April 16, 2002

Mr. C. Lance Terry
Senior Vice President & Principal Nuclear Officer
TXU Generation Company LP
Attn: Regulatory Affairs Department
P. O. Box 1002
Glen Rose, TX 76043

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES), UNIT 2 - RE: FIRST 10-YEAR INSERVICE INSPECTION (ISI) INTERVAL REQUEST FOR RELIEF FROM THE REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) BOILER AND PRESSURE VESSEL CODE (CODE) CONCERNING RELIEF REQUESTS A-4, REVISION 1; A-5, REVISION 2; A-6, A-7, AND A-8 (TAC NO. MB3039)

Dear Mr. Terry:

By letter dated September 28, 2001, as supplemented by letters dated March 4 and March 20, 2002, TXU Generation Company LP (the licensee) requested relief from ASME Code requirements for the first 10-year ISI interval for CPSES, Unit 2. The licensee requested relief from the ISI requirements identified by the licensee as Relief Requests A-4, Revision 1; A-5, Revision 2; A-6, A-7, and A-8.

The U. S. Nuclear Regulatory Commission (NRC) staff concludes that for Relief Requests A-4, Revision 1, A-5, Revision 2, and A-7, the proposed alternatives provide an acceptable level of quality and safety; therefore, relief is authorized pursuant to 10 CFR 50.55a(a)(i) for the first 10-year ISI interval for CPSES, Unit 2. In addition, the NRC staff concludes that for Relief Requests A-6 and A-8, compliance with the specified requirements results in hardship without a compensating increase in the level of quality and safety; therefore, the NRC staff authorizes the proposed alternatives pursuant to 10 CFR 50.55a(a)(3)(ii) for the first 10-year ISI interval for CPSES, Unit 2.

The NRC staff's safety evaluation is enclosed.

Sincerely,

/RA by W. Reckley for/

Robert A. Gramm, Chief, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-446

Enclosure: Safety Evaluation

cc w/encl: See next page

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**No legal objection
*Technical input via memo dated March 28, 2002

Accession No.: ML020890001
**No legal objection

OFFICE	PDIV-1/PM	PDIV-1/LA	EMCB/SC*	OGC	PDIV-1/SC
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Comanche Peak Steam Electric Station

cc:

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March 2002

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FIRST 10-YEAR INSERVICE INSPECTION INTERVAL

REQUEST FOR RELIEF

TXU GENERATION COMPANY LP

COMANCHE PEAK STEAM ELECTRIC STATION, UNIT 2

DOCKET NO. 50-446

1.0 INTRODUCTION

By letter dated September 28, 2001, as supplemented by letters dated March 4 and March 20, 2002, TXU Generation Company LP (TXU or the licensee) requested relief from American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) requirements for the first 10-year Inservice Inspection (ISI) interval for Comanche Peak Steam Electric Station (CPSES), Unit 2. The requested relief from the ISI requirements are identified by the licensee as Relief Requests A-4, Revision 1; A-5, Revision 2; A-6, A-7, and A-8.

2.0 BACKGROUND

ISI of the ASME 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 Regulations* (10 CFR) Section 50.55a(g), except where specific written relief has been granted by the U.S. Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.55a(g)(6)(i). As stated in 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the applicant 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) must meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, “Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components,” to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by

reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. In accordance with 10 CFR 50.55a(b), the applicable version of the Code is the 1986, no Addenda for the first 10-year ISI interval at CPSES, Unit 2.

3.0 RELIEF REQUESTS

3.1 RELIEF REQUEST A-4 , Revision 1

The Components for Which Relief is Requested

Four Class 1 Reactor Pressure Vessel (RPV) Nozzle-to-Vessel welds examined at CPSES, Unit 2.

RPV Nozzle-to-Vessel Weld (Weld TCX–1-1100A-19)
RPV Nozzle-to-Vessel Weld (Weld TCX–1-1100A-22)
RPV Nozzle-to-Vessel Weld (Weld TCX–1-1100A-23)
RPV Nozzle-to-Vessel Weld (Weld TCX–1-1100A-26)
RPV Nozzle-to-Vessel Weld (Weld TCX–1-1100A-20)
RPV Nozzle-to-Vessel Weld (Weld TCX–1-1100A-21)
RPV Nozzle-to-Vessel Weld (Weld TCX–1-1100A-24)
RPV Nozzle-to-Vessel Weld (Weld TCX–1-1100A-25)

Code Requirement

ASME Section XI Class 1, ASME Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1986 Edition with no Addenda; Table IWB-2500-1, Examination Category B-D, Full Penetration Welds of Nozzles in Vessels, Code Item B3.90, Figures IWB-2500-7 (a), (b), and (c) and Article 4 of Section V for the Ultrasonic (UT) examination.

Code Requirement from which Relief is Requested (as stated):

Pursuant to 10 CFR 50.55a(a)(3)(i), TXU Generating Company LP (TXU) requests to implement an alternative to the Volumetric (Ultrasonic Testing (UT)) requirements of ASME Section XI Table IWB-2500-1, Examination Category B-D, Full Penetration Welds of Nozzles in Vessels, Code Item B3.90, Figures IWB-2500-7 (a),(b) and (c). In lieu of the requirements of ASME Section XI, Figures IWB-2500-7 (a), (b), and (c), TXU Electric proposes to reduce the examination volume next to the widest part of the weld from half of the vessel wall thickness to one-half (½) inch from the weld; as indicated in a proposed revision to Code Case N-613.

This relief is requested for the Comanche Peak Steam Electric Station Unit 2, first 10-year interval vessel examination.

