. This would place a significant burden on the licensee, thus the ASME Code-required volumetric examinations are impractical.

As shown on the sketches and technical descriptions[8] provided by the licensee, approximately 83%, 73%, 62%, and 76% volumetric coverage of the required examination regions was obtained for Welds MRC-1/06, MRC-1/07, MRC-1/19, and MRC-2/06, respectively. The short radius geometry of the adjacent piping elbows severely limits axial scanning from the safe end side of these welds. However, full axial scans were completed from the nozzle side, and the licensee also met the ASME Code-required circumferential volumetric scan requirements. In addition, the ASME Code-required surface examinations were also completed with no limitations. No indications were observed during any of the volumetric or surface examinations performed.

While it is impractical for the licensee to obtain 100% of the ASME Code-required volumetric coverage from both sides of the subject welds, it is concluded that if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.8 Request for Relief RR-17, Examination Category B-J, Item B9.11, Pressure Retaining Welds in Piping

ASME Code Requirement: Examination Category B-J, Item B9.11 requires essentially 100% volumetric and surface examination, as defined by Figure IWB-2500-8, of the length of selected Class 1 circumferential piping welds, 4-inch national pipe size (NPS) and greater in diameter. "Essentially 100%", as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable.

8. Drawings and technical descriptions provided by the licensee are not included in this report.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume shown in Figure IWB-2500-8 for safe end-to-elbow Welds MRC-2/08 and MRC-2/20 on the primary outlet (cold leg) piping for Steam Generator B.

Licensee's Basis for Relief Request (as stated):

The steam generator B safe end-to-elbow weld MRC-2/08 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a dual focused 45 degree refracted L wave. The transducer used was manipulated on both sides of the weld and in four different directions, except where the adjacent elbow geometry interfered. Due to limitations, the required ultrasonic examination resulted in only 54.5% of the required weld volume being examined. Weld MRC-2/08 had no recordable indications in the 54.5% of the required volume that was throughly examined. The limitations for the stream generator B nozzle-to-safe end weld MRC-2/08 were the adjacent elbow geometry as depicted on ISI Isometric drawing A-09, and the detail drawing on page 15 of 17 in the ultrasonic report number 24 dated 10/27/99.

The steam generator B safe end-to-elbow weld MRC-2/20 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a dual focused 45 degree refracted L wave. The transducer used was manipulated on both sides of the weld and in four different directions, except where the adjacent elbow geometry interfered. Due to limitations, the required ultrasonic examination resulted in only 54.5% of the required weld volume being examined. Weld MRC-2/20 had no recordable indications in the 54.5% of the required volume that was throughly examined. The limitations for the steam generator A nozzle-to-safe end weld MRC-2/20 where the adjacent elbow geometry as depicted on ISI Isometric drawing A-09, and the detail drawing on page 17 of 17 in the ultrasonic report number 24 dated 10/27/99.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance processes were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions and not the four directions described in the ASME Section XI Code. Thus much of the exam volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

Surface examinations of these welds were required by the Code. Surface examinations found no indications.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the welds listed in this relief request. It would also be impractical to perform radiographic examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic

examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWB-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires essentially 100% volumetric and surface examination of the length of selected Class 1 piping welds. However, 100% volumetric examination of Steam Generator B outlet (cold leg) nozzle safe end-to-pipe Welds MRC-2/08 and MRC-2/20 cannot be completed due to adjacent piping elbow geometries, which limit scanning coverage for the subject welds. For the licensee to achieve 100% volumetric coverage, the piping safe end and elbow would have to be re-designed and modified. This would place a significant burden on the licensee, thus the ASME Code-required 100% volumetric examinations are impractical.

As shown on the sketches and technical descriptions[9] provided by the licensee, approximately 55% coverage of the required examination volumes was obtained for Welds MRC-2/08 and MRC-2/20. The completed examination coverage includes the entire ASME Code-required volume from the nozzle side of the safe end for axial scans and the entire ASME Code-required volumes for circumferential scans, using dual transmit-receive, 45-degree longitudinal waves. Axial scans from the piping side of the subject welds could not be accomplished due the outside surface geometry of the tight radius elbows. It is noted that the safe end material is centrifugally cast stainless steel; this material is very difficult to ultrasonically penetrate due to its coarse grained structure, making extended beam path examinations (by skipping sound off the inner surface of the pipe) for increasing volumetric coverage impractical. Therefore, the licensee has made a reasonable effort to maximize volumetric coverage on the subject welds, using currently acceptable methods. In addition, the ASME Code-required surface examinations were also completed with no limitations to coverage.

