

July 29, 2004

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

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION (SONGS) UNITS 2 AND 3:
REQUEST FOR RELIEF FROM REQUIREMENTS OF THE AMERICAN
SOCIETY OF MECHANICAL ENGINEERS (ASME) BOILER AND PRESSURE
VESSEL CODE (CODE) CONCERNING NOZZLE TO VESSEL WELDS (TAC
NOS. MC2736 AND MC2737)

Dear Mr. Ray:

By letter dated April 16, 2004, Southern California Edison (SCE) submitted Relief Request RR-B-2-08 to obtain relief from the ASME Code inspection requirements for Section XI, Class 1, Table IWB-2500-1, Examination Category B-D, Item No. B3.90, nozzle to vessel welds for the second 10-year interval at SONGS Units 2 and 3. You made this request on the basis that design configuration restrictions make the ASME Code examination coverage requirements impractical. The NRC staff has reviewed RR-B-2-08 for SONGS Units 2 and 3. The safety evaluation is enclosed.

The NRC staff concludes that for RR-B-2-08, compliance with the Code-examination requirements is impractical and would require design modification of welds resulting in significant burden to the licensee. The staff also believes that reasonable assurance of structural integrity of the welds has been provided with the licensee's best-effort examination. Therefore, RR-B-2-08 is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the second 10-year inservice inspection interval at SONGS Units 2 and 3. This granting of relief is authorized by law and will not endanger life, property, or the common defense and security and is otherwise in

H. Ray

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the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

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

Sincerely,

/RA/

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

Docket Nos. 50-361 and 50-362

Enclosure: Safety Evaluation

cc w/encl: See next page

H. Ray

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July 29, 2004

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

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

Docket Nos. 50-361 and 50-362

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF RR-B-2-08

SOUTHERN CALIFORNIA EDISON COMPANY

SAN ONOFRE NUCLEAR GENERATING STATION (SONGS) UNITS 2 AND 3

DOCKET NOS. 50-361 AND 50-362

1.0 INTRODUCTION

By letter dated April 16, 2004, Southern California Edison (SCE or the licensee) requested relief from certain volumetric examination requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, 1989 Edition for the reactor vessel hot-leg nozzle to shell welds at SONGS Units 2 and 3 for the second 10-year inspection interval. The relief, applicable to both hot-leg nozzle welds in each reactor vessel at SONGS, pertains to limited volumetric examination conducted for each of the welds due to the weld configuration. The staff has reviewed the request for relief pertaining to limited volumetric examination of the hot-leg nozzle to shell welds against the requirements of the 1989 Edition of the ASME Code, Section XI, pursuant to 10 CFR 50.55a(g)(6)(i).

The licensee performed these examinations as part of the inservice inspection program during the second 10-year inspection interval of SONGS Units 2 and 3.

2.0 BACKGROUND

The inservice inspection (ISI) of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) states, among other things, 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 of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. Section 50.55a(g)(4)(i) requires 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 applicable ISI Code of Record for the second 10-year ISI interval of SONGS Units 2 and 3, which ended on August 17, 2003, is the 1989 Edition, no Addenda. Pursuant to 10 CFR 50.55a(g)(5)(iv), the licensee is requesting NRC approval of its relief within 12 months after the expiration of the second 10-year ISI interval.

3.0 EVALUATION OF RELIEF REQUEST (RR-B-2-08)

3.1 Item for Which Relief Is Requested

<u>Weld ID</u>	<u>System</u>	<u>Examination Category/Item</u>	<u>Volumetric Coverage</u>
<u>SONGS Unit 2</u>			
02-001-021	Hot leg nozzle to shell weld at 0 deg	B-D, B3.90	74.1%
02-001-024	Hot leg nozzle to shell weld at 180 deg	B-D, B3.90	74.1%
<u>SONGS Unit 3</u>			
03-001-021	Hot leg nozzle to shell weld at 0 deg	B-D, B3.90	74.1%
03-001-024	Hot leg nozzle to shell weld at 180 deg	B-D, B3.90	74.1%

3.2 Code Requirements

The ASME Code Section XI, 1989 Edition, Table IWB-2500-1, Examination Category B-D, Item No. B3.90, nozzle to vessel welds, requires volumetric examination of essentially 100% of examination volume identified in Figure IWB-2500-7(a). In addition, ultrasonic examinations must be performed using procedures, personnel, and equipment qualified to the requirements of Appendix VIII of the ASME Code Section XI, 1995 Edition with the 1996 Addenda, "Performance Demonstration for Ultrasonic Examination Systems."

3.3 Licensee's Proposed Alternative:

Relief is requested for a limited scan of 74.1 percent combined volumetric coverage of the bore and transverse scans in lieu of 100 percent volumetric coverage for each of the welds identified above in item 3.1. The licensee proposed the following alternative inspections in lieu of the Code-required examination coverage shown in Figure IWB-2500-7(a) for the duration of the second 10-year inservice inspection interval:

- (1) The licensee has completed a volumetric examination (UT) of the subject welds, performed to the maximum extent practical with the existing design configuration. It

requests that this completed examination be considered as an acceptable alternative to the Code inspection requirement.