Licensee's Proposed Alternative (as stated):

For CPSES Unit 2 TXU proposes to use the reduced volume of one-half (½) inch from the widest part of the weld, in lieu of the requirements of ASME Section XI Figures IWB-2500-7 (a) and (b). This proposed inspection volume is consistent with the weld volume as indicated in

Figures 1, 2, and 3 of the Committee Correspondence letter dated October 23, 2000 from W. Norris to the ASME Subgroup Water-Cooled Systems (Reference 3 [in the licensee's March 4, 2002, supplement]). It is required that this relief be in effect until the end of the first ten-year interval.

TXU proposes to use the alternative requirements defined above in lieu of ASME Section V, Article 4 for the performance of the required volumetric examinations as specified in Table IWB-2500-1 Category B-D, Code Item B3.90, of the 1986 Edition with no Addenda of ASME Section XI. This relief is requested only for CPSES Unit 2 first ten-year interval, reactor pressure vessel examinations, which are scheduled to occur in March of 2002.

TXU will perform examinations in accordance with ASME Code, Section XI, Div. 1, 1995 Edition, 1996 Addenda, Appendix VIII Supplement 4 and 6 as amended by the *Federal Register* Notice 64 FR 51370 dated September 22, 1999, for the portion of the examination conducted from the vessel shell. For the examination conducted from inside the vessel, the inner volume will be examined to a minimum depth of 15% in four orthogonal directions with personnel and procedures qualified in accordance with Supplement 4, as modified by the rule, and the volume not examined according to Supplement 4 will be examined from the nozzle bore.

The extent of examination coverage proposed, along with the demonstrated ultrasonic technique and periodic system pressure tests will provide added assurance that the Reactor Vessel welds have remained free of service related flaws, therefore providing an acceptable level of quality and safety.

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

The examination volume for the RPV pressure retaining nozzle-to-vessel welds extend far beyond the weld into the base metal, and is unnecessarily large. This extends the examination time significantly, and results in no net increase in safety, as the area being examined is a base metal region which is not prone to inservice cracking and has been extensively examined during construction, pre-service examination, and during the first inservice examinations with acceptable results.

The implementation of this request for relief would reduce the examination volume next to the widest part of the weld from half of the vessel wall thickness to one-half (½) inch from the weld. This reduction is applicable to base metal examination volume that was extensively interrogated during the construction and pre-service inspections and is not located in the high stressed areas of the nozzle-to-vessel weld. The high stressed areas are included in the examination volume as defined above and are subject to examination.

The UT [ultrasonic test] examination of the RPV vessel-to-nozzle weld will be performed both from the vessel shell and from the nozzle bore to ensure full code required through volume examination coverage. The portion of the examination from the vessel shell will be conducted utilizing Appendix VIII Supplements 4 and 6 as amended by the Final Rule in *Federal Register* Notice 64 FR 51370 dated September 22, 1999 in lieu of Article 4 of Section V, which will allow TXU to use a Performance Demonstration Initiative (PDI) qualified procedure, personnel, and equipment for the examination.

In addition to the examination from the vessel wall, a UT examination from the nozzle bore will be performed per the requirements of Article 4 of Section V and the subsequent guideline requirements of Regulatory Guide 1.150 Rev. 1. Currently there are no PDI qualified procedures for the bore examination of the nozzle to vessel weld. The Final Rule requires implementation of Appendix VIII Supplement 7 "Qualification Requirements for Nozzle-To-Vessel Weld" by November 22, 2002. In Supplement 7 and as amended in the Final Rule, both Supplements 4 and 6 will be required at that time.

The use of a qualified UT procedure implementing Supplements 4 and 6 for the portion of the examinations conducted from the vessel shell will save time on the RPV inspection since this would be the same procedure and set up as used for the adjacent welds.

Evaluation

The licensee proposes reducing the examination volume to ½-inch from the widest part of the weld, consistent with Figures 1, 2, and 3 of Committee Correspondence dated October 23, 2000, in lieu of one-half the through-wall thickness from each side of the weld required by Figures IWB-2500-7(a) and (b). The acceptability of this reduced volume examination is based on prior examinations of the base metal and internal stress distribution near the weld. The base metal was extensively examined during construction, pre-service inspection, and inservice examinations. These examinations showed the ASME Code volume to be free of unacceptable flaws. The creation of flaws during plant service in the volume excluded by the proposed reduced examination is unlikely because of the low stress in the base metal away from the weld. The stresses caused by welding are concentrated at and near the weld. The highly stressed areas are within the volume included in the reduced examination volume proposed by the licensee. The prior thorough examination of the base metal and the examination of the highly stressed areas of the weld provide an acceptable level of quality and safety.

The licensee also proposes to perform the UT examination of the specified nozzle-to-vessel welds from inside the vessel with personnel and procedures qualified according to Supplements 4 and 6 of Appendix VIII of Section XI in lieu of the requirements of their ISI Code of record, and from the nozzle bore with personnel and procedures qualified according to its ISI Code of record. The ISI Code of record invokes examination requirements of Appendix I, Article I-2000, which in turn references Section V, Article 4. Article 4 requires the use of prescriptive criteria for qualifying UT techniques (nominal scanning angles of 0, 45, 60, and 70 degrees). The NRC staff has determined that the use of prescriptive criteria for qualifying UT techniques may be less effective than the use of performance-based criteria for detecting and sizing flaws in reactor vessels. This determination was made in September 22, 1999, rulemaking (64 FR 51370) that revised 10 CFR 50.55a and mandated accelerated implementation of Appendix VIII to Section XI of the ASME Code. That section of the ASME Code requires that the examination of nozzle-to-vessel welds utilize performance-based UT techniques that are qualified according to the criteria in Section XI, Appendix VIII, Supplement 7. Compliance with 10 CFR 50.55a(g)(6)(ii)(C) requires implementation by November 22, 2002. The nuclear utilities are participating in the Electric Power Research Institute's PDI [performance demonstration initiative] program that was created to develop a generic qualification process that would allow utilities to meet the implementation date established by the rule.

