



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

October 17, 2012

Mr. Thomas D. Gatlin
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Post Office Box 88
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1, ALTERNATIVE RR-III-08 FOR
THIRD 10-YEAR INSERVICE INSPECTION INTERVAL (TAC No. ME8966)

Dear Mr. Gatlin:

By letter dated July 27, 2012 (Agencywide Document Access and Management System (ADAMS) Accession No. ML12212A287), as supplemented September 13, 2012, South Carolina Electric & Gas Company, the licensee, proposed an alternative to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50 Section 55a(g)(6)(ii)(F)(3) for Virgil C. Summer Nuclear Station, Unit 1 (VCSNS). The licensee is essentially requesting a deferral of the baseline examinations for one cycle of operation. This relief request (RR) was made in conjunction with a previous letter from the licensee dated June 21, 2012 (ADAMS Accession No. ML12177A381), requesting re-categorization of the steam generator inlet and outlet dissimilar metal butt welds, under the inspection requirements of American Society of Mechanical Engineer's Boiler and Pressure Vessel Code (ASME) Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR [Pressure Water Reactor] Piping and Vessel Nozzle Butt Welds Fabricated With UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," with U.S. Nuclear Regulatory Commission staff (NRC, staff) conditions.

The staff recognizes that each of these welds have had inlay mitigations installed during initial construction using Alloy 152 material. While the staff has not completed its review to fully recategorize these welds under ASME Code Case N-770-1 for a new long-term inspection frequency, the application is noted as a mitigation option under ASME Code Case N-770-1. The Alloy 152 material used at VCSNS is considered to have a primary water stress corrosion cracking improvement factor of at least 10 over the structural materials of each of the welds in question. As such, the staff notes that the use of the Alloy 152 material, as an isolation boundary, does provide additional assurance for structural integrity versus other non-mitigated dissimilar metal butt welds. As such, the staff finds the licensee's proposed alternative provides reasonable assurance of structural integrity and leak tightness for the duration of the request. The staff also finds limited value in the licensee performing a high radiological dose best effort examination during the fall 2012 refueling outage that would not be specifically qualified for this type of mitigated weld.

T. Gatlin

- 2 -

As set forth in the enclosed safety evaluation, the NRC staff concludes that the licensee provided sufficient technical basis to demonstrate that compliance with the requirements of 10 CFR 50.55a(g)(6)(ii)(F)(3) would cause an unnecessary burden on the licensee without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii), and that the proposed alternative provides reasonable assurance of structural integrity and leak tightness, and therefore the alternative is in compliance with the *Code of Federal Regulation's* requirements. As such, in accordance with 10 CFR 50.55a(a)(3)(ii) the NRC staff authorizes the licensee's proposed alternative, RR-III-08, as supplemented by letter dated September 13, 2012, at the VCSNS, Unit 1, for the fall 2012 refueling outage until the spring 2014 refueling outage.

Sincerely,

A handwritten signature in black ink, appearing to read "R. Pascarelli", written in a cursive style.

Robert Pascarelli, 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/encl: Distribution via Listserv



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF (RR-III-08) FROM ASME CODE CASE N-770-1

BASELINE INSPECTION REQUIREMENT FOR VOLUMETRIC EXAMINATION

OF REACTOR SYSTEM DISSIMILAR METAL BUTT WELDS

SOUTH CAROLINA ELECTRIC & GAS COMPANY

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1

DOCKET NO. 50-395

1.0 INTRODUCTION

By letter dated July 27, 2012, (Agencywide Document Access and Management System (ADAMS) Accession No. ML12212A287), as supplemented by letter dated September 13, 2012 (ADAMS accession number ML12262A330), South Carolina Electric & Gas Company, the licensee, proposed an alternative to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(6)(ii)(F)(3) for Virgil C. Summer Nuclear Station, Unit 1 (VCSNS). The requirements, for which an alternative is requested, define the baseline volumetric inspection requirement for reactor coolant system dissimilar metal (DM) butt welds. The licensee is essentially requesting a deferral of the baseline examinations for one cycle of operation. This relief request was made in conjunction with a previous letter from the licensee, dated June 21, 2012, (ADAMS accession number ML12177A381) requesting recategorization of the steam generator inlet and outlet dissimilar metal butt welds, under the inspection requirements of American Society of Mechanical Engineer's Boiler and Pressure Vessel Code (ASME) Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated With UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," with Nuclear Regulatory Commission staff (NRC, staff) conditions.