While it is impractical for the licensee to obtain 100% of the ASME Code-required volumetric coverage from both sides of the subject welds, it is concluded that if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.9 Request for Relief RR-18, Examination Category B-J, Item B9.31, Pressure Retaining Welds in Piping

9. Drawings and technical descriptions provided by the licensee are not included in this report.

ASME Code Requirement: Examination Category B-J, Item B9.31 requires essentially 100% volumetric and surface examination, as defined by Figures IWB-2500-9, -10, or -11, as applicable, of the length of selected Class 1 circumferential branch piping connection welds, 4-inch national pipe size (NPS) and greater in diameter. "Essentially 100%", as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume shown in Figure IWB-2500-9, -10, or -11, as applicable, for branch pipe connection Welds MRC-1/03B and MRC-1/14-A on the Safety Injection System (SIS).

Licensee's Basis for Relief Request (as stated):

The safety injection branch connection weld MRC-1/03B was examined using manual ultrasonic techniques from the outside surface. The transducer used was a dual focused 45 degree refracted L wave. The transducer used was manipulated only on the pipe side of the weld and in three different directions, as no scanning could be performed from the branch connection side. Due to limitations, the required ultrasonic examinations resulted in only 50% of the required weld volume being examined. Weld MRC-1/03B had no recordable indications in the 50% of the required volume that was throughly examined. The limitations for the safety injection branch connection weld MRC-1/03B were the adjacent branch connection as depicted on ISI Isometric drawing A-08, and the detail drawing on the ultrasonic report number FC-96-UT-032 dated 10/24/96.

The safety injection branch connection weld MRC-1/14A was examined using manual ultrasonic techniques from the outside surface. The transducer used was a dual focused 45 degree refracted L wave. The transducer used was manipulated only on the pipe side of the weld and in three different directions, as no scanning could be performed from the branch connection side. Due to limitations, the required ultrasonic examinations resulted in only 50% of the required weld volume being examined. Weld MRC-1/03B had no recordable indications in the 50% of the required volume that was throughly examined. The limitations for the safety injection branch connection weld MRC-1/14A were the adjacent branch connection as depicted on ISI Isometric drawing A-08, and the detail drawing on the ultrasonic report number FC-96-UT-032 dated 10/21/96.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance processes were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions and not the four directions described in the ASME Section XI Code. Thus much of the

exam volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

Surface examinations of these welds were required by the Code. Surface examinations found no indications.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the welds listed in this relief request. It would also be impractical to perform radiographic examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWB-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires essentially 100% volumetric and surface examination of the length of selected Class 1 branch pipe connection welds. However, 100% volumetric examination for Safety Injection System (SIS) branch pipe connection Welds MRC-1/03B and MRC-1/14A cannot be completed due to the design geometry of the branch connections, which limit scanning coverage to the pipe side of the subject welds only. For the licensee to achieve 100% volumetric coverage, the branch piping connections would need to be redesigned and modified. This would place a significant burden on the licensee, thus the ASME Code-required 100% volumetric examinations are impractical.

As shown on the sketches and technical descriptions[10] provided by the licensee, approximately 50% of the required examination volumes was obtained for Welds MRC-1/03B and MRC-1/14A. The completed examination coverage includes the entire ASME Code-required volume from the main piping (large bore) side of the branch connection welds for axial scans and the entire ASME Code-required volumes for circumferential scans, using dual transmit-receive, 45-degree longitudinal waves. Axial scans from the branch connection (small bore) side of the subject welds could not be accomplished due their design geometry, which does not allow directing a sound beam into the weld region. It is noted that the main piping material is centrifugally cast stainless steel; this material is very difficult to ultrasonically penetrate due to its coarse grained structure, making extended beam path examinations (by skipping sound off the inner surface of the pipe) for increasing volumetric coverage impractical. Therefore, the licensee has made a reasonable effort to maximize volumetric coverage on the subject welds, using currently acceptable methods. In addition, the ASME Code-required surface examinations were also completed with no limitations to coverage.

10. Drawings and technical descriptions provided by the licensee are not included in this report.

While it is impractical for the licensee to obtain 100% of the ASME Code-required volumetric coverage from both sides of the subject welds, it is concluded that if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.10 Request for Relief RR-19, Examination Category B-J, Item B9.11, Pressure Retaining Welds in Piping

ASME Code Requirement: Examination Category B-J, Item B9.11 requires essentially 100% volumetric and surface examination, as defined by Figure IWB-2500-8, of the length of selected Class 1 circumferential piping welds, 4-inch national pipe size (NPS) and greater in diameter. "Essentially 100%", as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume shown in Figure IWB-2500-8 for pipe-to-tee Weld 6-SI-14/14 and valve-to-elbow Weld 6-SI-22/03 on the Safety Injection System (SIS).