Because the licensee does not yet have a fully developed qualification process for Supplement 7, the licensee's proposed alternative is to perform the nozzle-to-vessel weld examinations from the vessel shell with Appendix VIII, Supplement 7, qualified personnel and procedures, where possible. Otherwise, they will meet the Code requirements. For examinations conducted from inside the vessel, the rule would require that the inner volume be examined to a minimum depth of 15 percent in four orthogonal directions with personnel and procedures qualified in accordance with Supplement 4, as modified by the rule. The licensee's proposed alternative will satisfy these criteria. The rule would also require that when the volume cannot be effectively examined in all four directions, the examination must be augmented by examination from the bore using personnel and procedures qualified in accordance with Supplements 4 and 6. The licensee's proposed alternative is to continue using the prescriptive criteria from their ISI Code of record for examinations conducted from the bore because there is no PDI qualified procedure for bore examinations of nozzle-to-vessel welds. This methodology is comparable or better than the prescriptive UT, and approaches the methodology for Supplement 7 examinations that will be required after November 22, 2002.

Therefore, based on the above discussion, the NRC staff has determined that the proposed alternative for the examinations of the subject RPV nozzle-to-vessel welds provides an acceptable level of quality and safety and is authorized for the first 10-year ISI interval at CPSES, Unit 2 in accordance with 10 CFR 50.55a(a)(3)(i).

3.2 RELIEF REQUEST A-5, REVISION 2

The Components for Which Relief is Requested

Eight Class 1 RPV Nozzle-to-Shell welds. ASME Section XI, Class 1, Examination Category B-D, Item No. B3.100 Nozzle Inside Radius Section in Reactor Pressure Vessels (RPV) welds Examined at CPSES, Unit 2.

RPV Outlet Nozzle-to-Shell Welds

RPV Nozzle-to-Shell Weld (Weld TCX—1-1100A-19IR)
RPV Nozzle-to-Shell Weld (Weld TCX—1-1100A-22IR)
RPV Nozzle-to-Shell Weld (Weld TCX—1-1100A-23IR)
RPV Nozzle-to-Shell Weld (Weld TCX—1-1100A-26IR)

RPV Inlet Nozzle-to Shell Welds

RPV Nozzle-to-Shell Weld (Weld TCX—1-1100A-20IR)
RPV Nozzle-to-Shell Weld (Weld TCX—1-1100A-21IR)
RPV Nozzle-to-Shell Weld (Weld TCX—1-1100A-24IR)
RPV Nozzle-to-Shell Weld (Weld TCX—1-1100A-25IR)

Code Requirement (as stated):

ASME Section XI Class 1, ASME Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1986 Edition with no Addenda; Table IWB-2500-1, Examination Category B-D, Full Penetration Welds of Nozzles in Vessels, Code Item B3.100, Figures IWB-2500-7 (a) through (d).

Code Requirement from Which Relief is Requested (as stated):

Pursuant to 10 CFR 50.55a(a)(3)(i), TXU requests to implement an alternative to the Volumetric (Ultrasonic (UT)) requirements of ASME Code Section XI Table IWB-2500-1, Examination Category B-D, Item B3.100. TXU proposes to perform an enhanced visual examination.

Relief is requested for the Comanche Peak Steam Electric Station Unit 2, first 10-year interval vessel examination.

Licensee's Basis for Relief (as stated):

Comanche Peak Unit 2 is currently required to perform inservice examinations of selected welds in accordance with the requirements of 10 CFR 50.55a, and the 1986 Edition with no Addenda of the ASME Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components. According to a NRC memorandum (Reference 1 [in the licensee's September 28, 2001 submittal]), the NRC staff indicated that an ultrasonic examination could be replaced by VT-1 visual examination for the proposed RPV nozzle inspections on the basis surveillance is maintained and VT-1 visual examination is performed.

The implementation of this relief is also expected to reduce vessel examination time by approximately 20 hours, which will reduce personnel radiation exposure and yield a cost savings.

Licensee's Proposed Alternate Examinations

TXU Energy (TXU) proposes to perform a remote visual examination of the accessible surface M-N as shown in Figures IWB-2500-7(a) through (d) in lieu of the volumetric examination requirements of ASME Section XI, Table IWB-2500-1, Examination Category B-D, Item No. B3.100, a VT-1 visual examination will be performed.

Additionally, TXU proposes to perform an enhanced VT-1 (EVT) visual examination with essentially 100-percent coverage in lieu of the UT. The enhanced aspect of the examination is to use 8x magnification video equipment to examine the inner radii. The resolution sensitivity for this remote, in-vessel exam will be established using a 1-mil diameter wire.

TXU will also adhere to the allowable flaw length criteria in Table IWB-3512-1 of the ASME Code, Section XI, 1986 edition, for the disposition of any linear flaws.

Licensee's Justification for the Granting of Relief (as stated):

In an NRC memorandum (Reference 1), the NRC staff indicated that an ultrasonic examination could be replaced by VT-1 visual examination for the RPV nozzle inspections on the basis surveillance is maintained by a VT-1 visual examination. The proposed alternative examinations will not have an impact upon the overall plant quality and safety, and the granting of relief should not jeopardize the health and safety of the public.