2.0 REGULATORY EVALUATION

The inservice inspection (ISI) of ASME Code Class 1, 2 and 3 components is to be performed in accordance with Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the ASME Code and applicable editions and addenda as required by Title 10, *Code of Federal Regulations*, Part 50.55a(g) [10 CFR 50.55a(g)], except where specific written relief has been granted by the Commission.

Title 10 CFR 50.55a(g)(6)(ii) states that the Commission may require the licensee to follow an augmented ISI program for systems and components for which the Commission deems that added assurance of structural reliability is necessary. 10 CFR 50.55a(g)(6)(ii)(F) requires, in part, augmented inservice volumetric inspection of class 1 piping and nozzle DM butt welds of pressurized water reactors in accordance with ASME Code Case N-770-1, subject to the conditions specified in paragraphs (2) through (10) of 10 CFR 50.55a(g)(6)(ii)(F).

Alternatives to requirements under 10 CFR 50.55a(g) may be authorized by the Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.55a(a)(3)(i) or 10 CFR 50.55a(a)(3)(ii). In proposing alternatives or requests for relief, the licensee must demonstrate that: (1) the proposed alternatives would provide an acceptable level of quality and safety; or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

By letter dated July 27, 2012, the licensee proposed an alternative, RR-III-08, in accordance with 10 CFR 50.55a(a)(3)(ii) for relief from the requirements of 50.55a(g)(6)(ii)(F)(3) for six dissimilar metal (DM) butt welds at VCSNS.

10 CFR 50.55a(g)(6)(ii)(F)(3) states:

Baseline examinations for welds in Table 1, Inspection Items A-1, A-2, and B, shall be completed by the end of the next refueling outage after January 20, 2012. Previous examinations of these welds can be credited for baseline examinations if they were performed within the re-inspection period for the weld item in Table 1 using Section XI, Appendix VIII requirements and met the Code required examination volume of essentially 100 percent. Other previous examinations that do not meet these requirements can be used to meet the baseline examination requirement, provided NRC approval of alternative inspection requirements in accordance with paragraphs (a)(3)(i) or (a)(3)(ii) of this section is granted prior to the end of the next refueling outage after January 20, 2012.

3.0 TECHNICAL EVALUATION

3.1 Licensee Relief Request

3.1.1 Component Identification

DM butt weld identification numbers CGE-1-4100A-31DM, CGE-1-4100A-31DM, CGE-1-4200A-28DM, CGE-1-4200A-29DM, CGE-1-4300A-29DM, and CGE-1-4300A-30DM would require relief from 10 CFR 50.55a(g)(6)(ii)(F)(3).

3.1.2 Code Requirements for Which Relief is Requested

10 CFR 50.55a(g)(6)(ii)(F)(3) requires, in part, that all ASME Code Case N-770-1 Category A-2 and B welds have a baseline examination completed by the first refueling outage starting after January 20, 2012.

3.1.3 Licensee's Proposed Alternative

The licensee proposes to conduct the baseline inspection with a qualified program during the following outage RF-21, scheduled for the spring of 2014. VCSNS will conduct a visual examination of the steam generator hot leg safe end to nozzle welds during this fall 2012 refueling outage, RF-20. The visual exam will be in accordance with the requirements of Code Case N-770-1, table 1, note 2 for inspection items A-2.

3.1.4 Licensee's Duration of Relief Request

The licensee requests relief from 10 CFR 50.55a(g)(6)(ii)(F)(3) to extend the baseline inspection requirement until the spring 2014 refueling outage at VCSNS. This is a onetime relief request.

3.1.5 Licensee's Basis for Relief

The licensee is requesting to delay the inspection to provide additional time to plan, qualify, and implement the inspections. VCSNS is declaring hardship due to the following:

1. Each SG dissimilar metal weld has a unique safe end geometry, which will require, at the minimum, the fabrication of up to six mock-ups to qualify the ultrasonic examination from the outside surface.

