

February 11, 2004

Mr. Stephen A. Byrne
Senior Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Post Office Box 88
Jenkinsville, South Carolina 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION - RELIEF REQUEST RR-II-16
REGARDING REDUCED ULTRASONIC TESTING (TAC NO. MC0108)

Dear Mr. Byrne:

By letter dated July 11, 2003, as supplemented by letter dated September 16, 2003, South Carolina Electric and Gas submitted a request for relief from Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i) for the Virgil C. Summer Nuclear Station (VCSNS). Specifically, Relief Request (RR)-II-16 proposed to incorporate reduced ultrasonic examination volume for the reactor pressure vessel nozzle-to-vessel welds. The licensee request is applicable for the remainder of the second 10-year inservice inspection interval for VCSNS.

Based on the attached safety evaluation, the staff concludes that the proposed reduction in ultrasonic examination volume requirements, as described in RR-II-16, provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the Nuclear Regulatory Commission staff authorizes the proposed alternative for the remainder of the second 10-year interval at VCSNS.

Sincerely,

/RA/

John A. Nakoski, Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosure: Safety Evaluation

cc w/encl: See attached list

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF RR-II-16

SECOND 10-YEAR INSERVICE INSPECTION INTERVAL FOR

VIRGIL C. SUMMER NUCLEAR STATION

SOUTH CAROLINA ELECTRIC AND GAS COMPANY

DOCKET NO. 50-395

1.0 INTRODUCTION

By letter dated July 11, 2003, as supplemented by letter dated September 16, 2003, South Carolina Electric and Gas Company (SCE&G), (the licensee) submitted a request for relief from the requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i) for the Virgil C. Summer Nuclear Station (VCSNS). Specifically, Relief Request (RR)-II-16 proposed to incorporate reduced ultrasonic testing (UT) examination volume requirements for six reactor pressure vessel (RPV) nozzle-to-vessel welds. RR-II-16 is requested so that appropriate changes to VCSNS Examination Program can be completed to support implementation during Refueling Outage 14, scheduled for October 2003.

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 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)(i), 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

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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 10-year interval, subject to the limitations and modification listed therein. For VCSNS, the applicable edition of Section XI of the ASME Code for the second 10-year ISI interval is the 1989 Edition, without Addenda.

3.0 EVALUATION

3.1 Components for which Relief is Requested:

Relief is being requested for six ASME Section XI, Class 1, RPV Nozzle-to-Vessel Welds, three inlet and three outlet, as follows:

Weld CGE-1-1100A-18 at 25 degree vessel azimuth
Weld CGE-1-1100A-19 at 95 degree vessel azimuth
Weld CGE-1-1100A-20 at 145 degree vessel azimuth
Weld CGE-1-1100A-21 at 215 degree vessel azimuth
Weld CGE-1-1100A-22 at 265 degree vessel azimuth
Weld CGE-1-1100A-23 at 325 degree vessel azimuth

3.2 Applicable Code Requirements from which Relief is Requested:

Pursuant to 10 CFR 50.55a(a)(3)(i), SCE&G is requesting relief from ASME, Section XI, 1989 Edition, 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), for defining the examination volume requirements for ultrasonic examination of RPV nozzle-to-vessel welds. Specifically, the licensee is requesting relief from the weld region examination volume requirements of Figures IWB-2500-7(a) and (b).

3.3 Licensee's Proposed Alternative:

Figures IWB-2500-7(a) and (b) require the volumetric examination of the RPV nozzle-to-vessel welds and volume of base metal commence from a distance that extended out from the toe of the weld for a distance equivalent to one-half the through-wall shell thickness.

In accordance with 10 CFR 50.55a(a)(3)(i), SCE&G proposed using ASME Section XI Code Case N-613-1, "Ultrasonic Examination of Full Penetration Nozzles in Vessel, Examination Category B-D, Item Nos. B3.10 and B3.90, Reactor Nozzle-to-Vessel Welds, Figs. IWB-2500-7(a), (b), and (c) Section XI, Division I," dated August 20, 2002, in lieu of the Code requirements. This Code Case allows a reduced examination weld volume for Category B-D nozzle-to-vessel welds previously examined using the examination volumes of Figs. IWB-2500-7(a), (b), and (c), which extends to ½ inch from the crown on each side of the weld.