Moreover, in NUREG-0619, the NRC staff concluded that UT of the vessel nozzle inner radius section involves complex geometries, long examination metal paths, and inherent UT beam

spread, scatter, and attenuation. During the intervening years, improvements in UT technologies were introduced (e.g., computer modeling, tip diffraction, and phased array scanning), which improved the quality of the examination for this component. However, the area remains difficult to examine completely.

TXU believes that even with vessel examinations using improved NDE [nondestructive examination] technology from the outside surface, the complex geometry of the RPV nozzle inner radius sections prevents complete UT coverage. Hence, TXU proposes to perform an enhanced VT-1 (EVT) visual examination with essentially 100-percent coverage in lieu of the UT. The enhanced aspect of the examination is to use 8x magnification video equipment to examine the inner radii. The resolution sensitivity for this remote, in-vessel exam will be established using a 1-mil diameter wire.

The primary degradation mode in RPV nozzles is fatigue, which produces hairline surface indications along the circumference of the nozzle at the inner radius section. Given the 1-mil resolution capability of the EVT, it is highly unlikely that the TXU would not detect such flaws using high magnification cameras that can examine 100 percent of the nozzle inner radius section surface area. TXU believes that the high resolution image from the camera in lieu of UT of the inner nozzle radius that is difficult to perform, provides adequate assurance of structural integrity. TXU will also adhere to the allowable flaw length criteria in Table IWB-3512-1 of the ASME Code, Section XI, 1986 edition, for the disposition of any linear flaws. Therefore, there is reasonable assurance that the proposed alternative will result in an acceptable level of quality and safety.

Evaluation

In the mid 1970s, fatigue-initiated cracking was discovered in the nozzle inner radius section of feedwater nozzles at 18 boiling water reactor plants. Volumetric testing did not reveal the presence of these cracks. This prompted the NRC to prepare NUREG-0619 which modified the inspection requirements for these components.

In NUREG-0619, the NRC staff concluded that UT of the vessel nozzle inner radius section involves complex geometries, long examination paths, and inherent UT beam spread, scatter and attenuation. During the intervening years, improvements in UT technologies were introduced (e.g., computer modeling, tip diffraction, and phased array scanning), which made improvements to the quality of the examination for this type of component. However, the area remains difficult to examine completely.

The NRC staff finds that even with vessel examinations using improve NDE technology from the outside surface, the complex geometry of the RPV nozzle inner radius sections prevents complete UT coverage. The licensee proposed to perform an enhanced VT-1 visual examination with essentially 100-percent coverage in lieu of the UT examination. The enhanced aspect of the examination is to use 8x magnification video equipment to examine the inner radii. The resolution sensitivity for this remote exam will be established using a 1-mil diameter wire.

The primary degradation mode in RPV nozzles is fatigue, which produces hairline surface indications along the circumference of the nozzle at the inner radius section. Given the 1-mil resolution capability of the enhance VT-1, it is highly unlikely that the licensee would not detect

such flaws using high magnification cameras that can examine essentially 100-percent of the nozzle inner radius section surface area. The NRC staff has determined that the high resolution image from the camera will provide adequate assurance of structural integrity in lieu of UT examination. The licensee will use the allowable flaw length criteria in Table IWB-3512-1 of the ASME Code, Section XI, 1986 Edition, for the disposition of flaws. The NRC staff finds that the proposed alternative will result in an acceptable level of quality and safety.

Therefore, based on the above, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the first 10-year inservice inspection interval at CPSES, Unit 2, because the proposed alternative will provide an acceptable level of quality and safety.

3.3 RELIEF REQUEST A-6

The Components for Which Relief is Requested

Sixteen Category B-J Pressure Retaining Piping welds attaching the reactor pressure vessel (RPV) Nozzle to safe end and safe end elbow.

Weld Numbers:

TCX-1-4100-1	TCX-1-4300-1
TCX-1-4100-2	TCX-1-4300-2
TCX-1-4100-13	TCX-1-4300-13
TCX-1-4100-14	TCX-1-4300-14
TCX-1-4200-1	TCX-1-4400-1
TCX-1-4200-2	TCX-1-4400-2
TCX-1-4200-13	TCX-1-4400-13
TCX-1-4200-14	TCX-1-4400-14

Code Requirement (as stated):

The 1999 Edition of 10 CFR 50.55a was revised by *Federal Register* Notice 64 FR 51400 on September 22, 1999. This revision requires the implementation of ASME Code, Section XI, 1995 Edition with 1996 Addenda, Appendix VIII, Supplements 2 and 3 for austenitic piping welds be implemented by May 22, 2000.

Code Requirement from Which Relief is Requested (as stated):

Pursuant to 10 CFR 50.55a(a)(3)(ii), TXU requests relief from ASME Section XI, Appendix VIII Supplement 2 and 3 for piping welds. TXU is requesting approval to use alternative requirements by performing ultrasonic (UT) examination of the subject welds from the inside surface in accordance with the 1986 Edition, no addenda, of the ASME Code, Section XI, Paragraph IWA-2232 and Appendix III. This relief request would be for the CPSES- 2 first 10-year interval reactor pressure vessel examination scheduled for the spring of 2002.

Licensee's Basis for Relief (as stated):

The subject welds are located inside the primary shield and reactor cavity. There are currently no Appendix VIII qualified personnel or procedures for performing piping welds from the inside surface. In lieu of doing the Appendix VIII, Supplements 2, and 3 UT examinations from the pipe OD [outside diameter], TXU requests relief to continue the past practice of performing the UT examination from the inside diameter (ID) using the 1986 Edition of the ASME Code, Section XI, Paragraph IWA-2232 (b), and Appendix III.