N-770-1 Category	Description
A-2	Weld CGE-1-4100A-31DM, Steam Generator "A" Hot Leg Nozzle
B	Weld CGE-1-4100A-32DM, Steam Generator "A" Cold Leg Nozzle
A-2	Weld CGE-1-4200A-28DM, Steam Generator "B" Hot Leg Nozzle
B	Weld CGE-1-4200A-29DM, Steam Generator "B" Cold Leg Nozzle
A-2	Weld CGE-1-4300A-29DM, Steam Generator "C" Hot Leg Nozzle
B	Weld CGE-1-4300A-30DM, Steam Generator "C" Cold Leg Nozzle

2. Ultrasonic examination from the outside surface, will not meet the code required examination volume of essentially 100 percent.
3. The VCSNS refueling schedules do not include drain down and opening the steam generator primary man ways until the 2014 outage. Adding the weld inspections from the inside diameter during the fall 2012 outage would result in an increase in outage duration, unplanned dose and significant additional costs.
4. The industry is working to establish a qualified program for performing encoded ultrasonic and eddy current examination from the inside diameter but the equipment and guidance is currently in the developmental stage. Additionally,

the equipment being developed is scheduled to support another station's outage and will not be available for use at VCSNS in the fall of 2012.

5. There are no qualified vendors to perform surface examination using automated encoded eddy current testing from the inside surface. The industry is working to establish a qualified program but the equipment and guidance is currently in the developmental stage. The availability of qualified personnel will be limited to the organization that is developing the program that is scheduled to support another station's outage.
6. Conducting a liquid penetrant inspection on the welds from the inside surface would result in high radiation exposure.

The licensee states that the fabrication of each of the welds in question was performed using an inlaid layer of at least 1/8-inch thick Alloy 152 material with approximately 28.8% chromium. This layer of material provides a more resistant primary water stress corrosion-cracking barrier between the susceptible structural weld material and the primary coolant. Further, the licensee confirms, that the inlays were applied in a manner that meets the thickness and application requirements of the new ASME Code Case N-766, "Nickel Alloy Reactor Coolant Inlay and On lay for Mitigation of PWR Full Penetration Circumferential Nickel Alloy Dissimilar Metal Welds in Class 1 Items," approved by ASME on December 20, 2010.

In their September 13, 2012 letter, the licensee provided substantial additional information on the radiological dose, which would be incurred by performing the examinations in RF-20 versus RF-21 and the licensee's efforts to find qualified personnel, equipment, and procedures to perform the exam in RF-20. The licensee explained that the dose impacts from performing a manual volumetric examination and visual surface examination on the steam generator nozzle welds (hot leg and cold leg) internally during the fall 2012 outage was estimated to be between 43 to 77 Rem. The licensee provided extensive details on their study and radiological surveys to support their estimations.

Additionally the licensee confirmed that only one individual from one non-destructive examination vendor had passed the procedures, equipment and personnel qualification process to perform the required remote examinations by August 2012. This individual is scheduled for an inspection at another site and would only be available to perform the licensee's inspection late in November. The licensee's current scheduled Defueled Work Window to perform this examination would need to be extended an additional four weeks to complete this examination which would have a similar extension to the licensee's outage time.

The licensee examined the possibility of having another automated ultrasonic testing system manufactured and the availability of qualified personnel to support the exam at VCSNS. However, based on prior commitments to industry peers, vendor support and a very heavy outage season, resources were found to be limited. The licensee noted that the EPRI PDI qualification process requires plant-specific procedures, mock ups, laser profiling of the inside diameter and scan coverage calculations be established to have a code acceptable process. The one qualified vendor identified the following to the licensee as a list of items that should be considered to prepare for the examinations at VCSNS:

- Steam generator primary nozzle drawings review.

- Tooling design engineer and NDE Level III will verify conditions of diameter, thickness, weld location, weld and surface conditions/geometry, steam dam ring configuration, and manway parameters to note any differences and determine the effect on existing tooling or NDE procedure.
- Validate NDE procedure and exam area conditions are consistent with the EPRI Performance Demonstration Initiative (PDI) qualified procedure.
- Make any required adjustments or modifications to tooling (if required).
- Determine if any additional fit and function type mockup is required (if tooling modifications are required they should be tested).
- Scan Plan Development.
- Station general examination planning (i.e. determine equipment setup locations, submit procedures, personnel certifications, equipment certifications for review and approval, planning and scheduling meetings, etc.).