Licensee's Basis for Relief Request (as stated):

The safety injection circumferential weld 6-SI-14/14 was examined using manual ultrasonic techniques from the outside surface. The transducers used were a 45 degree shear wave, a 45 degree refracted L-wave, and a 70 degree refracted L-wave. The transducers used were manipulated only on the pipe side of the weld and in three different directions, as no scanning could be performed from the tee side. Due to limitations, the required ultrasonic examination resulted in only 47.1% of the required weld volume being examined. Weld 6-SI-14/14 had no recordable indications in the 47.1% of the required volume that was thoroughly examined.

It should be noted that although no credit was taken for extra coverage, the 45 degree shear wave transducer has a screen size incorporating a 6/8 vee path of sound, although credit was only taken for a 4/8 vee path examination. This would have made the coverage over 80% as seen on the accompanying report 69-UT for weld 6-SI-22/03. However, maximum coverage for single-sided examinations is limited to 50% credit per 10 CFR 50.55a (b)(2)(xv)(A)(2), which restricts taking credit for "one sided" examinations without completing a single-sided ASME Section XI, Appendix VIII demonstration using flaws on the opposite side of the weld. At the time of the examinations, no Performance Demonstration Initiative (PDI) program existed for single-sided austenitic welds. Thus 50% examination coverage is the maximum permissible. The limitations for the safety injection circumferential weld 6-SI-14/14 were the adjacent valve connection as depicted on ISI Isometric drawing A-28, and the detail drawing on page 4 of the ultrasonic report number 92-UT dated 3/30/01.

The safety injection circumferential weld 6-SI-22/03 was examined using manual ultrasonic techniques from the outside surface. The transducers used were a 45 degree shear wave and a 70 degree refracted L-wave. The transducers used were manipulated only on the elbow side of the weld and in three different directions, as no scanning could

be performed from the valve side. Due to limitations, the required ultrasonic examination resulted in only 50% of the required weld volume being examined. Weld 6-SI-22/03 had no recordable indications in the 50% of the required volume that was thoroughly examined.

It should be noted that although no credit was taken for extra coverage from the 45 degree shear wave transducer that incorporated a 6/8 vee path of sound, thus obtaining 85% coverage as depicted on page 3 of report 69-UT. However, maximum coverage for single-sided examinations is limited to 50% credit per 10 CFR 50.55a (b)(2)(xv)(A)(2), which restricts taking credit for "one-sided" examinations without completing a single-sided ASME Section XI, Appendix VIII demonstration using flaws on the opposite side of the weld. At the time of the examinations, no Performance Demonstration Initiative (PDI) program existed for single-sided austenitic welds. Thus 50% examination coverage is the maximum permissible. The limitations for the safety injection circumferential weld 6-SI-22/03 were the adjacent tee connection as depicted on ISI Isometric drawing A-27, and the detail drawing on page 3 of the ultrasonic report number 69-UT dated 3/22/01.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance processes were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions and not the four directions described in the ASME Section XI Code. Thus much of the exam volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

Surface examinations of these welds were required by the Code. Surface examinations found no indications.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the welds listed in this relief request. It would also be impractical to perform radiographic examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Evaluation: The ASME Code requires essentially 100% volumetric and surface examination of the length of selected Class 1 circumferential piping welds. However, 100% volumetric examination for Safety Injection System (SIS) Welds 6-SI-14/14 and 6-SI-22/03 cannot be completed due to the design geometries of these pipe-to-tee and valve-to-elbow welds, respectively, which limit scanning coverage to one side of the subject welds only. For the licensee to achieve 100% volumetric coverage, the branch piping connections would need to be redesigned and modified. This would place a

significant burden on the licensee, thus the ASME Code-required 100% volumetric examinations are impractical.

As shown on the sketches and technical descriptions[11] provided by the licensee, approximately 47% and 50% coverage of the required examination volumes were obtained for Welds 6-SI-14/14 and 6-SI-22/03, respectively. The completed examination coverage includes most of the ASME Code-required volume from the pipe side(s) of pipe-to-tee Weld 6-SI-14/14 and pipe-to-valve Weld 6-SI-22/03 for axial scans and the ASME Code-required volumes for circumferential scans, using single element pulse-echo, 45-degree shear waves, and dual transmit-receive, 45-degree and 70-degree longitudinal waves. Axial scans from the tee and valve sides of the subject welds could not be accomplished due to their design geometries, which do not allow directing a sound beam into the weld region. In addition, the ASME Code-required surface examinations were also completed with no limitations to coverage.

While it is impractical for the licensee to obtain 100% of the ASME Code-required volumetric coverage from both sides of the subject welds, it is concluded that if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.11 Request for Relief RR-20, Examination Category C-B, Item C2.21, Pressure Retaining Nozzle Welds in Vessels

ASME Code Requirement: Examination Category C-B, Item C2.21, requires volumetric and surface examination, as defined by Figure IWC-2500-4(a) or (b), as applicable, of Class 2 nozzle-to-shell welds in vessels greater than ½-inch nominal wall thickness without reinforcing plates. ASME Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume shown in Figure IWC-2500-4(a) or (b), as applicable, for nozzle-to-shell Welds RHE-N-14 and RHE-N-15 on the regenerative heat exchanger.