This will be done in conjunction with our 10-year vessel examination, utilizing current industry technology. This will reduce the examination limitations by employing the UT from the ID. The ID examination would reduce the radiation dose and be a cost savings by eliminating the need for the removal of the sand plugs.

To perform the UT examination from the outside surface personnel performing the manual examinations (and supports such as builders of scaffolding, removal of insulation, preparing and cleaning the welds, fire watch, health physics among others) maybe exposed to a dose rate of 2500 to 8000 mRem/Hr.

The estimated number of hours required of these examinations, are as follows:

- Build scaffolding: 84 hours,
- Remove insulation: 32 hours,
- Weld preparation: 48 hours,
- Nondestructive examinations for 24 welds: 96 hours,
- Reinstall insulation: 32 hours and
- Remove scaffolding: 32 hours.

The total man-hours are 324. Using an effective dose rate of 0.25 R/Hr for work directly on the welds and 0.040 R/Hr for work away from the welds, the estimated dose is 27 Person-Rem.

TXU 's vendor would be required to perform an additional qualification exercise if they have to implement Appendix VIII examinations on the subject welds during the upcoming refueling outage. It is estimated that the total cost to our inspection vendor could exceed $150,000.

Licensee's Proposed Alternative

The licensee proposes to perform RPV ultrasonic examination of the subject welds from the inside surface in accordance with the 1986 Edition, no Addenda of the ASME Boiler and Pressure Vessel Code Section XI, Paragraph IWA-2232(b), and Appendix III.

Licensee's Justification for the Granting of Relief (as stated):

In 1991, licensees created the Performance Demonstration Initiative (PDI) to implement the performance demonstration requirements of Appendix VIII to Section XI of the Code for UT examination systems. PDI began qualifying personnel and procedures to Appendix VIII, Supplements 2 and 3 in 1994. These qualifications were applicable for UT examinations conducted from the outside surface of the pipe-to-pipe weld. By the time the proposed rule was published for comment in the *Federal Register* (62 FR 63892) on December 3, 1997, the staff

and PDI believed that a sufficient number of UT personnel were qualified to Supplement 2 requirements to satisfy the licensees' needs. The staff established the accelerated implementation schedule for Supplement 2 based on this availability of qualified personnel. The final rule was published in the *Federal Register* (64 FR 51370) on September 22, 1999, which has since been reflected in the regulations.

Shortly after publishing the final rule, PDI realized that their program could not support Supplement 2 performance demonstrations conducted from the inside surface. For example, the existing test specimens were designed for performance demonstrations performed on the outside surface; the specimens contained flaws which were visible from the inside surface; and, the specimens did not model geometric limitations or scanning conditions which would been encountered during inside surface examinations. To support performance demonstrations conducted from the inside pipe surface, PDI has had to: design, fabricate, and acquire new test specimens; develop the appropriate protocol and test implementation procedures; "fingerprint" the specimens; develop inspection procedures; and train personnel.

PDI has submitted a proposed Code change to Supplement 2 that provides criteria for examinations that are to be performed from the inside diameter of piping. PDI projected that they will be able to support performance demonstrations from the pipe inside surface by November 22, 2002.

TXU has determined that Supplement 2 examinations performed on the outside surface of the safe-end-to-pipe welds would not satisfy Code coverage requirements. Examinations from the outside surface would also require that the sand plugs be removed from the floor of the refueling cavity, and would result in additional costs and occupational radiation dose to plant workers as opposed to performing the examinations from the inside surface (see discussion in Section V, Basis for Relief, above [in the licensee's September 28, 2001 submittal]).

In addition, in order to satisfy the required accelerated implementation of Supplement 2 for inspection from the inside surface, TXU would be required to fabricate additional qualification specimens that are not currently available, which would result in a significant burden in order to perform the necessary qualifications to implement Appendix VIII examinations on subject welds during this outage. TXU proposes to perform RPV UT examination of the safe-end to pipe welds from the inside surface in accordance with the 1986 Edition, of the ASME Code, Section XI, Paragraph IWA-2232(b), and Appendix III. Appendix III requires a minimum UT examination volume of the inner 1/3 of the weld area (1/3t), and will provide reasonable assurance of the structural integrity of these welds. Thus an acceptable level of quality and safety will have been achieved and allowing the proposed alternative examination in lieu of the Code requirement will not endanger public health and safety.

TXU believes that requiring CPSES Unit 2 to conduct UT examination from the outside surface of the pipe in accordance with the qualification requirements of Supplement 2 would result in a hardship without a compensating increase in the level of safety.

Evaluation

In 1991, licensees created the Performance Demonstration Initiative (PDI) to implement the performance demonstration requirements of Appendix VIII to Section XI of the Code. PDI started qualifying personnel and procedures to Appendix VIII, Supplements 2 and 3 in 1994.

These qualifications were for UT examinations conducted from the outside surface of the pipe-to-pipe weld. In 1997, the NRC issued a proposed rule which would change 10 CFR 50.55a to, among other things, provide the implementation schedule for Appendix XIII to Section XI of the Code, including Supplement 7. By the time the proposed rule was published for comment in the *Federal Register* (62 FR 63892) on December 3, 1997, the NRC staff and PDI believed that a sufficient number of UT personnel were qualified to Supplement 2 requirements to satisfy the licensees' needs. The NRC staff established the accelerated implementation schedule for Supplement 2 based on this availability of qualified personnel. The final rule was published in the *Federal Register* (64 *FR* 51370) on September 22, 1999, which has since been reflected in the regulations.

