



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 1, 2016

Mr. George A. Lippard, III
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
P.O. Box 88, Mail Code 800
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1 – RELIEF FROM THE
REQUIREMENTS OF THE ASME CODE (CAC NO. MF7098)

Dear Mr. Lippard:

By letter dated November 10, 2015, as supplemented by letters dated May 6, 2016, and June 2, 2016, South Carolina Electric & Gas Company (SCE&G, the licensee) submitted Relief Request RR-III-12 to the U.S. Nuclear Regulatory Commission (NRC) for the third 10-year inservice inspection (ISI) interval of the Virgil C. Summer Nuclear Station, Unit No. 1. The licensee requested relief from the examination requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PV Code) applicable to ASME Code Class 1 piping welds and ASME Code Class 2 vessel welds. The scope of this approval is for the four ASME Code Class 1 piping welds CGE-1-4102A-1, CGE-1-4102A-7, CGE-1-4202A-14, and CGE-1-4502-13. The two ASME Code Class 2 vessel welds, CGE-2-1110-1B/1 and CGE-2-1110-1B/2 were approved by letter dated May 6, 2016.

The request was submitted pursuant to Title 10 of the *Code of Federal Regulations* 50.55a(g)(5)(iii). The licensee requested relief and to use alternative requirements (if necessary) for ISI on the basis that the B&PV Code requirement is impractical.

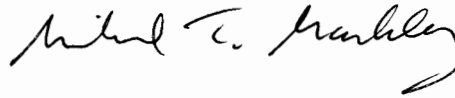
The NRC staff has reviewed the request and concludes, as set forth in the enclosed safety evaluation, that SCE&G has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i) and, therefore, authorizes the proposed alternative for the four ASME Code Class 1 piping welds CGE-1-4102A-1, CGE-1-4102A-7, CGE-1-4202A-14, and CGE-1-4502-13. All other ASME Code requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

G. Lippard, III

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If you have any questions, please contact the Project Manager, Shawn Williams, at 301-415-1009 or Shawn.Williams@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael T. Markley". The signature is fluid and cursive, with a large, sweeping flourish at the end.

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosure:
Safety Evaluation

cc w/enclosure: Distribution via Listserv



UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELIEF REQUEST RR-III-12 REGARDING ASME CODE CLASS 1 VESSEL WELDS
SOUTH CAROLINA ELECTRIC & GAS COMPANY
SOUTH CAROLINA PUBLIC SERVICE AUTHORITY
VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1
DOCKET NO. 50-395

1.0 INTRODUCTION

By letter dated November 10, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15316A556), as supplemented by letters dated May 6, 2016, and June 2, 2016 (ADAMS Accession Nos. ML16132A248 and ML16159A193, respectively), South Carolina Electric & Gas Company (the licensee) submitted Relief Request RR-III-12 to the U.S. Nuclear Regulatory Commission (NRC or the Commission) for the third 10-year inservice inspection (ISI) interval of the Virgil C. Summer Nuclear Station, Unit No. 1 (VC Summer). In its submittal of RR-III-12, the licensee requested relief from the volumetric examination of Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) applicable to ASME Code Class 1 piping welds and ASME Code Class 2 vessel welds. The scope of this review is for the four ASME Code Class 1 piping welds, CGE-1-4102A-1, CGE-1-4102A-7, CGE-1-4202A-14, and CGE-1-4502-13 identified in the licensee's submittal. The subject welds are ASME Code, Section XI, Examination Category B-J, Item No. B9.11. ASME Code, Section XI, Table IWB-2500-1, requires essentially 100 percent volumetric examination of the required volume of these welds.

The two ASME Code Class 2 vessel welds, CGE-2-1110-1B/1 and CGE-2-1110-1B/2, were approved by NRC letter dated May 6, 2016 (ADAMS Accession No. ML16124A897).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(5)(iii), the licensee requested relief on the basis that achieving the ASME Code-required examination coverage for these welds was impractical due to obstructions.

2.0 REGULATORY EVALUATION

As required by 10 CFR 50.55a(g)(4), throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components that are classified as ASME Code Class 1, 2, and 3 components must meet the requirements, except the design and access provisions and preservice examination requirements, as set forth in Section XI of the ASME Code incorporated

Enclosure

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.

When conformance to these requirements is determined to be impractical, relief may be granted by the NRC pursuant to 10 CFR 50.55a(g)(5)(iii). Additionally, pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee must notify the NRC and submit, as specified in 10 CFR 50.4, information to support the determination. Requests for relief made in accordance with 10 CFR 50.55a(g)(5)(iii) must be submitted no later than 12 months after the expiration of the initial or subsequent 10-year inspection interval.