Licensee's Basis for Relief Request (as stated):

The regenerative heat exchanger nozzle weld RHE-N-14 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a 45 degree refracted L wave. The transducer used was manipulated only on the vessel side of the weld and in three different directions, as no scanning could be performed from the nozzle side. Due to limitations, the required ultrasonic examination resulted in only 50% of the required weld volume being examined. Weld RHE-N-14 had no recordable

11. Drawings and technical descriptions provided by the licensee are not included in this report.

indications in the 50% of the required volume that was thoroughly examined. The limitations for the regenerative heat exchanger weld RHE-N-14 were the adjacent nozzle as depicted on ISI Isometric drawing B-43, and the detail drawing on page 8 of the ultrasonic report number 95-FC-UT-003 dated 3/16/95.

The regenerative heat exchanger nozzle weld RHE-N-15 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a 45 degree refracted L wave. The transducer used was manipulated only on the vessel side of the weld and in three different directions, as no scanning could be performed from the nozzle side. Due to limitations, the required ultrasonic examination resulted in only 50% of the required weld volume being examined. Weld RHE-N-15 had no recordable indications in the 50% of the required volume that was thoroughly examined. The limitations for the regenerative heat exchanger weld RHE-N-15 were the adjacent nozzle as depicted on ISI Isometric drawing B-43, and the detail drawing on page 8 of the ultrasonic report number 95-FC-UT-003 dated 3/16/95.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance processes were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions and not the four directions described in the ASME Section XI Code. Thus much of the exam volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

Surface examinations of these welds were required by the Code. Surface examinations found no indications.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the welds listed in this relief request. It would also be impractical to perform radiographic examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWC-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires volumetric and surface examination of selected nozzle-to-shell welds on Class 2 vessels. However, 100% volumetric examination for

regenerative heat exchanger Welds RHE-N-14 and RHE-N-15 cannot be completed due to the design geometries of these nozzle-to-shell welds, which limit scanning coverage to one side of the subject welds only. For the licensee to achieve full volumetric coverage, geometries of the nozzle-to-shell attachment areas would need to be redesigned and modified. This would place a significant burden on the licensee, thus the ASME Code-required volumetric examinations are impractical.

As shown on the sketches and technical descriptions[12] provided by the licensee, approximately 50% coverage of the required examination volumes were obtained for each nozzle-to-shell Weld RHE-N-14 and Weld RHE-N-15. The completed examination coverage includes most of the ASME Code-required volume from the shell side of the regenerative heat exchanger for axial scans, using dual transmit-receive, 45-degree longitudinal waves. Circumferential scanning on portions of these welds was also limited, due to the outside surface blend radius of the weld crowns. Axial scans from the nozzle side of the subject welds could not be accomplished due [to] their design geometry, which does not allow directing a sound beam into the weld region. It is noted that the shell material is fabricated of centrifugally cast stainless steel piping; this material is very difficult to ultrasonically penetrate due to its coarse grained structure, making extended beam path examinations (by skipping sound off the inner surface of the pipe) for increasing volumetric coverage impractical. Therefore, the licensee has made a reasonable effort to maximize volumetric coverage on the subject welds, using currently acceptable methods. In addition, the ASME Code-required surface examinations were also completed with no limitations to coverage.

While it is impractical for the licensee to obtain 100% of the ASME Code-required volumetric coverage from both sides of the subject welds, it is concluded that if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

12. Drawings and technical descriptions provided by the licensee are not included in this report.

3.12 Request for Relief RR-21, Examination Category C-F-1, Items C5.11 and C5.21, Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping

ASME Code Requirement: Examination Category C-F-1, Items C5.11 and C5.21 require 100% volumetric and surface examinations, as defined by Figure IWC-2500-7, of selected Class 2 circumferential welds in austenitic steel or high alloy piping systems. ASME Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume shown in Figure IWC-2500-7 for circumferential piping welds in the Safety Injection (SI), Shutdown Cooling (SDC), Containment Spray (CS), and Charging (CH) Systems listed in Table 3.12 below:

Table 3.12 - Piping Welds Included in RR-21

ASME Item	Weld I.D.	Piping Configuration	Coverage
C5.11	6-SI-2002/15	Elbow-to-flange	41.7%
C5.11	12-SDC-2002/17	Pipe-to-flange	50%
C5.11	12-SDC-2020/20	Pipe-to-tee	50%
C5.11	12-LPH-2001/14	Tee-to-pipe	50%
C5.11	12-CSS-2011/09	Reducer-to-flange	50%
C5.21	4-CH-10/19	Pipe-to-valve	50%

Licensee's Basis for Relief Request (as stated):

The safety injection piping weld 6-SI-2002/15 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a 45 degree shear wave, a 45 degree refracted L wave and a 70 degree shear wave. The transducers were manipulated only on the elbow side of the weld and in three different directions as no scanning could be performed from the flange side. Due to limitations, the required ultrasonic examination resulted in only 41.7% of the required weld volume being examined. Weld 6-SI-2002/15 had no recordable indications in the 41.7% of the required volume that was thoroughly examined. Root geometry was noted. The limitations for the safety injection piping weld 6-SI-2002/15 were the adjacent flange as depicted on ISI Isometric drawing B-42, and the detail drawing on pages 6 and 7 of the ultrasonic report number 166-UT dated 3/28/01.

