

November 20, 2001

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, UNIT NOS. 2 AND 3 -
REQUEST FOR RELIEF (TAC NOS. MB2484 AND MB2485)

Dear Mr. Ray:

By letter dated June 29, 2001, as supplemented by letter dated October 22, 2001, Southern California Edison Company (the licensee), requested relief from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) required inspection criteria. The licensee's proposed alternatives to the ASME Code are contained in relief requests RR B-2-01, RR B-2-02, and RR B-2-03 for the second 10-year inservice inspection interval at San Onofre Nuclear Generating Station (SONGS), Units No. 2 and 3. The letter dated October 22, 2001, revised relief requests RR B-2-02 and RR B-2-03. Relief requests RR B-2-01 and RR B-2-02 are for both units, and RR B-2-03 is for Unit 2 only.

Based on the enclosed safety evaluation (SE), the NRC staff found that these requests for relief provide an acceptable level of quality and safety. Therefore, as described in the SE, pursuant to 10 CFR 50.55a(a)(3)(i) and (ii), the Commission authorizes the proposed alternatives in the above three relief requests for the second 10-year inservice inspection intervals at SONGS, Units 2 and 3. Relief request RR B-2-03 is authorized for only SONGS, Unit 2. Relief requests RR B-2-02 and RR B-2-03 are authorized only until November 22, 2002.

The licensee has submitted an additional relief request by separate letter dated July 27, 2001. This relief request will be the subject of a separate technical review to be performed under the same TAC Nos. MB2484 and MB2485. If you have any questions, please contact Jack Donohew at (301) 415-1307.

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

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Docket Nos. 50-361 and 50-362

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OFFICE	PDIV-2/PM	PDIV-1/LA	EMCB/DE	OGC	PDIV-2/SC
NAME	JDonohew:as	MMcAllister	TChan*	RHoefling*	SDembek
DATE	11/19/2001	11/19/01	11/08/01	11/15/01	11/20/01

San Onofre Nuclear Generating Station, Units 2 and 3

cc:

Mr. R. W. Krieger, Vice President
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

Alan R. Watts, Esq.
Woodruff, Spradlin & Smart
701 S. Parker St. No. 7000
Orange, CA 92668-4720

Mr. Sherwin Harris
Resource Project Manager
Public Utilities Department
City of Riverside
3900 Main Street
Riverside, CA 92522

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. Steve Hsu
Radiologic Health Branch
State Department of Health Services
Post Office Box 942732
Sacramento, CA 94327-7320

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

Resident Inspector/San Onofre NPS
c/o U.S. Nuclear Regulatory Commission
Post Office 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. Robert A. Laurie, Commissioner
California Energy Commission
1516 Ninth Street (MS 31)
Sacramento, CA 95814

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION FOR
SECOND 10-YEAR INSERVICE INSPECTION INTERVAL AT
SAN ONOFRE NUCLEAR GENERATING STATION UNITS 2 AND 3
RELIEF REQUEST NOS. RR B-2-01, RR B-2-02, AND RR B-2-03
SOUTHERN CALIFORNIA EDISON COMPANY
DOCKET NUMBERS 50-360 AND 50-361

1.0 INTRODUCTION

Inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class 1, Class 2, and Class 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 Commission pursuant to 10 CFR 50.55a(g)(6)(i). Section 10 CFR 50.55a(a)(3) of Title 10 of the *Code of Federal Regulations* (10 CFR) 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 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. The Code of record for San Onofre Nuclear Generating Station (SONGS), Units 2 and 3 - second 10-year ISI interval is the 1989 Edition of the ASME Boiler and Pressure Vessel Code with no addenda.

The NRC staff has reviewed the information submitted by Southern California Edison Company (the licensee) by letter dated June 29, 2001, and supplemented by letter dated October 22, 2001, requesting relief from certain Code-required inspection criteria. The licensee's proposed alternatives to the Code requirements are contained in Relief Requests RR B-2-01 and

RR B-2-02 for SONGS, Units 2 and 3, and in Relief Request RR B-2-03 for SONGS, Unit 2 only. The three relief requests are for the second 10-year ISI Interval at SONGS, Unit 2 and 3.

2.0 RELIEF REQUEST NO. RR B-2-01, EXAMINATION CATEGORY B-A: ALTERNATIVE LENGTH SIZING CRITERIA

2.1 Component Description

ASME Section XI, Class 1, Examination Category B-A, Item No. B.1-10 reactor pressure vessel (RPV) longitudinal and circumferential shell welds and B1.20 RPV head welds subject to Appendix VIII, Supplement 4 examination for SONGS, Units 2 and 3.