Pursuant to 10 CFR 50.55a(g)(6)(i), the Commission will evaluate determinations under paragraph (g)(5) of this section that Code requirements are impractical. The Commission may grant such relief, and may impose such alternative requirements, as it determines are authorized by law and will not endanger life or property or the common defense and security, and are 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.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request, and the NRC to grant, the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Applicable Code Edition and Addenda

The code of record at VC Summer for the third 10-year ISI interval is the 1998 Edition of Section XI of the ASME Code, with the 2000 Addenda. The third 10-year ISI interval was extended by 1 year to end on December 31, 2014. The subject examinations for which relief is requested were performed in accordance with ASME Code, Section XI, Appendix VIII, Supplement 2, "Qualification Requirements for Wrought Austenitic Piping Welds."

3.2 Regulatory Requirements

ASME Code, Section XI, Table 2500-1, Examination Category B-J, requires essentially 100 percent volumetric examination. "Essentially 100 percent," as clarified by ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds," is greater than 90 percent coverage of the examination volume, or surface area, as applicable. ASME Code Case N-460 has been approved for use by the NRC in Regulatory Guide 1.147, Revision 17, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," dated August 2014. For Examination Category B-J, the examination volume is defined in Figure IWB-2500-8.

Additionally, pursuant to 10 CFR 50.55a(b)(2)(xv)(A)(1) and 10 CFR 50.55a(b)(2)(xv)(A)(2), piping must be examined in two axial directions, and when examination in the circumferential direction is required, the circumferential examination must be performed in two directions, provided access is available. Where examination from both sides is not possible for austenitic or dissimilar metal welds, full coverage credit from a single side weld may be claimed only after

completing a successful single-sided Appendix VIII demonstration using flaws on the opposite side of the weld.

3.3 Components for Which Relief is Requested

Table 1 – Examination Category B-J Welds with Limited Volumetric Coverage					
Category/ Item No.	Weld ID	Limitation	Pipe Size (inches)	Material/ Wall Thickness (inches)	Coverage Obtained Percent
B-J/B9.11	CGE-1-4102A-1	Single side pipe-to-branch	12	SA-376, Gr 316 1.125	50
B-J/B9.11	CGE-1-4102A-7	Single side pipe-to-valve	12	SA-376, Gr 316 1.125	50
B-J/B9.11	CGE-1-4202A-14	Single side pipe-to-valve	6	SA-376, Gr 304 0.719	47.80
B-J/B9.11	CGE-1-4502A-13	Single side pipe-to-tee	6	SA-376, Gr 304 0.719	50

3.4 Duration of Relief

Relief is requested for the third 10-year inspection interval, which began on September 16, 2003, and ended on December 31, 2013. In accordance with ASME Code, Section XI, paragraph IWA-2430(c)(1), VC Summer extended the third ISI interval by 1 year, to end on December 31, 2014.

3.5 Reason for Request and Proposed Alternative

The limitation for examination coverage is due to physical design and configuration of the component. The subject welds were examined to the maximum extent practical, using multiple angles and beam paths. As stated in the licensee's supplement dated June 2, 2016, the ultrasonic examinations were performed using personnel, equipment, and procedures qualified in accordance with ASME Section XI, Appendix VIII, as implemented by the Performance Demonstration Initiative (PDI). The ASME Code-required volume of these welds was interrogated ultrasonically to the maximum extent possible.

Welds CGE-1-4102A-7 and CGE-1-4202A-14 consist of pipe-to-valve configurations, where the taper of the valve is within close proximity of the weld. Due to the absence of sufficient distance between the weld and valve, circumferential and axial scanning was performed from the pipe side only. This resulted in credited ultrasonic examination coverage of 50 percent and 47.8 percent for welds CGE-1-4102A-7 and CGE-1-4202A-14, respectively. Weld CGE-1-4202A-14 had slightly less coverage due to minor additional geometric obstruction.

Weld CGE-1-4502-13 consists of a pipe-to-tee configuration, where the radius of the tee is within close proximity of the weld and does not provide sufficient distance from the tee side to

perform complete axial and circumferential scanning on the tee side of the weld. Due to the absence of sufficient distance between the radius of the tee and the weld, axial and circumferential scanning was performed from the pipe side only; therefore, only 50 percent coverage was provided.

Weld CGE-1-4102A-1 consists of a pipe-to-branch connection configuration, where the branch connection does not provide sufficient distance to perform complete axial and circumferential scanning from the branch connection side of the weld. The configuration limited examinations to axial and circumferential examinations from the pipe side only, resulting in 50 percent coverage.

These ultrasonic examination scans included combinations of 45- and 60-degree shear and 60-degree refracted longitudinal waves (L-waves) examinations from a single side (pipe side) and did not yield any recordable indications.

4.0 NRC Staff Evaluation

ASME Code, Section XI, Table IWA-2500-1, Examination Category B-J, requires essentially 100 percent volumetric and surface examinations. However, complete volumetric examinations are restricted by component design, materials, and weld configurations. These conditions preclude the licensee from obtaining full volumetric examinations from both sides of these welds. To gain access for examination, the subject welds would require design modifications. This would place a burden on the licensee; thus, obtaining 100 percent of the ASME Code-required volumetric examinations for the subject welds is considered impractical.