Shortly after publishing the final rule, PDI realized that their program could not support Supplement 2 performance demonstrations conducted from inside the pipe. For example, the existing test specimens were designed for performance demonstrations performed on the outside surface. To support performance demonstrations conducted from the inside pipe surface, PDI has to design, fabricate, and acquire new test specimens; develop the appropriate protocol and test implementation procedures; "finger print" the specimens; develop inspection procedures; and train personnel. PDI projects that they will be able to support performance demonstrations from the pipe inside surface by November 22, 2002. However, to require the licensee to fabricate the necessary samples in order to comply with the Appendix VIII requirements would result in a significant burden. In addition, the licensee determined that Supplement 2 examinations performed on the outside surface of pipe-to-safe end welds and the subject reactor coolant system nozzle-to-pipe welds would require removal of sand plugs, scaffold erection, insulation removal, and weld surface preparation prior to performing the volumetric examinations from the outside surface. Furthermore, there would still be limitations in meeting the coverage requirements. The dose estimate to perform the examinations and preparations is approximately 27 person-rem. Therefore, performance of the examinations from the outside surface to meet the requirements of Supplement 2, for the subject welds, would result in a hardship.

The licensee proposes to perform the examination of these welds from the inside surface. The licensee will perform a complete through-wall UT examination from the inside surface of the subject welds (see evaluation of Relief Request A-8, herein). This examination volume exceeds the Code required volume of the inner 1/3 of the weld area and will provide reasonable assurance of structural integrity of the welds. The NRC staff concludes that examination of the full thickness of the weld area from the inside surface will provide reasonable assurance of structural integrity.

Based on the above, the NRC staff finds that compliance with the Code examination requirements result in hardship without a compensating increase in the level of quality and safety and that the alternative to perform the UT examination from the inside surface of the welds provides reasonable assurance of structural integrity. Therefore, the proposed alternative is authorized in accordance with 10 CFR 50.55a(a)(3)(ii) for the examination of the subject welds listed above, during the refueling outage scheduled for March 2002 at CPSES, Unit 2.

3.4 RELIEF REQUEST A-7

The Components for Which Relief is Requested

ASME Category B-A Pressure Retaining Welds in Reactor Pressure Vessel (RPV), Item No. B1.30 shell-to-flange weld.

Code Requirement (as stated):

ASME Section XI, Rules for Inservice Inspection of Nuclear Power plant Components 1986 Edition, No addenda, Subsection IWA-2232, requires UT examination of the RPV-to-flange weld to be in accordance with ASME Code, Section V, Article 4.

In addition, the NRC has issued Regulatory Guide (RG) 1.150, Revision 1, "Ultrasonic Testing Of Reactor Vessel Welds During Preservice and Inservice Examinations ," serves as regulatory guidance for the UT examination of RPV welds.

Code Requirement from Which Relief is Requested (as stated):

ASME Code Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 1986 Edition, no Addenda, Subsection IWA-2232, requires UT examination of the RPV-to-flange weld to be in accordance with ASME Code, Section V, Article 4. In addition, Regulatory Guide (RG) 1.150, Revision 1, "Ultrasonic Testing Of Reactor Vessel Welds During Preservice and Inservice Examinations," serves as regulatory guidance for the UT examination of RPV welds.

Licensee's Basis for Relief (as stated):

CPSES Unit 2 is required to perform inservice examination of the RPV flange weld in accordance with the requirements of ASME Section V Article 4 and the subsequent guideline requirements of Regulatory Guide 1.150 Rev 1.

Federal Register Notice 64 FR 51370 through 51400, dated September 22, 1999, revised the 1999 Edition of 10 CFR 50.55(a) Codes and Standards. This revision requires that ASME Section XI, Appendix VIII, Supplements 4, Qualification Requirements For The Clad/Base Metal Interface of Reactor Vessel, and Supplement 6, Qualification Requirements For Reactor Vessel Welds Other Than Clad/Base Metal Interface, be implemented for most of the RPV welds by Nov. 22, 2000. The RPV vessel-to-flange weld is the only RPV circumferential weld not included in Appendix VIII.

This relief is requested to allow the use of a PDI qualified procedure to complete the UT examination of the RPV vessel-to-flange weld from the vessel side of the weld in accordance with ASME Section XI, Div. 1, 1995 Edition, 1996 Addenda, Appendix VIII Supplement 4 and 6 as amended by the *Federal Register* Notice 64 FR 51370 through 51400, dated September 22, 1999 in lieu of ASME Section V Article 4.

During the upcoming ten (10) year RPV weld examinations, we will be employing personnel, procedures and equipment, demonstrated and qualified by a Performance Demonstration Initiative (PDI) and in accordance with ASME Section XI, Div. 1, 1995 Edition, 1996 Addenda,

Appendix VIII Supplements 4 and 6 as amended by the *Federal Register* Notice 64 FR 51370 through 51400, dated September 22, 1999 for the adjacent welds.

The remote examinations will be performed using the Westinghouse SUPREEM Robot and the Paragon UT data acquisition system in accordance with a PDI qualified procedure. The Westinghouse procedure PDI-ISI-254, "Remote Inservice Examination of Reactor Vessel Shell Welds," in accordance with ASME Section XI, Appendix VIII, Supplements 4 and 6, was demonstrated at the PDI qualification session in 2001 (Performance Demonstration Qualification Sheet (PDQS) No. 407). The procedure complies with ASME Section XI, Appendix VIII, 1995 edition, 1996 Addenda as modified by the final rule.

Appendix VIII was developed to ensure the effectiveness of UT examinations within the nuclear industry by means of a rigorous, item specific performance demonstration. The performance demonstration was conducted on a RPV mockup containing flaws of various sizes and locations. The demonstration established the capability of equipment, procedures, and personnel to find flaws that could be detrimental to the integrity of the RPV.