2.2 Code Requirements for Which Relief is Requested

Title 10 of the *Code of Federal Regulations* Section 50.55a(b)(2) was amended to reference Section XI of the Code through the 1995 Edition with the 1996 Addenda (64 FR 51370). ASME Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 4, Subparagraph 3.2(c), requires that the ultrasonic testing performance demonstration results be plotted on a two-dimensional plot with the measured depth plotted along the ordinate axis and the true depth plotted along the abscissa axis. For qualification, the plot must satisfy the following statistical parameters: (1) the slope of the linear regression line is not less than 0.7; (2) the mean deviation of flaw depth is less than 0.25 inches; and (3) the correlation coefficient is not less than 0.70.

The licensee requests relief from using the statistical parameters of Appendix VIII, Supplement 4, Subparagraph 3.2(c).

2.3 Licensee's Proposed Alternative to ASME Code

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposes to use the root mean square error (RMSE) calculations of Appendix VIII, Supplement 4, Subparagraphs 3.2(a) and 3.2(b) in lieu of the statistical parameters of Subparagraph 3.2(c). The licensee proposes to use the RMSE value of 10 CFR 50.55a(b)(2)(xv)(C)(1), which modifies the depth sizing criterion of Appendix VIII, Supplement 4, Subparagraph 3.2(a). These inspections will be performed during the second 10-year inspection interval for SONGS, Units 2 and 3.

2.4 Evaluation

The U.S. nuclear utilities created the Performance Demonstration Initiative (PDI) to implement performance demonstration requirements contained in Appendix VIII of Section XI of the ASME Code. To this end, PDI has developed a performance demonstration program for qualifying ultrasonic testing (UT) equipment, procedures, and personnel. During the development of the performance demonstration for Supplement 4, PDI determined that the ASME Code criteria for flaw sizing was unworkable.

In Relief Request RR B-2-01, the licensee proposed to eliminate the use of the requirement in Supplement 4, Subparagraph 3.2(c) which imposes three statistical parameters for depth sizing. The first parameter, 3.2(c)(1), pertains to the slope of a linear regression line. The linear regression line is the difference between actual versus true value plotted along a through-wall

thickness. For Supplement 4 performance demonstrations, a linear regression line of the data is not applicable because the performance demonstrations are performed on test specimens with flaws located in the inner 15 percent through-wall. The differences between actual versus true value produce a tight grouping of results which resemble a shotgun pattern. The slope of a regression line from such data is extremely sensitive to small variations, thus making the parameter of Subparagraph 3.2(c)(1) a poor and inappropriate acceptance criterion. The second parameter, 3.2(c)(2), pertains to the mean deviation of flaw depth. The value used in the ASME Code is too lax with respect to evaluating flaw depths within the inner 15 percent of wall thickness. Therefore, the licensee proposed to use the more appropriate criterion of 0.15-inch RMSE of 10 CFR 50.55a(b)(2)(xv)(C)(1), which modifies Subparagraph 3.2(a), as the acceptance criterion. The third parameter, 3.2(c)(3), pertains to a correlation coefficient. The value of the correlation coefficient in Subparagraph 3.2(c)(3) is inappropriate for this application since it is based on the linear regression from Subparagraph 3.2(c)(1).

PDI was aware of the inappropriateness of Subparagraph 3.2(c) early in the development of their program. They brought the issue before the appropriate ASME committee which formalized eliminating the use of Supplement 4, Subparagraph 3.2(c) in Code Case N-622. The NRC staff representatives participated in the discussions and consensus process of the code case. Based on the above, the NRC staff finds that the use of Subparagraph 3.2(c) requirements in this context is inappropriate and that the proposed alternative to use the RMSE value of 10 CFR 50.55a(b)(2)(xv)(C)(1), namely 0.15-inch RMSE, which modifies the criterion of Appendix VIII, Supplement 4, Subparagraphs 3.2(a) and 3.2(b), in lieu of Subparagraph 3.2(c), will provide an acceptable level of quality and safety.

2.5 Conclusion

Based on the discussion above, the NRC staff concludes that the proposed alternative in Relief Request RR B-2-01 will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the proposed alternative for the second 10-year ISI intervals at SONGS, Units 2 and 3.

3.0 RELIEF REQUEST NO. RR B-2-02, EXAMINATION CATEGORY B-D: REDUCED WELD VOLUME OF ½ INCH FROM THE WELD

3.1 Component Description

ASME Section XI, Class 1, Examination Category B-D, RPV nozzle-to-vessel welds for SONGS, Units 2 and 3.

3.2 Code Requirements for Which Relief is Requested

ASME Code, Section XI, 1989 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) and (b), define weld examination volume requirements, and ASME Code, Section V, Article 4, specify UT examination procedure requirements for RPV nozzle-to-vessel welds.

