

Mr. Harold B. Ray
Executive Vice President
Southern California Edison Company
San Onofre Nuclear Generating Station
P.O. Box 128
San Clemente, CA 92674-0128

January 15, 2003

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION (SONGS), UNIT 3 -
RE: REQUEST FOR RELIEF FROM THE REQUIREMENTS OF THE
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) BOILER AND
PRESSURE VESSEL CODE (CODE) CONCERNING INSERVICE INSPECTION
(ISI) PROGRAM REACTOR PRESSURE VESSEL (RPV) EXAMINATION
(TAC NO. MB6708)

Dear Mr. Ray:

By letter dated October 29, 2002, Southern California Edison Company (SCE) requested relief (RR-B-2-05) from the requirements of ASME Code, Section XI, Subsection IWA-2232, to use an alternative procedure for the ultrasonic testing (UT) examination of the RPV upper shell to flange weld.

The ASME Code, Section XI, Subsection IWA-2232, requires UT examination of the RPV shell 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. In lieu of these Code requirements, the licensee proposes to perform UT examinations using a performance demonstration initiative (PDI) qualified procedure in accordance with Appendix VIII, Supplements 4 and 6 of the ASME Code, Section XI, 1995 Edition, 1996 Addenda. SCE asserts that performance demonstrations have shown that this PDI qualified technique is equal to or surpasses the requirements of the ASME Code and the supplemental recommendations of RG 1.150, Revision 1.

Based on the enclosed safety evaluation, the NRC staff concludes that the proposed alternative to use Appendix VIII, Supplements 4 and 6, provides an acceptable level of quality and safety. Therefore, your request for relief is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the second 10-year ISI interval at SONGS, Unit 3.

Sincerely,

/RA/

Stephen Dembek, Chief, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-362

Enclosure: Safety Evaluation

cc w/encl: See next page

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* Previously concurred

NRR-028

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San Onofre Nuclear Generating Station, Unit 3

cc:

Mr. Raymond Waldo, Plant Manager
Nuclear Generation
Southern California Edison Company
San Onofre Nuclear Generating Station
P.O. Box 128
San Clemente, CA 92674-0128

Mr. Douglas K. Porter
Southern California Edison Company
2244 Walnut Grove Avenue
Rosemead, CA 91770

Mr. David Spath, Chief
Division of Drinking Water and
Environmental Management
P.O. Box 942732
Sacramento, CA 94234-7320

Chairman, Board of Supervisors
County of San Diego
1600 Pacific Highway, Room 335
San Diego, CA 92101

Eileen M. Teichert, Esq.
Supervising Deputy City Attorney
City of Riverside
3900 Main Street
Riverside, CA 92522

Mr. Gary L. Nolff
Power Projects/Contracts Manager
Riverside Public Utilities
2911 Adams Street
Riverside, CA 92504

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

Mr. Michael Olson
San Onofre Liaison
San Diego Gas & Electric Company
P.O. Box 1831
San Diego, CA 92112-4150

Mr. Ed Bailey, Radiation Program Director
Radiologic Health Branch
State Department of Health Services
P.O. Box 942732 (MS 178)
Sacramento, CA 94327-7320

Resident Inspector/San Onofre NPS
c/o U.S. Nuclear Regulatory Commission
P.O. Box 4329
San Clemente, CA 92674

Mayor
City of San Clemente
100 Avenida Presidio
San Clemente, CA 92672

Mr. Dwight E. Nunn, Vice President
Southern California Edison Company
San Onofre Nuclear Generating Station
P.O. Box 128
San Clemente, CA 92674-0128

Mr. James D. Boyd, Commissioner
California Energy Commission
1516 Ninth Street (MS 31)
Sacramento, CA 95814

Mr. Joseph J. Wambold, Vice President
Southern California Edison Company
San Onofre Nuclear Generating Station
P.O. Box 128
San Clemente, CA 92764-0128

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REACTOR VESSEL HEAD PENETRATION REPAIRS

REQUEST FOR RELIEF NO. RR-B-2-05

SOUTHERN CALIFORNIA EDISON COMPANY

SAN ONOFRE NUCLEAR GENERATING STATION (SONGS), UNIT 3

DOCKET NO. 50-362

1.0 INTRODUCTION

By letter dated October 29, 2002, Southern California Edison Company (SCE or the licensee) requested relief (RR-B-2-05) from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, Subsection IWA-2232, to use an alternative procedure for the ultrasonic testing (UT) examination of the reactor pressure vessel (RPV) shell to flange weld.

2.0 BACKGROUND

The inservice inspection (ISI) of the ASME Code Class 1, Class 2, and Class 3 components is to be performed in accordance with Section XI of the ASME Code, applicable edition and addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) states in part 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 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) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ISI Code of record for the second 10-year interval for SONGS, Unit 3 is the 1989 Edition. The components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code incorporated

by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein and subject to commission approval.