Although Appendix VIII is not a requirement for this weld, the qualification process to Appendix VIII criteria demonstrates that the examination and evaluation techniques are equal or surpass the requirements of paragraph IWA-2232, "Ultrasonic Examination" of Section XI of the ASME Code and the guidance in RG 1.150.

A comparison between the ASME Section V Article 4 based UT methods and the procedures developed to satisfy the PDI/Appendix VIII can be best described as a comparison between a compliance-based procedure (ASME Section V Article 4) and a results-based procedure (PDI/Appendix VIII), see attached table [in the licensee's March 4, 2002 submittal]. ASME Section V procedures use an amplitude-based technique and a known reflector. The proposed alternate UT method was established independently from the acceptance standards for flaw size found in ASME Section XI.

The PDI qualified sizing method is considered more accurate than the method used in ASME Section V Article 4. The proposed alternate UT examination technique provides an acceptable level of quality and examination repeatability as compared to the Article 4 requirements.

The PDI Program's PDQS No. 407 attests that Westinghouse procedure PDI-ISI-254 is in compliance with the detection and sizing tolerance requirements of Appendix VIII. The PDI qualification method is based on [a] group of samples, which validate the acceptable flaw sizes in ASME Section XI. The sensitivity to detect these flaws is considered to be equal to or greater than the sensitivity obtained through ASME Section V Article 4 because the Westinghouse procedure PDI-ISI-254 procedure relies on a smaller scan index and a higher scan sensitivity for the detection of the UT signals.

The examination and sizing procedure use echo-dynamic motion and tip diffraction characteristics of the flaw instead of the amplitude characteristics required by ASME Section V Article 4. The search units interrogate the same examination volume as depicted by ASME Section XI, Figure IWB 2500-4, Shell-to-Flange Weld Joint.

The use of procedures for satisfying the requirements of ASME Section V Article 4 for the UT examination of the RPV to flange weld from the vessel shell has not received the same qualifications as PDI qualified procedure.

The use of Appendix VIII Supplements 4 and 6 for the completion of the RPV vessel-to-flange weld from the shell side (which PDI has qualified) is expected to reduce examination time, which translates to reduce personnel radiation exposure.

Additionally, this relief would allow a smooth transition to the welds adjacent to the RPV circumferential and longitudinal welds (welds B1.11 and B1.12) which do require an examination in accordance with Appendix VIII Supplement 4 and 6. This would eliminate the need to switch to the different calibration; procedure and technique required by ASME Section V Article 4 and the Regulatory Guide 1.150 Rev 1. This would result in a reduction in transition time to the different calibration, procedure, and technique required which translates to reduce personnel radiation exposure and is more cost effective.

Licensee's Proposed Alternative

The remaining automated shell to flange weld examinations shall be performed using a qualified procedure in accordance with ASME Code, Section XI, Div. 1, 1995 Edition, 1996 Addenda, Appendix VIII Supplement 4 and 6 as amended by the *Federal Register* Notice 64 FR 51370 through 51400, dated September 22, 1999.

This relief is requested for the CPSES, Unit 2, third period of the first 10-year interval vessel examination.

Licensee's Justification for the Granting of Relief

The Appendix VIII criteria was developed to ensure the effectiveness of UT examinations within the nuclear industry by means of a rigorous, item specific performance demonstration. The performance demonstration was conducted on RPV mockups containing flaws of various sizes and locations. The demonstration established the capability of equipment, procedures, and personnel to find flaws that could be detrimental to the integrity of the RPV. The performance demonstration showed that the proposed UT technique is equal to or surpasses the requirements of the Code and the recommendations of RG 1.150. Therefore, there is reasonable assurance that the proposed alternative provides an acceptable level of quality and safety.

Evaluation

The 1986 Edition of Section XI requires the examination of vessel welds to comply with Article 4 of Section V as amended by IWA-2232 of Section XI. The licensee proposes the use of ultrasonic examination procedures and techniques that have been developed to meet Appendix VIII, Supplements 4 and 6, of the 1995 Edition, 1996 Addenda for the examination of RPV shell-to-flange welds.

The NRC staff has reviewed and evaluated the licensee's alternative to use UT techniques (personnel, equipment, and procedures) qualified to Appendix VIII, Supplements 4 and 6. Based on the licensee's ability to obtain full coverage on the subject weld and the NRC staff's

review of the PDI protocol, the NRC staff concludes that the proposed alternative examination of the shell-to-flange weld would provide an equivalent or better examination than the current Code requirements and RG 1.150 recommendations and thus would provide assurance that flaws that could be detrimental to the integrity of the RPV would be detected. Therefore, the NRC staff has determined that the alternative provides an acceptable level of quality and safety. Pursuant to 10 CAR 50.55a(a)(3)(I), the proposed alternative is authorized for the RPV shell-to-flange weld examination for the first 10-year ISI interval at CPSES, Unit 2.

3.5 RELIEF REQUEST A-8

The Components for Which Relief is Requested (as stated):

Comanche Peak Steam Electric Station (CPSES) Unit 2, Class 1, Sixteen Category B-J and B-F Pressure Retaining Piping welds attaching the Reactor Pressure Vessel (RPV) Nozzle to safe end and safe end elbow [here after referred to as the subject welds].

Weld Numbers:

TAX-1-4100-1	TAX-1-4300-1
TAX-1-4100-2	TAX-1-4300-2
TAX-1-4100-13	TAX-1-4300-13
TAX-1-4100-14	TAX-1-4300-14
TAX-1-4200-1	TAX-1-4400-1
TAX-1-4200-2	TAX-1-4400-2
TAX-1-4200-13	TAX-1-4400-13
TAX-1-4200-14	TAX-1-4400-14

Code Requirement

The 1999 Edition of 10 CFR 50.55a Codes and Standards was revised by *Federal Register* Notice 64 FR 51370, September 22,1999. This revision requires that ASME Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1995 Edition with 1996, Addenda 1, Appendix VIII, Supplement 2 and 3 for austenitic piping welds be implemented by May 22, 2000.