The licensee is requesting relief from the one-half through-wall thickness ($t_s/2$) examination volume requirements of Figures IWB-2500-7(a) and (b) for the SONGS, Units 2 and 3, second

10-year interval. Additionally, the licensee is requesting relief from the requirement to perform the UT examinations specified in Table IWB-2500-1 of the ASME Code in accordance with Section V, Article 4 of the ASME Code. The licensee requests this relief for the SONGS, Unit 2, second 10-year interval RPV examination scheduled for May 2002.

3.3 Licensee's Proposed Alternative to ASME Code

The licensee proposes to use the reduced examination volume of one half ($\frac{1}{2}$) inch from the widest part of the weld, consistent with the weld volume as indicated in Figures 1, 2, and 3 of Committee Correspondence (letter dated October 23, 2000 from W. Norris to Subgroup Water-Cooled Systems, Subj.: Proposed Revision to Code Case N-613, "Ultrasonic Examination of Full Penetration Nozzles, Examination Category B-D, Item Nos. B3.10 and B3.90, Reactor Vessel-to-Nozzle Welds, Fig. IWB-2500-7(a), (b), and (c), Section XI, Division 1"). This inspection would be performed in lieu of the requirements of ASME Section XI Figures IWB-2500-7(a) and (b).

The licensee also proposes to perform the UT examinations 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 dated September 22, 1999, for the portion of the examination conducted from the vessel shell. For the examination conducted from inside the RPV, the licensee proposes to examine the inner volume to a minimum depth of 15 percent of through-wall thickness from four orthogonal directions as would be required by the rule, using personnel and procedures qualified in accordance with Supplement 4 as modified by the rule. The volume not examined according to Supplement 4 will be examined from the nozzle bore using personnel and procedures qualified in accordance with Section V, Article 4 of the ASME Code and the subsequent guidelines of Regulatory Guide 1.150 Revision 1.

3.4 Evaluation

The licensee proposes reducing the examination volume to 1/2-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, preservice inspection, and prior ISIs. These examinations showed the ASME Code volume to be free of unacceptable flaws. The creation of flaws during plant service in the volume excluded from 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. Cracks, should they initiate, occur in the highly stressed areas of 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 their

ISI Code of record. The ISI Code of record invokes examination requirements of Appendix I, Article 1-2000, 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 a 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. The rule 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 by November 22, 2002. The nuclear utilities are participating in the Electric Power Research Institute's PDI program that was created to develop a generic qualification process that would allow utilities to meet the implementation date established in the rule.

In the spirit of meeting Supplement 7 but absent a 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 qualified personnel and procedures, where possible. 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 4 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 nozzle 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 SONGS, Unit 2, RPV nozzle-to-vessel welds during the second 10-year interval inspection scheduled for spring 2002 is acceptable until November 22, 2002.

3.5 Conclusion

Based on its review, the NRC staff finds that the proposed alternative to reduce the examination volume to 1/2-inch from the widest part of the weld in lieu of one-half through-wall thickness from each side of the weld will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized for the examination of ASME Code, Section XI, Class 1, RPV nozzle-to-vessel welds during the second 10-year interval for SONGS, Units 2 and 3.

The NRC staff also finds that the proposed alternative to perform the UT examinations 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 dated September 22, 1999, for the portion of the examination conducted from the vessel shell, and the proposed alternative to perform UT inspection from the bore in accordance with the ISI Code of record will provide an acceptable level of safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), these proposed alternatives are authorized for the examination of ASME Code,

Section XI, Class 1, RPV nozzle-to-vessel welds during the second 10-year interval inspection scheduled for May 2002 at SONGS, Unit 2, until November 22, 2002.

4.0 RELIEF REQUEST NO. RR B-2-03, EXAMINATION CATEGORY B-J: RPV PIPING NOZZLE ULTRASONIC TESTING FROM THE INSIDE SURFACE

4.1 Component Description

ASME Section XI, Class 1, Category B-J Pressure Retaining Piping welds attaching the RPV nozzle to extension piece and extension piece to pipe weld.

4.2 Code Requirements for which Relief is Requested

The regulations at 10 CFR 50.55a, "Codes and Standards," were revised by *Federal Register* Notice dated September 22, 1999 (64 FR 51400). The revision requires that ASME Code, Section XI, 1995 Edition, including 1996 Addenda, Appendix VIII, Supplements 2 and 3 be implemented by May 22, 2000.

The licensee is requesting relief from ASME Section XI, Appendix VIII, Supplement 3 for piping welds attaching the RPV nozzle to extension piece and extension piece to pipe or elbow weld. Relief requested is to examine these welds from the inside surface.