By letter dated October 29, 2002, SCE submitted RR-B-2-05, proposing an alternative to the ultrasonic examination requirement of the 1989 Edition, ASME Code, Section XI, Subsection IWA-2232 for the reactor vessel to flange weld for the second 10-year ISI interval. In lieu of the Code-required examination in accordance with the ASME Code, Section V, Article 4, and supplemental guidance of Regulatory Guide (RG) 1.150, Revision 1, "Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations," the licensee proposes to perform examinations using a Performance Demonstration Initiative (PDI) qualified procedure in accordance with Appendix VIII, Supplements 4 and 6 of the ASME Code, Section XI, 1995 Edition including the 1996 Addenda. The NRC staff has evaluated the licensee's proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i).

3.0 EVALUATION OF RELIEF REQUEST

3.1 Component for Which Relief is Requested:

RPV upper shell to flange weld, ASME, Section XI, Code Category B-A, Item No. B1.30.

3.2 Code Requirement:

ASME Code, Section XI, 1989 Edition, Subsection IWA-2232 requires UT of the RPV shell to flange weld in accordance with ASME Code, Section V, Article 4. In addition, the NRC has issued RG 1.150, Revision 1, "Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations," which serves as regulatory guidance for the UT examination of RPV welds.

3.3 Licensee's Proposed Alternative:

The 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, Supplements 4 and 6 as amended by the *Federal Register* notice 64 FR 51370 through 51400, dated September 22, 1999.

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

"SONGS, Unit 3 is required to perform inservice examination of the RPV flange weld in accordance with the requirements of ASME Code, 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 Code, Section XI, Appendix VIII, Supplement 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 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 in lieu of ASME Code, 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 Code, 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 Code, 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 Code, 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 Code, 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 Code, Section V, Article 4) and a results-based procedure (PDI/Appendix VIII). ASME Code, 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 Code, Section XI.

The PDI qualified sizing method is considered more accurate than the method used in ASME Code, 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 Code, relies on a smaller scan index and a higher scan sensitivity for the detection of the UT signals.

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

The use of procedures for satisfying the requirements of ASME Code, 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 a PDI qualified procedure.

The PDI qualification specimens are curved vessel shell plate sections and do not have taper transition geometry. However, the procedure is used to examine reactor vessel shell welds which have taper transitions at weld joints of dissimilar thickness. The PDI qualification for Supplements 4 and 6 allows for examination of material thickness up to 12.3 inches or a metal path distance of 17.5 inches in the case of the 45 degree transducer. This qualified test range bounds a significant percentage of the flange to shell weld examination volume even in the thicker portion above the weld centerline

The weld was examined during pre-service by remote automated inspection in accordance with Section XI. The pre-service examination was performed from the vessel ID surface, using Section XI techniques at 0 degree longitudinal and 45 and 60 degree shear beam angles. Examination from the flange surface was performed using 0, 8, and 19 degree longitudinal. For inservice examinations, during the first interval the weld examination from flange surface was performed in accordance with Section XI using 0, 7, 8 and 13.5 degree longitudinal. The weld ID surface examination was performed using 0, 45, 60, and 50/70 degree beam angles by remote automated inspection in accordance with Section XI and Regulatory Guide (RG) 1.150 Revision 1. No matters of concern were identified during the aforementioned examinations.

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 reduced personnel radiation exposure.

Additionally, this relief would allow a smooth transition to the welds adjacent to the RPV circumferential and longitudinal welds (welds B 1.11 and B 1.12) which do require an examination in accordance with Appendix VIII, Supplements 4 and 6. This would eliminate the need to switch to the different calibrations; procedure and technique required by ASME Code, Section V, Article 4 and 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 reduced personnel radiation exposure and is more cost effective.”

3.5 Evaluation:

The 1989 Edition, ASME Code, Section XI requires the examination of vessel welds to comply with Article 4 of the ASME Code, Section V, as stated under Subsection 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 of 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 that of the current Code requirements supplemented by the guidance of RG 1.150, Revision 1, "Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations," 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 proposed alternative in Relief Request RR-B-2-05 provides an acceptable level of quality and safety.

4.0 CONCLUSION

The NRC staff concludes that the proposed alternative to use Appendix VIII Supplements 4 and 6 in lieu of the Code-required examination in accordance with ASME Code, Section V, Article 4, supplemented by RG 1.150, Revision 1 for examination of the reactor vessel to flange weld from the shell side provides an acceptable level of quality and safety. Therefore, the proposed relief is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the second 10-year ISI interval at SONGS, Unit 3.

Principal Contributor: P. Patnaik

Date: January 15, 2003