



April Rice
Manager
New Nuclear Licensing

July 7, 2016
NND-16-0246
10 CFR 50.55a

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3
Docket Numbers 52-027 and 52-028
Request for Alternative: Preservice Inspection Requirements for Steam
Generator Nozzle to Reactor Coolant Pump Casing Welds

Reference: 1. ND-16-0687, Southern Nuclear Operating Company, Vogtle Electric
Generating Plant Units 3 and 4, Request for Alternative: Preservice Inspection
Requirements for Steam Generator Nozzle to Reactor Coolant Pump Casing
Welds (VEGP 3&4-PSI-ALT-05), dated June 24, 2016.

Pursuant to 10 CFR 50.55a(z)(1), South Carolina Electric & Gas Company (SCE&G), acting on behalf of itself and the South Carolina Public Service Authority (Santee Cooper), hereby requests NRC authorization to use an alternative to the requirements of Section XI, IWB-2500, of the ASME Boiler and Pressure Vessel (B&PV) Code, 2007 Edition through 2008 Addenda (code of record) for Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3. The proposed request for alternative is applicable to preservice inspection of the steam generator nozzle to reactor coolant pump casing butt weld. This butt weld is an ASME Code Class 1 weld and is not addressed in the ASME code of record for VCSNS Units 2 and 3. This request proposes the use of the 2013 Edition of the ASME B&PV Code, Section XI for the inspection requirements of this weld, as amended by the six NRC conditions provided in Federal Register, Volume 81, No. 41, March 2, 2016, Proposed Rules, which conditionally accepts ASME Code Case N-799. This code case was the precedent to the examination requirements now included in the 2013 Edition of ASME B&PV Code, Section XI for this weld.

The details of the 10 CFR 50.55a(z)(1) request are contained in the enclosure to this letter. Approval is requested by October 14, 2016, to support the Section XI preservice inspections for the steam generator cold leg nozzle to reactor coolant pump casing welds.

This letter contains no regulatory commitments. Should you have any questions, please contact Mr. Richard Troficanto at (803)941-9873 or by email at Richard.Troficanto@scana.com.

This request is consistent in technical content with Southern Nuclear Operating Company (SNC) alternative request VEGP 3&4-PSI-ALT-05 submitted June 24, 2016 (Reference 1).

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 7th day of July 2016.

Sincerely,



April Rice
Manager
New Nuclear Licensing

BB/RAJ/bb

Enclosure: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1) Regarding Preservice Inspection Requirements for Steam Generator Nozzle to Reactor Coolant Pump Casing Welds

c: Billy Gleaves
Ruth Reyes
Chandu Patel
Paul Kallan
Tom Fredette
Tomy Nazario
Cathy Haney
Jim Reece
Stephen A. Byrne
Jeffrey B. Archie
Ronald A. Jones
Alvis J. Bynum
Kathryn M. Sutton
April Rice
Nick Kellenberger
Richard Troficanto
Mike Fanguy
Andrea Sterdis
Brad Stokes
Bryan Barwick
Margaret Felkel
Cynthia Lanier
Lisa Spears
Pat Young
Zach Harper
Brian McIntyre
Brian Bedford
Carl Churchman
Joseph Cole
Chuck Baucom
Lisa Alberghini
Curt Castell
Jeff Hawkins
Susan E. Jenkins
William M. Cherry
Rhonda O'Banion
vcsummer2&3project@westinghouse.com
VCSummerMail@westinghouse.com
DCRM-EDMS@SCANA.COM

South Carolina Electric & Gas Company

NND-16-0246

Enclosure

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

**Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1)
Regarding Preservice Inspection Requirements for Steam Generator Nozzle to Reactor
Coolant Pump Casing Welds**

(Enclosure consists of 8 pages, including this cover page.)