The subject Class 1 austenitic stainless steel piping welds have geometric limitations that restrict ultrasonic scanning to be performed from the pipe side of the welds only. Specifically, weld CGE-1-4102A-1 is a pipe-to-branch connection, welds CGE-1-4102A-7 and CGE-1-4102A-14 are pipe-to-valve, and weld CGE-1-44502A-13 is tee-to-pipe. Volumetric examinations on the subject welds were conducted with equipment, procedures, and personnel that were qualified to a performance demonstration process outlined in ASME Code, Section XI, Appendix VIII. These techniques have been qualified through the industry's PDI, which meets the intent of the ASME Code, Section XI, Appendix VIII, requirements for flaws located on the near side of the welds; far side detection of flaws is considered to be a "best effort." Because the subject welds are wrought austenitic stainless steel, and there are currently no PDI-qualified single side examination procedures that demonstrate equivalency to two-sided examination on austenitic piping welds, the NRC staff finds that the licensee-achieved examination coverage by the "best effort" is considered justified.

As shown in the sketches and technical descriptions included in the licensee's submittals, examinations of the subject pipe-to-tee, pipe-to-valve, and pipe-to-branch connection welds have been completed to the maximum extent practical. The volumetric coverage ranged from approximately 47.8 to 50.0 percent of the ASME Code-required volumes as shown in Table 1 above. The examination volume was limited because these welds could only be examined from a single side (i.e., the pipe side or near side) due to the geometric configuration of these components. The ultrasonic techniques employed for these welds meet the ASME Code, Section XI, Appendix VIII, requirements for austenitic stainless steel welds. These techniques have been qualified for flaws located on the near side, not the far side, of the welds; far side detection of flaws is considered to be a "best effort."

Additionally, L-waves have been shown to provide enhanced detection on the far side of austenitic stainless steel welds. Therefore, while the licensee has only taken credit for obtaining limited volumetric coverage, the NRC staff expects that the techniques employed would have provided some coverage beyond the near side, into the far side of the welds.

Furthermore, as a comparison, in response to NRC letter dated April 8, 2016 (ADAMS Accession No. ML16097A081), the licensee stated that, to date it has not observed any evidence of degradation on welds that are similar to the subject four welds. As part of its response, the licensee provided results from previous examinations of similar welds that have achieved essentially 100 percent examination coverage without reported degradation or leakage.

The NRC staff notes that in addition to the ultrasonic examinations, these welds are also subject to system leakage testing requirements of the ASME Code, Section XI, IWB-2500 (Table IWB-2500-1, Examination Category B-J), during each refueling outage. The NRC staff finds that the licensee's leakage testing provides additional assurance that significant degradation, if it is present, would be detected and provides the opportunity for the licensee to take appropriate corrective action(s).

The licensee has demonstrated that due to geometric limitations, it was impractical to meet the ASME Code-required "essentially 100 percent" volumetric examination coverage for the subject piping welds for its third ISI interval. Although the ASME Code-required coverage could not be obtained, the ultrasonic techniques employed provided nearly full volumetric coverage from the near side of the welds, which provides some limited volumetric coverage for the weld materials on the opposite (far) side of these welds. Based on the aggregate coverage obtained for the subject welds, the extent of the examinations, and considering the licensee's performance of essentially 100 percent examination coverage of welds with similar material, environment, and expected degradation, it is reasonable to conclude that if significant service-induced degradation is present in these welds, some evidence of degradation would have been detected. Furthermore, ultrasonic examinations of the subject welds performed in 2015 as part of its fourth ISI interval, which did not yield any recordable indications, provided additional confidence in the structural integrity of these welds.

The NRC staff has determined that obtaining the ASME Code-required examination volume is impractical because it would impose a burden upon the licensee. The NRC staff also determined that the ultrasonic examinations performed, despite the limited coverage obtained by the licensee, provide reasonable assurance of the structural integrity of welds CGE-1-4102A-1, CGE-1-4102A-7, CGE-1-4202A-14, and CGE-1-4502-13.

5.0 CONCLUSION

As set forth above, the NRC staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security, and is otherwise in the public interest, given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Furthermore, the NRC staff concluded that the examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject components. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants relief from the ASME Code examination requirements for welds CGE-1-4102A-1, CGE-1-4102A-7,

CGE-1-4202A-14, and CGE-1-4502-13, included in Relief Request RR-III-12 for the VC Summer third 10-year ISI interval.

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

Principal Contributor: Roger Kalikian

Date: July 1, 2016

G. Lippard, III

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If you have any questions, please contact the Project Manager, Shawn Williams, at 301-415-1009 or Shawn.Williams@nrc.gov.

Sincerely,

/RA/

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-395

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Safety Evaluation

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