The licensee found these actions to be a significant hardship to complete in the limited time before the scheduled refueling outage. Further, additional time was necessary to plan, qualify and implement the examinations from the inside surface to be in accordance with 10 CFR 50.55a(g)(6)(ii)(F).

3.2 NRC STAFF'S EVALUATION

The staff reviewed the licensee's proposed alternative under the requirements of 10 CFR 50.55a(a)(3)(ii), such that;

Compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The current requirements of 10 CFR 50.55a(g)(6)(ii)(F)(3) would require a qualified volumetric examination of each of the dissimilar metal welds identified in Section 3.1.1 during the scheduled fall 2012 refueling outage at VCSNS. By letter dated June 21, 2012, (ADAMS accession number ML12177A381), as supplemented by letter dated July 27, 2012 (ADAMS accession number ML12212A287), the licensee has requested recategorization of certain welds, listed in Section 3.1.1 of this safety evaluation, under 10 CFR 50.55a(g)(6)(ii)(F) to take credit for the inlay mitigation installed during replacement of the steam generators at VCSNS. The NRC has not completed its review of the licensee's recategorization request, but recognizes the licensee's installation of an inlay mitigation process. Under the requirements of 10 CFR 50.55a(g)(6)(ii)(F), the inlay mitigated welds at VCSNS would require a qualified volumetric and surface examination be performed during the scheduled fall 2012 refueling outage to meet the reinspection frequency of Table 1 of ASME Code Case N-770-1. For the purpose of this relief request, RR-III-08, the staff finds it is reasonable to base the hardship consideration on the licensee's need to perform a qualified volumetric and surface examination during the fall 2012 outage.

In order for the licensee to perform a qualified volumetric and surface examination, the licensee would need access to the inside diameter of the welds. This would require access through the steam generators themselves and work within a high radiation area. The preferred method for

this examination would be a remote access system that would limit the radiological dose for inspection personnel. The licensee has stated in their submittals that only one person from one vendor has met the qualification requirements of personnel, equipment and procedure to perform this examination during the fall 2012 outage season. Due to the inspection schedule for the vendor, the licensee has stated that the inspection of these welds in this manner could be performed if the outage schedule was extended for at least four weeks. The staff has confirmed with a qualification organization and non-destructive examination vendors that there have been difficulties for vendors to establish a remote qualified inspection program that can address the access restrictions of performing an inside diameter volumetric and surface inspection of the steam generator inlet and outlet dissimilar metal welds by the fall 2012 outage season. The licensee explored the option of performing a best effort manual ultrasonic and surface examination, but estimated that a radiological dose of 43 to 77 REM would be absorbed by licensee personnel to perform this examination now rather than 13 REM for a qualified remote examination. The staff reviewed the licensee's dose estimates and radiological dose survey maps finding the information to be sufficiently detailed to support the licensee's estimates. Given the limitation of a qualified remote inspection and the radiological dose of a best effort manual examination, the staff finds the licensee has provided sufficient information to demonstrate a significant hardship in performing the examination of these welds during the scheduled fall 2012 refueling outage at VCSNS.

As part of the licensee's proposed alternative to delay the volumetric and inside surface examination of their steam generator inlet and outlet dissimilar metal welds, the licensee proposes an action to perform a visual exam in accordance with the requirements of Code Case N-770-1, Table 1, and Note 2 for the steam generator inlet dissimilar metal welds. The staff notes that this visual examination would be able to ensure no small leaks have initiated from the more primary water stress corrosion cracking susceptible welds, due to higher operating temperature, during the fall 2012 outage. The staff notes that the licensee's boric acid corrosion walk-downs performed during the fall 2012 outage will also be able to provide additional assurance that no significant leakage is coming from both the steam generator inlet and outlet dissimilar metal welds.

The staff also notes that the timing requirement of a baseline examination under 10 CFR 50.55a(g)(6)(ii)(F)(3) was chosen to provide licensees sufficient time to begin implementation of the new long term regulatory requirements for reactor coolant pressure boundary dissimilar metal welds. The staff defined the implementation requirement for these baseline examinations to begin on the first scheduled refueling outage starting after January 20, 2012. Because of the possible length of an operating cycle being 2 years, the NRC expected licensees to perform the baseline examinations in a time period from the spring 2012 to the spring 2014 refueling outages. While the staff finds it was the intent of the rulemaking to implement the baseline inspection requirement for VCSNS during the scheduled fall 2012 refueling outage, there would not be a significant impact on of these welds by extending the baseline requirement for VCSNS until the spring 2014 refueling outage.