Plant Site-Unit:	Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3
Interval-Interval Dates:	Applies to Preservice Inspection (PSI)
Requested Date for Approval:	Approval is requested by October 14, 2016 to support the performance of the VCSNS Unit 2 Section XI PSI of the steam generator cold leg nozzle to reactor coolant pump casing welds.
ASME Code Components Affected:	The AP1000 [®] design is unique in that the reactor coolant pump inlet nozzle is welded directly to the steam generator cold leg outlet nozzle (two per steam generator). The dissimilar metal circumferential butt weld joining the low alloy steel with austenitic stainless steel cladding steam generator nozzle to the cast austenitic stainless steel reactor coolant pump casing is classified as an ASME Section XI Class 1 weld (see Figure 1). The AP1000 design has two steam generators and four reactor coolant pumps in both VCSNS Unit 2 and Unit 3.
Applicable Code Edition and Addenda:	ASME B&PV Code, Section XI, 2007 Edition through the 2008 Addenda (code of record)
Applicable Code Requirements:	The ASME code of record for VCSNS Units 2 and 3 does not address this dissimilar Category B-F weld. ASME has approved Code Case N-799 and the corresponding code change is included in the 2013 edition of ASME Section XI, Table IWB-2500-1, Category B-F, Item Number B5.71. The code case and this version of ASME Section XI have not been approved by the NRC for use.
Reason for Request:	The 2007 Edition of ASME Section XI through the 2008 Addenda does not describe requirements for the examination of these welds. If approved, this alternative will be used to satisfy the preservice inspection requirements for the steam generator nozzle to reactor coolant pump casing butt weld.

**Proposed
Alternative and
Basis for Use:**

SCE&G proposes to use the 2013 Edition of ASME Section XI for the inspection requirements of these welds as amended by the six NRC conditions specified in Federal Register Volume 81, No. 41, March 2, 2016, Proposed Rules, to conditionally accept ASME Code Case N-799. Table IWB-2500-1 of the 2013 Edition list these welds as ASME Category B-F, Item Number B5.71 with a description of Nominal Pipe Size 4-inch or Larger Nozzle-to-Component Butt Welds. Figure IWB-2500-8(c) from the 2013 Edition best depicts this configuration.

In alignment with ASME Section XI, 2013 Edition, SCE&G proposes to perform a surface examination on the outer diameter (OD) surface and perform an encoded volumetric examination from the inner diameter (ID) surface using the ultrasonic test method. The ultrasonic test techniques will be qualified in accordance with the Performance Demonstration Initiative (PDI) Program which satisfies the requirements of ASME Section XI, Appendix VIII, Supplement 10, including Code Case N-695 and 10 CFR 50.55a.

In addition to the ASME Section XI examinations, SCE&G proposes to perform eddy current test techniques from the ID surface. Although not an ASME mandatory examination, the eddy current technique utilized on the ID surface will be qualified in accordance with ASME Section V, Article 14 (2007 Edition through the 2008 Addenda).

The ultrasonic test and eddy current techniques are the same as those applied to Reactor Pressure Vessel (RPV) nozzle to safe end dissimilar metal welds from the ID surface by WesDyne, the inspection vendor, except for the addition of larger and deeper focused ultrasonic test transducers. These added transducers allow for through-wall coverage through the full thickness of the weld in the event flaw indications are detected within the inner 1/3 of the thickness of the weld and adjacent base material or the defined examination volume. The AP1000 steam generator nozzle to pump casing dissimilar metal butt weld is thicker than the RPV nozzle to safe end dissimilar metal welds found in other pressurized water reactors.

To extend the PDI qualification to this greater thickness and to account for the specific weld configuration, an AP1000 steam generator to pump casing weld specimen was designed and fabricated by the Electric Power Research Institute (EPRI) in accordance with the EPRI/PDI Program. This specimen serves as a blind test specimen necessary to qualify the ultrasonic test procedure and the ultrasonic test personnel. The ultrasonic test procedure and personnel qualifications are conducted by PDI under the PDI ASME Section XI, Appendix VIII program.

The eddy current techniques are qualified internally by the inspection vendor in accordance with ASME Section V, Article 14, intermediate rigor, using test data obtained from an additional AP1000 steam generator to pump casing butt weld specimen, containing ID surface breaking planar flaws.

This combination of ID surface applied ultrasonic and eddy current techniques that have been qualified or demonstrated will allow detection of primary water stress corrosion cracking, the failure mechanism identified for dissimilar metal welds in operational pressurized water reactors. It is also noted that the ultrasonic test techniques are capable of detecting and length sizing

**Proposed
Alternative and
Basis for Use
(Continued):**

embedded planar flaws throughout the ASME Code 2013 Edition examination volume as demonstrated on an open AP1000 steam generator to pump casing butt weld specimen.

The proposed preservice inspections are complimented by the required ASME B&PV Code Section III radiography examinations and the design organization’s required ASME Code Section V ultrasonic examinations imposed during component fabrication. The ultrasonic examinations include in-progress inspections of the buttering material on both the steam generator and RCP materials from the end face, and post-weld inspections of the full volume of the weld using multiple angle, four directional angle beam techniques from both the ID and OD surfaces. The post-weld ultrasonic examinations are evaluated against the ASME Code Section III and Section XI standards for acceptance.