It should be noted that although no credit was taken for extra coverage, the 45 degree shear wave transducer has a screen size incorporating a 6/8 vee path of sound, although credit was only taken for a 4/8 vee path examination. This would have made the coverage over 80%. However, maximum coverage for single sided examinations is

limited to 50% credit per 10 CFR 50.55a(b)(2)(xv)(A)(2), which restricts taking credit for "one-sided" examinations without completing a single-sided ASME Section XI, Appendix VIII demonstration using flaws on the opposite side of the weld. At the time of the examinations, no Performance Demonstration Initiative (PDI) program existed for single-sided austenitic welds. Thus 50% examination coverage is the maximum permissible.

The shutdown cooling piping weld 12-SDC-2002/17 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a 45 degree shear wave and a 70 degree shear wave. The transducers used were manipulated only on the pipe side of the weld and in three different directions, as no scanning could be performed from the flange side. Due to limitations, the required examination resulted in only 50% of the required weld volume being examined. Weld 12-SDC-2002/17 had no recordable indications in the 50% of the required volume that was thoroughly examined. The limitations for the shutdown cooling pipe weld 12-SDC-2002/17 were the adjacent flange as depicted on ISI Isometric drawing B-22, and the detail drawing on page 3 of the ultrasonic report number 89-UT dated 5/3/02.

It should be noted that although no credit was taken for extra coverage, the 45 degree and 70 degree shear wave transducers had a screen size incorporating a 6/8 vee path of sound. This would have made the coverage over 95%. However, maximum coverage for single sided examinations is limited to 50% credit per 10 CFR 50.55a(b)(2)(xv)(A)(2), which restricts taking credit for "one-sided" examinations without completing a single-sided ASME Section XI, Appendix VIII demonstration using flaws on the opposite side of the weld. At the time of the examinations, no Performance Demonstration Initiative (PDI) program existed for single-sided austenitic welds. Thus 50% examination coverage is the maximum permissible.

The shutdown cooling piping weld 12-SDC-2020/20 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a 45 degree shear wave and a 70 degree shear wave. The transducers used were manipulated only on the pipe side of the weld and in three different directions, as no scanning could be performed from the tee side. Due to limitations, the required ultrasonic examination resulted in only 50% of the required weld volume being examined. Weld 12-SDC-2020/20 had no recordable indications in the 50% of the required volume that was thoroughly examined. The limitations for the shutdown cooling piping weld 12-SDC-2020/20 were the adjacent tee as depicted on the ISI Isometric drawing B-11, and detail drawing on page 3 of the ultrasonic report number 109-UT dated 5/30/02.

It should be noted that the 45 degree and 70 degree shear wave transducers had a screen size incorporating a 6/8 vee path of sound. This would have made the coverage 95%. However, maximum coverage for single sided examinations is limited to 50% credit per 10 CFR 50.55a(b)(2)(xv)(A)(2), which restricts taking credit for "one-sided" examinations without completing a single-sided ASME Section XI, Appendix VIII demonstration using flaws on the opposite side of the weld. At the time of the examinations, no Performance Demonstration Initiative (PDI) program existed for single-sided austenitic welds. Thus 50% examination coverage is the maximum permissible.

The safety injection piping weld 12-LPH-2001/14 was examined using manual ultrasonic techniques from the outside surface. The transducer used was 45 degree shear wave and a 70 degree shear wave. The transducers used were manipulated only on the pipe side of the weld and in three different directions, as no scanning could be performed from the tee side. Due to limitations, the required ultrasonic examination resulted in only 50% of the required weld volume being examined. Weld 12-LPH-2001/14 had no recordable indications in the 50% of the required volume that was thoroughly examined. The limitations for the safety injection piping weld 12-LPH-2001/14 were the adjacent tee as depicted on ISI Isometric drawing B-16, and the detail drawing on page 3 of the ultrasonic report number 66-UT dated 5/3/02.

It should be noted that the 45 degree and 70 degree shear wave transducers had a screen size incorporating a 6/8 vee path of sound. This would have made the coverage 95%. However, maximum coverage for single sided examinations is limited to 50% credit per 10 CFR 50.55a(b)(2)(xv)(A)(2), which restricts taking credit for “one-sided” examinations without completing a single-sided ASME Section XI, Appendix VIII demonstration using flaws on the opposite side of the weld. At the time of the examinations, no Performance Demonstration Initiative (PDI) program existed for single-sided austenitic welds. Thus 50% examination coverage is the maximum permissible.