3.4 Licensee's Basis for the Proposed Alternative:

In the July 11, 2003, submittal, as supplemented by the September 16, 2003, letter the licensee provided the following basis for the proposed alternative:

The examination volume for the RPV nozzle-to-vessel are unnecessarily large. For the VCSNS reactor vessel, the nozzle to shell volume would extend about 5 inches into the nozzle forging and the same distance into the upper shell course forging. This proposed alternative would re-define the examination volume boundary to ½ inch of the base metal on each side of the thickest portion of the weld. This reduction in base metal inspection will not affect the flaw detection capabilities in the weld and heat affected zone.

Compliance with these requirements will assure the requisite level of quality and safety is maintained.

The proposed reduction in the exam volume is base metal only, extensively interrogated by ultrasonic examination during fabrication, preservice examinations and inservice examinations performed in 1993. In 1993, the data was acquired, archived and analyzed using automated ultrasonic systems. SCE&G is confident that reasonable comparison can be made between the past and the present if necessary. During previous examinations, no indications exceeding the allowable limits of the preservice and inservice criteria were found in the six-reactor vessel nozzle to shell examination volumes including the base metal proposed for exclusion from examination in this request. The 1993 results were based on examinations performed in accordance with the ASME Code, Section XI, Section V and Regulatory Guide 1.150, Rev. 1.

The Section XI examination volume for the pressure-retaining nozzle to welds extends from the edge of the weld to include a significant portion of the nozzle forging body (inward) and reactor vessel upper shell course (outward) which is a forged ring. The large volume results in a significant increase in examination time with no corresponding increase in safety as the greatest portion of the volume is base material not prone to inservice cracking.

The implementation of this request for relief would reduce the examination volume next to the widest portion of the weld from half the vessel wall thickness to ½ inch from the weld. This reduction applies only to base metal and not to the stressed areas of the nozzle to shell weld.

The nozzle to shell examination volume is also accessible from the vessel ID [inside diameter] surface and will be examined in four orthogonal directions for the first 15 percent of the weld thickness with respect to the vessel ID surface using Appendix VIII, Supplement 4 qualified techniques. The remaining 85 percent of weld volume accessible from the vessel ID surface will be examined in two opposing circumferential scanning directions using Appendix VIII, Supplement 6 qualified techniques to interrogate for transverse defects.

This combination of scans addresses the requirements set forth by the ASME Code, Section XI, 1995 Edition with 1996 Addenda as modified by 10 CFR 50.55a and assures that current qualified technology will be applied to the re-defined examination volume specified herein to the maximum extent

practical. Compliance with these requirements will assure the requisite level of quality and safety is maintained.

3.5 Staff Evaluation:

The acceptability of the reduced ultrasonic testing (UT) examination volume is based on previous volumetric examinations of the welds and the required volume of base metal, which extended out from the weld for a distance equivalent to one-half the through-wall shell thickness. The previous volumetric examinations showed the ASME Code volume to be free of unacceptable flaws. This base metal region included in the original ASME Code volume was extensively examined during construction of the unit, preservice inspection, and prior ISIs. The creation of flaws during plant service in the volume excluded from the proposed reduced examination volume is unlikely because of the low stress in the base metal away from the weld. The stresses caused by welding are concentrated at, or near, the weld. Cracks, should they initiate, occur in the highly stressed area of the weld. These areas are within the volume included in the reduced examination volume proposed by SCE&G.

Based on the above discussion, the staff finds that the areas to be excluded from UT examination by the relief request have previously been found to be free of unacceptable flaws by examinations performed during previous inspections. The staff further finds that the initiation of flaws in the unexamined regions, subsequent to the performance of said examinations, is highly unlikely due to the lower weld-induced stresses in these regions. Therefore, the staff finds that the proposed alternative to reduce the UT examination volume to one-half inch from the nozzle-to-vessel weld on each side of the weld crown will provide an acceptable level of quality and safety.

4.0 CONCLUSION

Based on its review, the NRC staff has determined that the proposed Relief Request RR-II-16, submitted on July 11, 2003, as supplemented by letter dated September 16, 2003, will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the proposed alternative for the second 10-year interval at VCSNS. The NRC staff's authorization is limited to the six primary nozzle-to-vessel welds. All other requirements of the ASME Code, Section XI, for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

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Date: February 11, 2003

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