In addition to the use of the 2013 Edition of ASME Section XI for inspection of these welds, SCE&G proposes to partially adopt the six proposed conditions currently outlined in the referenced Federal Register. The six proposed conditions and SCE&G application of these conditions are listed below:

Condition 1: This proposed condition would require that the scanning surfaces have a gap less than 0.032-inch beneath the ultrasonic testing probe.

SCE&G Application of Condition 1: SCE&G will meet Condition 1. The design organization’s fabrication specification requires a flatness of 0.031-inch per 1 inch or better over the entire required scan length.

Condition 2: This proposed condition is that the examination requirements of Section XI, Mandatory Appendix I, paragraph I–3200(c) must be applied.

SCE&G Application of Condition 2: SCE&G will meet Condition 2. Inspections of these welds will be performed in two axial and two circumferential directions in accordance with Mandatory Appendix I, paragraph I-3200(c). The ultrasonic test procedure that is applied is qualified for detection and length-sizing of ID-connected flaws in dissimilar metal (DM) welds in accordance with Section XI, Appendix VIII, Supplement 10 (as administered by EPRI/PDI) assuming double sided access although the procedure is not qualified for examinations from the cast austenitic stainless steel (CASS) reactor coolant pump casing.

The ultrasonic test procedure has also been demonstrated on ID-connected flaws when scanning from the CASS material in accordance with ASME Section V, Article 14 under the cognizance of EPRI/PDI. Ultrasonic test personnel are qualified in a blind test. An eddy current technique is also applied for surface examination. This eddy current technique is applied axially and circumferentially across the surface extent of the examination volume. The eddy current procedure and personnel have demonstrated detection and length-sizing in accordance with ASME Section V, Article 14 by the inspection vendor.

Condition 3: This proposed condition is that the examination of the dissimilar metal welds between reactor vessel nozzles and components, and between steam generator nozzles and pumps must be full volume.

**Proposed
Alternative and
Basis for Use
(Continued):**

SCE&G Application of Condition 3: SCE&G proposes to take a partial exception to Condition 3 and perform a preservice inspection volumetric examination of the required 2013 Edition of ASME Section XI inspection volume, not the entire weld volume. The ultrasonic and eddy current inspection techniques are performed from the component ID surface. This approach minimizes the impact of sound beam re-direction and scattering. The capability of detecting and length sizing of ID-initiated flaws in the weld and in the CASS material was demonstrated on a representative blind test specimen. Therefore, full volume of the inner third of the weld, as required by the 2013 Edition of ASME Section XI, will be achieved. For clarification, SCE&G's proposed volumetric coverage for preservice inspection is depicted in IWB-2500-8(c) and applied to the VCSNS steam generator nozzle to reactor coolant pump casing butt welds in Figure 2.

It is noted that the full volume of the weld has been ultrasonically examined using multiple angle, four directional angle beam techniques applied from both the ID and OD surfaces during the fabrication process in accordance with ASME Section V using the acceptance standards of both ASME Code Section III and Section XI.

Condition 4: This proposed condition is that ultrasonic depth and sizing qualifications for CASS components must use the ASME Code requirements in Section XI, Appendix VIII, Supplement 10. Supplement 10 contains qualification requirements for dissimilar metal welds.

SCE&G Application of Condition 4: SCE&G will meet Condition 4. SCE&G will utilize a Section XI, Appendix VIII, Supplement 10 qualified procedure (detection and length sizing) for the steam generator nozzle to reactor coolant pump casing butt weld including the scans over the CASS material. Depth sizing limitations are addressed in SCE&G application of condition 6.

Condition 5: This proposed condition will require the examination's acceptability to be based on an ultrasonic examination of the qualified volume and a flaw evaluation of the largest hypothetical crack that could exist in the volume not qualified for ultrasonic examination.

SCE&G Application of Condition 5: SCE&G proposes to take an exception to Condition 5. This condition is not applicable to the examination that will be performed. The examination procedure to be utilized has been qualified on a mock-up representative of the thickness and configuration of the steam generator outlet nozzle to reactor coolant pump casing weld and contains ID-initiated planar flaws in the weld, buttering and in the cast stainless steel material. Detection and length sizing qualification was extended to the full thickness. Because the examinations are performed from the ID surface, coverage of the examination volume is not limited. It is important to note, the examination volume is the inner 1/3 of the thickness of the weld and includes the weld and 0.25 inch of adjacent base metal on both sides of the weld and buttering. The weld and buttering on the steam generator outlet nozzle are composed of Alloy 690 weld metals. Alloy 690 weld metals used in the AP1000 design are much more resistant to developing flaws and have significantly improved flaw growth tolerance as compared to Alloy 600 weld metals. Examination of the outer 2/3 is not required unless performing depth sizing of a flaw indication.