The containment spray piping weld 12-CSS-2011/09 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a 45 degree shear wave, a 45 degree refracted L wave and a 70 degree shear wave. The transducers used were manipulated only on the reducer side of the weld and in three different directions, as no scanning could be performed from the flange side. Due to limitations, the required ultrasonic examination resulted in only 50% of the required weld volume being examined. Weld 12-CSS-2011/09 had no recordable indications in the 50% of the require volume that was thoroughly examined. The limitations for the containment spray piping weld 12-CSS-2011/09 were the adjacent flange as depicted on ISI Isometric drawing B-39, and the detail drawing on page 3 of the ultrasonic report number 101-UT dated 5/27/02.

It should be noted that although no credit was taken for extra coverage, the 45 degree shear wave transducer had a screen size incorporating a 6/8 vee path of sound, although credit was only taken for a 4/8 vee path examination. This would have made the coverage over 80%. However, maximum coverage for single sided examinations is limited to 50% credit per 10 CFR 50.55a(b)(2)(xv)(A)(2), which restricts taking credit for “one-sided” examinations without completing a single-sided ASME Section XI, Appendix VIII demonstration using flaws on the opposite side of the weld. At the time of the examinations, no Performance Demonstration Initiative (PDI) program for single-sided austenitic welds. Thus 50% examination coverage is the maximum permissible.

The charging piping weld 4-CH-10/19 was examined using manual ultrasonic techniques from the outside surface. The transducer used was 45 degree shear wave and a 70 degree shear wave. The transducers used were manipulated only on the pipe side of the weld and in three different directions, as no scanning could be performed from the valve side. Due to limitations, the required ultrasonic examination resulted in only 50% of the required weld volume being examined. Weld 4-CH-10/19 had no recordable indications in the 50% of the required volume that was thoroughly examined. The

limitations for the charging piping weld 4-CH-10/19 were the adjacent valve as depicted on ISI Isometric drawing B-73, and the detail drawing on page 3 of the ultrasonic report number 73-UT dated 5/3/02.

It should be noted that the 45 degree shear wave transducer had a screen size incorporating a 6/8 vee path of sound. This would have made the coverage 84%. However, maximum coverage for single sided examinations is limited to 50% credit per 10 CFR 50.55a(b)(2)(xv)(A)(2), which restricts taking credit for "one-sided" examinations without completing a single-sided ASME Section XI, Appendix VIII demonstration using flaws on the opposite side of the weld. At the time of the examinations, no Performance Demonstration Initiative (PDI) program existed for single-sided austenitic welds. Thus 50% examination coverage is the maximum permissible.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance processes were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions and not the four directions described in the ASME Section XI Code. Thus much of the exam volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

Surface examinations of these welds were required by the Code. Surface examinations found no indications.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the welds listed in this relief request. It would also be impractical to perform radiographic examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWC-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires 100% volumetric and surface examination of selected circumferential welds in Class 2 austenitic stainless steel or high alloy piping systems. However, 100% volumetric examination for the welds listed in Table 3.12 above cannot be completed due to the design geometries of adjacent components such as flanges, tees or valves, which limit scanning coverage to one side of the subject

welds only. For the licensee to achieve full volumetric coverage, geometries of the piping and adjacent components would need to be redesigned and modified. This would place a significant burden on the licensee, thus the ASME Code-required volumetric examinations are impractical.

As shown on the sketches and technical descriptions[13] provided by the licensee, approximately 42% coverage of the required examination volume was obtained for Weld 6-SI-2002/15, and approximately 50% coverage of the required examination volumes were obtained for each of the subject remaining Welds 12-SDC-2002/17, 12-SDC-2020/20, 12-LPH-2001/14, 12-CSS-2011/09, and 4-CH-10/19. These examinations were limited to the pipe side of the welds only, due to outside surface geometries of the adjacent joined components (see Table 3.12 for a list of the pipe-to-component configurations). The completed examinations cover most of the ASME Code-required volumes from the pipe side of the welds for axial scans using multiple techniques, including single element, pulse-echo 45-degree shear waves and dual transmit-receive, 45-degree or 70-degree longitudinal waves. Circumferential scanning on these welds was also performed with similar methods. Axial scans from the joined component (flange, tee, or valve) side of the subject welds could not be accomplished due to the design geometry, which does not allow directing a sound beam into the weld region. No service-induced flaws were detected in any of the volumetric examinations performed. In addition, the ASME Code-required surface examinations were also completed with no limitations to coverage.