The licensee requests relief for the SONGS, Unit 2, second 10-year interval RPV examination scheduled for May 2002. After November 22, 2002, the licensee will use the PDI procedures for inside diameter (ID) examinations. The PDI procedures are intended to address ID examinations for welds covered by Supplement 3 with Supplement 12 to ASME Code, Appendix VIII, Division 1, 1995 Edition with 1996 Addenda.

4.3 Licensee's Proposed Alternative to ASME Code

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposes to perform RPV UT examination of the RPV nozzle to extension piece and extension piece to pipe or elbow welds from the inside surface in accordance with the 1989 Edition, with no Addenda of the ASME Code, Section XI, as per the licensee's previous commitment in the second interval ISI program.

4.4 Evaluation

In 1991, licensees created the 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. Supplement 2 provides qualification requirements for wrought austenitic piping welds, and Supplement 3 provides qualification requirements for ferritic piping welds. Supplement 3 criteria are normally added to Supplement 2 criteria for qualification purposes. The PDI qualifications were applicable to 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 NRC staff and PDI believed that a sufficient number of UT personnel were qualified to Supplement 2 and 3 requirements to satisfy licensees' needs. The NRC staff established the accelerated implementation schedule for Supplements 2 and 3 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 Supplements 2 and 3 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 be 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 and Supplement 3 that provides criteria for examinations performed from the inside surface of piping. PDI projected that they will be able to support performance demonstrations from the pipe inside surface by November 22, 2002.

The licensee has determined that Supplement 3 examinations performed on the outside surface of the RPV nozzle to extension piece and extension piece to pipe welds would be severely limited due to the close proximity of the two welds and their location inside the primary shield and reactor cavity, which makes access difficult. These inspections would result in additional costs and occupational radiation dose to plant workers as opposed to performing the examinations from the inside surface. The licensee has estimated the dose for outside inspections to be about 27 person-rem. In addition, in order to satisfy the required accelerated implementation of Supplement 3 for inside surface examinations, the licensee 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 the subject welds during this outage.

The licensee proposes to perform RPV UT examination of the RPV nozzle to extension piece and extension piece to pipe or elbow welds from the inside surface in accordance with the 1989 Edition, with no Addenda, of the ASME Code, Section XI, Paragraph IWA-2232(b), as per the licensee's previous commitment in its second interval ISI program. The licensee's previous commitment requires a 100 percent UT exam of each of these welds from the inside piping and will provide reasonable assurance of the structural integrity of these welds. Thus, the NRC staff finds that requiring the licensee to conduct UT examination from the outside surface of the pipe in accordance with the qualification requirements of Supplement 3 would result in a hardship without a compensating increase in the level of safety.

4.5 Conclusion

Based on its review, the NRC staff finds that the proposed alternative of performing examinations of RPV nozzle to extension piece and extension piece to pipe or elbow welds from the inside surface in accordance with the licensee's previous commitment in the second interval ISI program will provide reasonable assurance of structural integrity. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC staff authorizes the proposed alternative of ASME Section XI, Class 1, Category B-J pressure retaining piping welds attaching RPV nozzle to extension piece and extension piece to pipe or elbow welds for the SONGS, Unit 2, second 10-year interval RPV examination scheduled for May 2002, on the basis that compliance with ASME Code

requirements would result in a hardship without a compensating increase in the level of safety. The propose alternative is authorized until November 22, 2002.

5.0 CONCLUSION

The licensee submitted relief requests RR B-2-01 and RR B-2-02 for SONGS, Units 2 and 3, and RR-2-03 for SONGS, Unit 2, in its letters of June 29 and October 22, 2001. The letter of October 22, 2001, revised relief requests RR B-2-02 and RR B-2-03. Relief request RR B-2-02 requests different relief for SONGS, Units 2 and 3. The relief requests are for the second 10-year ISI interval for SONGS, Units 2 and 3.

Based on Sections 2.0 and 3.0, the NRC staff concludes that the proposed alternatives in relief requests RR B-2-01 and RR B-2-02 provide an acceptable level of quality and safety. Based on this, pursuant to 10 CFR 50.55a(a)(3)(i), the Commission authorizes the relief requests RR B-2-01 and RR B-2-02 (until November 22, 2002) for the second 10-year ISI interval for SONGS, Units 2 and 3.

Based on Section 4.0, the NRC staff concludes that the proposed alternative in relief request RR B-2-03 will provide reasonable assurance of structural integrity and compliance with the ASME Code would result in a hardship without a compensating increase in the level of quality and safety. Pursuant to 10 CFR 50.55a(a)(3)(ii), the Commission authorizes relief request RR B-2-03 for the second 10-year ISI interval until November 22, 2002, for SONGS, Unit 2.

Principal Contributors: M. Scott
D. Naujock

Date: November 20, 2001