<p>Proposed Alternative and Basis for Use (Continued):</p>	<p>Condition 6: This proposed condition is that cracks that are detected but cannot be depth-sized with performance-based procedures, equipment, and personnel qualifications consistent with Section XI, Appendix VIII, shall be repaired or removed.</p> <p>SCE&G Application of Condition 6: SCE&G will meet Condition 6.</p> <p>The proposed examinations are in accordance with the 2013 Edition of ASME Section XI, as amended by SCE&G application of the proposed six NRC conditions, as described above. Therefore, SCE&G concludes that the proposed examinations will provide an acceptable level of quality and safety.</p>
<p>Duration of Proposed Alternative:</p>	<p>The duration of the proposed alternative is the Section XI preservice inspections for both VCSNS Unit 2 and Unit 3.</p>
<p>References:</p>	<ol style="list-style-type: none"> 1. Section XI ASME Code Case N-799 2. Section XI ASME Code Case N-695 3. ASME B&PV Code, Section XI, 2007 Edition through the 2008 Addenda 4. ASME B&PV Code, Section XI, 2013 Edition 5. ASME B&PV Code, Section III, 1998 Edition through the 2000 Addenda 6. ASME B&PV Code, Section V, 2007 Edition through the 2008 Addenda 7. Federal Register Vol. 81, No. 41 dated March 2, 2016 8. VC Summer Units 2 and 3, Updated Final Safety Analysis Report (UFSAR), Subsection 5.1.3.3
<p>Status:</p>	<p>Awaiting NRC authorization.</p>

Figure 1

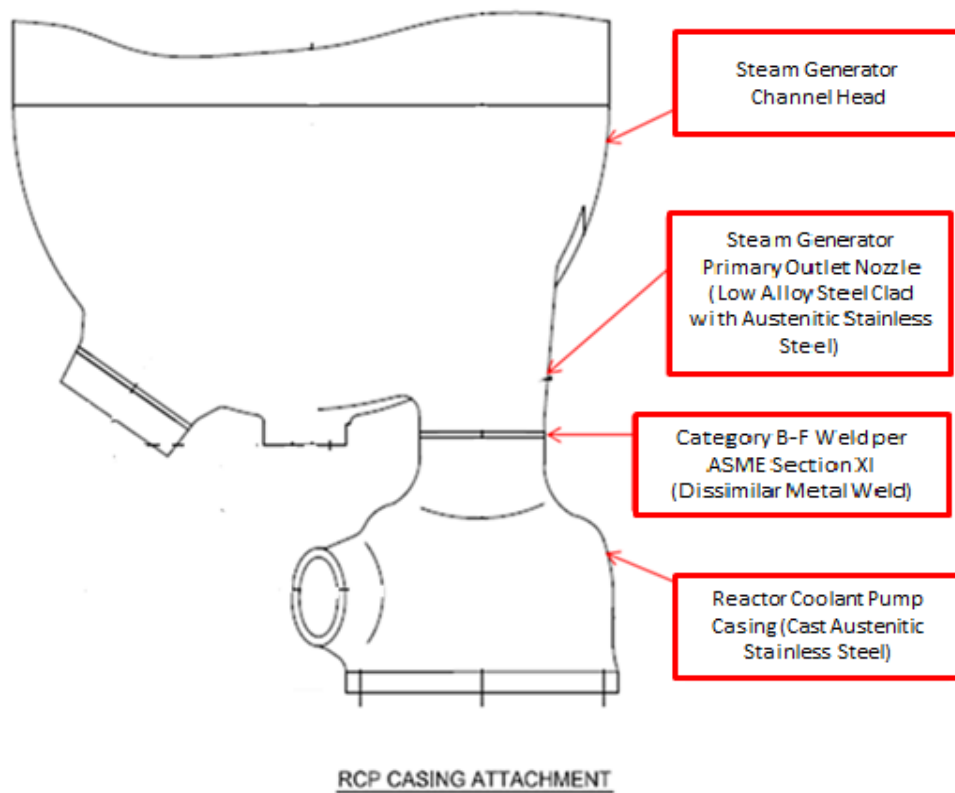


Figure 2