- (2) A visual examination that was performed as required under Examination Category B-N-1 of the ASME Code Section XI.
 - (3) A visual examination (VT-2) during system pressure test that was performed as required under Examination Category B-P of the ASME Code Section XI.
- 3.4 Licensee's Basis for Relief (as stated)

Unit 2 Examination Limitations

During the Unit 2 Cycle-12 refueling outage in the summer of 2002 the outlet nozzle to shell welds were examined by a remote tool (automated examination) from the nozzle bore and from the vessel interior using a circular scanning path around the nozzle opening to examine for transverse defects. These circular scans are commonly called tangential (Tan) scans. The bore examinations provided 100% coverage for the axial scan direction, which accounts for 50% of the required scans. The limitation occurred in the circular scans performed from the vessel interior where the nozzle protrusion or boss obstructs complete scanning of a significant portion of the examination volume residing within the nozzle cylinder base metal. Scans are limited above the nozzle and the coverage is worsened at the 90/270-degree locations where the saddle effect of the shell geometry projects the central beam away from a significant portion of the examination volume. Two rotations of the Shell sled were used to maximize the coverage by placing each of the transducers as near as possible to the weld. When combining the bore and transverse scan coverage estimates, the combined coverage for these welds is 74.1%.

Unit 3 Examination Limitations

During the Unit 3 Cycle-12 refueling outage in the spring of 2003 the outlet nozzle to shell welds were examined by a remote tool (automated examination) from the nozzle bore and from the vessel interior using circular and radial scanning paths around the nozzle opening to examine for transverse defects and defects parallel to the weld axis. The circular scans are commonly called tangential scans and the radial scans are referred to as star scans. The bore and star scan examinations provided 100% coverage for the axial scan direction, which accounts for 50% of the required scans. The limitation occurred in the circular scans performed from the vessel interior where the nozzle protrusion or boss obstructs complete scanning of a significant portion of the examination volume residing within the nozzle cylinder base metal. Scans are limited above the nozzle and the coverage is worsened at the 90/270-degree locations where the saddle effect of the shell geometry projects the central beam away from a significant portion of the examination volume. When combining the bore, star and transverse scan coverage estimates, the combined coverage for these welds is 74.1%.

The design configuration restrictions of SONGS Units 2 and 3 make the Code required examination coverage requirements impractical. Plant modifications or the replacement of components designed to allow for complete coverage would be needed to meet the ASME Code requirements. This would impose a considerable burden to SONGS.

3.5 Evaluation

The reactor vessel outlet nozzle to shell welds require 100 percent volumetric examination during each inspection interval in accordance with the applicable ASME Code Section XI. The staff notes that each of the welds identified in RR-B-2-08 was examined in accordance with the performance demonstration initiative requirements of Appendix VIII to Section XI, and did receive 100 percent volumetric examination coverage during the bore scan, which only detected reflectors parallel to the weld seam. The tangential scans for detection of transverse reflectors were restricted due to weld configurations resulting from the nozzle protrusion. However, a combined volumetric examination coverage of 74.1 percent was obtained for each of the welds. Nevertheless, Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds," endorsed by NRC, only allows a reduction in examination coverage of less than 10 percent for a weld due to interference by another component or part geometry. In our evaluation, the staff has determined that performance of the Code-required examination in this particular case is impractical, due to weld and component configuration. In order to comply with the Code requirement, a design modification of the piping system would have to be performed, which would impose a significant burden on the licensee.

The staff has also further evaluated the impact of limited volumetric examination coverage on the structural integrity of the welds. In assessing the structural integrity of the welds in the hot-leg nozzle to vessel affected by this relief request, the staff examined issues of active degradation mechanisms, the likelihood of a flaw existing in the subject welds, and the growth of an existing flaw necessary to cause a failure during the second 10-year inspection interval. The factors considered were:

- (1) The hot-leg nozzle to shell welds for which relief from Code-required examination coverage is requested are composed of low-alloy carbon steel which is not susceptible to stress corrosion cracking in the exposed environment. There is no degradation mechanism other than fatigue active in the subject welds which would cause a failure of the weld. Furthermore, the examination conducted for each weld provides reasonable assurance of structural integrity of the weld since fatigue-type cracks in the weld would likely have been detected during examination of the accessible volume of the weld.
- (2) The system pressure test, routinely conducted at the end of each refueling outage prior to operation, will likely result in the detection of a leak before any gross failure occurs.

Based on the above, the staff, therefore, has determined that the limited volumetric examination and tests conducted during the second 10-year inspection interval provide reasonable assurance of structural integrity of the reactor vessel hot-leg nozzle to shell welds at SONGS Units 2 and 3.

4.0 CONCLUSION

Based on the above, the staff concludes that for RR-B-2-08, compliance with the Code-examination requirements is impractical and would require design modification of hot-leg nozzle to shell welds resulting in a significant burden to the licensee. The staff also believes that reasonable assurance of structural integrity of the welds has been provided with the licensee's best-effort examination. Therefore, RR-B-2-08 is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the second 10-year inservice inspection interval at SONGS Units 2 and 3. This granting of relief is authorized by law and will not endanger life, 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 ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: P. Patnaik

Date: July 29, 2004