Finally, the staff also recognizes that each of these welds have had inlay mitigations installed during initial construction using Alloy 152 material. While the staff has not completed its review to fully recategorize these welds under ASME Code Case N-770-1 for a new long-term inspection frequency, the application is noted as a mitigation option under ASME Code Case N-770-1. The Alloy 152 material used at VCSNS is considered to have a primary water stress corrosion cracking improvement factor of at least 10 over the structural materials of each of the

welds in question. As such, the staff notes that the use of the Alloy 152 material, as an isolation boundary, does provide additional assurance for structural integrity versus other non-mitigated dissimilar metal butt welds. The staff also finds limited value in the licensee performing a high radiological dose best effort examination during the fall 2012 refueling outage that would not be specifically qualified for this type of mitigated weld. As such, the staff finds the licensee's proposed alternative provides reasonable assurance of structural integrity and leak tightness for the duration of the request.

Given this basis and the hardship of performing a volumetric and inside surface examination of the welds identified in Section 3.1.1 during the scheduled fall 2012 refueling outage at VCSNS, the staff concludes that the licensee has provided adequate technical basis to demonstrate that compliance with the requirements of 10 CFR 50.55a(g)(6)(ii)(F)(3) for the baseline volumetric inspection of the steam generator inlet and outlet DM welds at VCSNS, during the fall 2012 refueling outage, would cause an unnecessary hardship or unusual difficulty on the licensee without a compensating increase in the level of quality and safety given that a qualified volumetric and inside surface examination will be performed on each weld during the spring 2014 refueling outage.

4.0 CONCLUSIONS

As set forth above, the NRC staff concludes that the licensee provided sufficient technical basis to demonstrate that compliance with the requirements of 10 CFR 50.55a(g)(6)(ii)(F)(3) would cause an unnecessary burden on the licensee without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii), and that the proposed alternative provides reasonable assurance of structural integrity and leak tightness, and therefore the alternative is in compliance with the *Code of Federal Regulation's* requirements. As such, in accordance with 10 CFR 50.55a(a)(3)(ii) the NRC staff authorizes the licensee's proposed alternative, RR-III-08, as supplemented by letter dated September 13, 2012, at VCSNS, Unit 1, for the fall 2012 refueling outage until the spring 2014 refueling outage.

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: J. Collins, NRR

Date: October 17, 2012

T. Gatlin

- 2 -

As set forth in the enclosed safety evaluation, the NRC staff concludes that the licensee provided sufficient technical basis to demonstrate that compliance with the requirements of 10 CFR 50.55a(g)(6)(ii)(F)(3) would cause an unnecessary burden on the licensee without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii), and that the proposed alternative provides reasonable assurance of structural integrity and leak tightness, and therefore the alternative is in compliance with the Code of Federal Regulation's requirements. As such, in accordance with 10 CFR 50.55a(a)(3)(ii) the NRC staff authorizes the licensee's proposed alternative, RR-III-08, as supplemented by letter dated September 13, 2012, at the VCSNS, Unit 1, for the fall 2012 refueling outage until the spring 2014 refueling outage.

Sincerely,

/RA/

Robert Pascarelli, 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/encl: Distribution via Listserv

DISTRIBUTION:

Public LPL2-1 R/F RidsNrrDeEpnResource RidsNrrPMSummer Resource
RidsAcrs_AcnwMailCTR Resource RidsNrrLASFiguroa Resource RidsOgcRp Resource
RidsNrrDorIDpr Resource RidsRgn2MailCenter Resource JCollins, NRR

ADAMS Accession No. ML12289A050

*By memo dated **Via email

OFFICE	NRR/LPL2-1/PM	NRR/LPL2-1/LA**	NRR/DE/EPNB/BC	NRR/LPL2-1/BC	NRR/LPL2-1/PM
NAME	RMartin	SFiguroa	TLupold	RPascarelli	RMartin
DATE	10/17/12	10/16/12	10/12/12	10/17/12	10/17/12

OFFICIAL RECORD COPY