While it is impractical for the licensee to obtain 100% of the ASME Code-required volumetric coverage from both sides of the subject welds, it is concluded that if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.13 Request for Relief RR-22, Examination Category C-F-2, Item C5.51, Pressure Retaining Welds in Carbon or Low Alloy Piping

ASME Code Requirement: Examination Category C-F-2, Item C5.51 requires 100% volumetric and surface examinations, as defined by Figure IWC-2500-7, of selected Class 2 circumferential welds in carbon steel or low alloy piping systems. ASME Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's ASME Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from examining 100% of the ASME Code-required inspection volume and surface area shown in Figure IWC-2500-7 for circumferential pipe-to-flange Welds 6-MS-2005/02 and 6-MS-2006/02 in the Main Steam System.

Licensee's Basis for Relief Request (as stated):

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13. Drawings and technical descriptions provided by the licensee are not included in this report.

The main steam piping weld 6-MS-2005/02 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a 45 degree shear wave and a 60 degree shear wave. The transducers used were manipulated only on the pipe side of the weld and three different directions, as no scanning could be performed from the flange side. Additionally, the scanning was limited due to the 4 welded lugs located at every 90 degrees. These are depicted in the ultrasonic report number 189-UT dated 4/1/01. Due to limitations, the required ultrasonic examination resulted in only 41% of the required weld volume being examined. Weld 6-MS-2005/02 had no recordable indications in the 41% of the required volume that was thoroughly examined. Root geometry was noted. The limitations for the safety injection piping weld 6-MS-2005/02 were the adjacent flange and 4 welded lugs as depicted on ISI Isometric drawing B-06, and the detail drawing on pages 5, 6 and 7 of the ultrasonic report number 189-UT dated 4/1/01. In addition, the required surface examination on 6-MS-2005/02 resulted in only 70% of the required area being examined. This again, was due to the 4 welded lugs at every 90 degrees and is depicted on magnetic particle test report number 189-MT dated 4/1/01. These welded lugs are not considered removable.

The main steam piping weld 6-MS-2006/2 was examined using manual ultrasonic techniques from the outside surface. The transducer used was a 45 degree shear wave and a 60 degree shear wave. The transducers used were manipulated only on the pipe side of the weld and in three different directions, as no scanning could be performed from the flange side. Additionally, the scanning was limited due to the 4 welded lugs located at every 90 degrees. These are depicted in the ultrasonic report number 189-UT dated 4/1/01. Due to limitations, the required ultrasonic examination resulted in only 48% of the required weld volume being examined. Weld 6-MS-2006/02 had no recordable indications in the 45% of the required volume that was thoroughly examined. Root geometry was noted. The limitations for the safety injection piping weld 6-MS-2006/02 were the adjacent flange and 4 welded lugs as depicted on ISI Isometric drawing B-06, and the detail drawing on pages 5, 6 and 7 of the ultrasonic report number 190-UT dated 4/1/01. In addition, the required surface examination on weld 6-MS-2006/02 resulted in only 70% of the required area being examined. This again, was due to the 4 welded lugs at every 90 degrees and is depicted on magnetic particle test report number 190-MT dated 4/1/01. These welded lugs are not considered removable.

The proposed alternative is to accept the achievable inspection coverage as representative of the condition of the entire required inspection volume. The inaccessible examination volumes represent a small percentage of the overall required exam volume. The accessible UT exam volumes were successfully examined in accordance with Code requirements and were found to be free of service-induced flaws. The exam results from the accessible areas would be representative of the inaccessible areas because the same fabrication and maintenance processes were applicable to both. Many areas of inaccessibility were so designated not because they could not be examined at all, but because the UT sound beam only traveled in one or two directions and not the four directions described in the ASME Section XI Code. Thus much of the exam volume reported as inaccessible in this relief request was partially examined without detecting any service-induced flaws.

Surface examinations of these welds were required by the Code. Surface examinations found no indications.

OPPD concludes that performing the required ultrasonic examination of essentially 100% of the weld volume to be impractical on the welds listed in this relief request. It would also be impractical to perform radiographic examinations to increase or supplement the ultrasonic coverage of the required weld volume. The ultrasonic examination of the maximum extent possible will provide an acceptable level of quality and safety. OPPD concludes that significant degradation, if present, would have been detected during the ultrasonic examination performed on the subject welds.

Licensee's Proposed Alternative Examination (as stated):

In lieu of the ASME Code-required essentially 100% coverage of the weld and adjacent material as described in ASME Section XI Table IWC-2500-1, OPPD proposes an examination of the accessible areas to the maximum extent practical within the limitations of design, geometry and materials of construction.

Evaluation: The ASME Code requires 100% volumetric and surface examination of selected circumferential welds in Class 2 carbon steel or low alloy piping systems. However, 100% volumetric and surface examination for Welds 6-MS-2005/02 and 6-MS-2006/02 cannot be completed due to the pipe-to-flange design geometry and the presence of welded support lugs, which restrict access to these welds. For the licensee to achieve full volumetric and surface coverage, the piping and adjoining flanges, and support system appurtenances, would need to be redesigned and modified. This would place a significant burden on the licensee, thus the ASME Code-required volumetric examinations are impractical.