Basis for Relief (as stated):

Pursuant to 10 CFR 50.55a(a)(3)(I), relief is requested from the 1986 Edition, No Addenda, of ASME Section XI requirements for surface examination of the specified nozzle-to-safe end and safe end-to-piping welds. In lieu of performing these surface examinations, CPSES, [Unit 2] will perform an alternative ultrasonic examination from the nozzle bore that will cover the full through-wall volume of these welds and adjacent base material. The ultrasonic examinations performed in lieu of surface examinations will be performed with automated equipment in conjunction with the ten year ISI examinations of reactor shell and nozzle welds. The ultrasonic examination technique to be applied in lieu of surface examination has previously been qualified and successfully demonstrated to Nuclear Regulatory Commission (NRC) personnel by our RPV inspection vendor (Wesdyne) on an Indian Point Unit 2 welded mockup containing implanted cracks.

To perform the UT examination from the outside surface personnel performing the manual examinations (and supports such as builders of scaffolding, removal of insulation, preparing and cleaning the welds, fire watch, health physics among others) maybe exposed to a dose rate of 2500 to 8000 mRem/Hr.

The estimated number of hours required of these examinations, are as follows:

- Build scaffolding: 84 hours,
- Remove insulation: 32 hours,
- Weld preparation: 48 hours,
- Nondestructive examinations for 24 welds: 96 hours,
- Reinstall insulation: 32 hours and
- Remove scaffolding: 32 hours.

The total man-hours are 324. Using an effective dose rate of 0.25 R/Hr for work directly on the welds and 0.040 R/Hr for work away from the welds, the estimated dose is 27 Person-Rem.

Licensee's Proposed Alternate Examinations (as stated):

A full volume ultrasonic examination will be conducted from the nozzle bore using automated inspection equipment in lieu of performing a surface examination on the outside of the specified welds. The ultrasonic technique to be applied in lieu of the surface examination has been previously qualified by our NDE vendor to reliably detect and size outside surface-connected cracks implanted in a full size mockup of these welds and associated base materials. The Wesdyne procedure and equipment was qualified and successfully demonstrated for Indian Point Unit 2 and NRC personnel at the vendor's facilities. CPSES, [Unit 2) considers the Wesdyne ultrasonic technique to be applied in lieu of surface examination to be qualified for CPSES, [Unit 2] because the Indian Point qualification mockup contains identical materials and has a configuration similar to the specified CPSES, [Unit 2] welds and base materials. Where configuration differences exist, the Indian Point design is considered to be more challenging than CPSES, [Unit 2] for ultrasonic inspection. Since CPSES, [Unit 2] considers the Wesdyne ultrasonic technique in lieu of surface examination to have been previously qualified, we are planning no further demonstration of it on CPSES, [Unit 2] calibration blocks or flawed specimens. However, Wesdyne will optimize their ultrasonic technique and equipment for application on CPSES RPV welds by testing flawed specimens representative of CPSES, [Unit 2] materials and configurations for the specified welds.

In addition to the alternative ultrasonic inspection described above, the specified welds are subjected to VT-2 visual examination for leakage during system pressure testing in accordance with ASME Section XI requirements each refueling outage which also serves to assure continued structural reliability.

Evaluation

The Code requires volumetric examination of the inner 1/3T of the weld and an outside diameter surface examination of the subject nozzle to safe end and safe end to piping welds. TXU proposes not to perform the Code required surface examination but will perform a full volume ultrasonic examination. This full volume examination will use a qualified procedure which has been demonstrated on a full scale mock-up of its capability to detect surface cracks

on the outside diameter when examination conducted from the nozzle bore. Additionally, this procedure has been successfully used at other sites for examination of these welds.

Requiring CPSES, [Unit 2] to perform the surface examinations on the outside of the reactor vessel nozzle-to-safe end and safe end-to-pipe welds as required by ASME Section XI, Table IWB-2500-1, Examination Category B-F, Item No. B5.10 and Examination B-J, Item No. B9.11, respectively, would impose a hardship on CPSES, [Unit 2] due to the restricted access to these welds and the high radiation exposure to NDE and support personnel.

Based on the above, the NRC staff finds that compliance with the specified Code requirements would result in hardship, without a compensatory increase in the level of quality and safety, and that the alternative to perform the UT examination from the inside surface of the welds provides reasonable assurance of structural integrity. Therefore, the proposed alternative is authorized in accordance with 10 CFR 50.55a(a)(3)(ii) for the examination of the subject welds listed above, during the refueling outage scheduled for March 2002 at CPSES, Unit 2.

4.0 CONCLUSION

Based on the above evaluations for Relief Requests A-4, Revision 1, A-5, Revision 2, A-7, and A-8, the NRC staff concludes that the proposed alternatives provide an acceptable level of quality and safety; therefore, relief is authorized pursuant to 10 CFR 50.55a(a)(i) for the first 10-year ISI interval for CPSES, Unit 2. In addition, based on the above evaluations for Relief Requests A-6 and A-8, the NRC staff concludes that compliance with the specified requirements results in hardship without a compensating increase in the level of quality and safety; therefore, the NRC staff authorizes the proposed alternatives pursuant to 10 CFR 50.55a(a)(3)(ii) for the first 10-year ISI interval for CPSES, Unit 2.

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