As shown on the sketches and technical descriptions[14] provided by the licensee, approximately 41% and 48% coverage of the required examination volumes were obtained by ultrasonic testing for Welds 6-MS-2005/02 and 6-MS-2006/02, respectively. The ultrasonic examinations were limited to the pipe side of the welds only, due to outside surface geometries of the adjoining bolted flanges. Additionally, four welded support lugs slightly interfere with the pipe side scanning region on these welds. The completed examinations cover nearly one-half of the ASME Code-required volumes from the pipe side of the welds for axial scans using single element, pulse-echo 45- and 60-degree shear waves. Circumferential scanning on these welds was also performed with similar methods. Axial scans from the flange side of the subject welds could not be accomplished due to the tapered outside surface geometry of the bolted flange, which does not allow directing a sound beam into the weld region. No service-induced flaws were detected in any of the volumetric examinations performed.

Approximately 70% of the ASME Code-required surface area coverage, using magnetic particle testing, was obtained for each of these welds. Four welded support lugs interfered with placement of the magnetizing yoke, which caused the reduced coverage obtained during the surface examinations. These carbon steel lugs, or gusset plates, are integrally welded along the piping axis, located at approximately 90-degree intervals around the circumference of the pipe, and extend from the upstream side, over and

14. Drawings and technical descriptions provided by the licensee are not included in this report.

across, to the downstream side of the subject welds. No service-induced flaws were detected during the surface examinations of the subject welds.

While it is impractical for the licensee to obtain 100% of the ASME Code-required volumetric coverage from both sides of the subject welds, and surface coverage due to integrally welded support lugs, it is concluded that if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would be detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

4.0 CONCLUSIONS

The PNNL staff has reviewed the licensee's submittal and concludes that ASME Code examination coverage requirements are impractical for the subject welds listed in Requests for Relief RR-10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -20, -21, and -22. Further, if significant service-induced degradation were occurring in the subject components, there is reasonable assurance that evidence of it would have been detected by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that the subject relief requests be granted for the third 10-year interval at Fort Calhoun Station, which concluded on October 31, 2004. 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.

TABLE 1
SUMMARY OF RELIEF REQUESTS

Relief Request Number	PNNL TLR Sec.	System or Component	Exam. Category	Item No.	Volume or Area to be Examined	Required Method	Licensee Proposed Alternative	Relief Request Disposition
RR-10	3.1	RPV Shell Welds	B-A	B1.11 B1.12	100% of length of all pressure-retaining shell welds	Volumetric	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-11	3.2	RPV Closure Head-to-flange Weld	B-A	B1.40	100% of length of pressure-retaining head-to-flange weld	Volumetric and Surface	Use achieved volumetric and surface coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-12	3.3	PZR Shell Welds	B-B	B2.11 B2.12	100% of length of selected pressure-retaining shell welds	Volumetric	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-13	3.4	SG Nozzle-to-vessel Welds	B-D	B3.130	100% of pressure-retaining nozzle-to-vessel welds	Volumetric	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-14	3.5	Regenerative Heat Exchanger	B-D	B3.150	100% of pressure-retaining Class 1 nozzle-to-shell welds	Volumetric	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-15	3.6	RPV Nozzle-to-vessel Welds	B-D	B3.90	100% of pressure-retaining nozzle-to-vessel welds	Volumetric	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-16	3.7	SG Nozzle Dissimilar Metal Welds	B-F	B5.70	100% of pressure-retaining dissimilar metal welds in nozzles	Volumetric and Surface	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-17	3.8	Class 1 Piping Welds	B-J	B9.11	100% of selected pressure-retaining circumferential piping welds	Volumetric and Surface	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-18	3.9	Class 1 Piping Welds	B-J	B9.31	100% of selected pressure-retaining branch piping welds	Volumetric ans Surface	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-19	3.10	Class 1 Piping Welds	B-J	B9.11	100% of selected pressure-retaining circumferential piping welds	Volumetric and Surface	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-20	3.11	Regenerative Heat Exchanger	C-B	C2.21	100% of pressure-retaining Class 2 nozzle-to-shell welds	Volumetric and Surface	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-21	3.12	Class 2 Piping Welds	C-F-1	C5.11 C5.21	100% of selected pressure-retaining circumferential piping welds	Volumetric and Surface	Use achieved volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
RR-22	3.13	Class 2 Piping Welds	C-F-2	C5.51	100% of selected pressure-retaining circumferential piping welds	Volumetric and Surface	Use achieved volumetric and surface coverage	Granted 10 CFR 50.55a(g)(6)(i)