

October 16, 2012

Mr. Ronald B. Clary, Vice President
New Nuclear Deployment
MC P40
South Carolina Electric and Gas Company
P.O. Box 88
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNITS 2 AND 3 –
ALTERNATIVE TO THE REQUIREMENTS OF THE ASME CODE
SECTION III (TAC NO. RQ0304)

Dear Mr. Clary:

By letter dated September 24, 2012, South Carolina Electric and Gas Company (SCE&G/Licensee), acting on behalf of itself and South Carolina Public Service Authority (Santee Cooper), submitted an alternative for Virgil C. Summer Nuclear Station (VCSNS), Units 2 and 3 to the Nuclear Regulatory Commission (NRC) that would allow SCE&G to use an alternative to the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code*, Section III, with respect to the jurisdictional boundary of the reactor vessel (RV) flow skirt welds.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee proposes to allow the RV flow skirt weld to be excluded from the RV jurisdictional boundary, but continue to use the requirements of Subsection NB of Section III to the ASME Code during installation of the RV flow skirt at the VCSNS site.

Pursuant to the requirements of 10 CFR 50.55a(a)(3)(ii), the licensee requested to use an alternative on the basis that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that SCE&G has adequately demonstrated that compliance with the specified requirements of the ASME Code, Section III, related to the jurisdictional boundary would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, the NRC staff authorizes the proposed alternative pursuant to 10 CFR 50.55a(a)(3)(ii) for VCSNS, Units 2 and 3.

R. Clary

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If you have any questions, please contact Denise McGovern, Project Manager, at (301) 415-0681 or Denise.McGovern@nrc.gov

Sincerely,

/RA/

Mark Tonacci, Chief
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

Docket Nos.: 52-027
52-028

Enclosure:
Safety Evaluation

cc: See next page

R. Clary

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SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS
RELATED TO REQUEST FOR AN ALTERNATIVE
TO THE REACTOR VESSEL FLOW SKIRT WELD ASME JURISDICTIONAL BOUNDARY
VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNITS 2 AND 3
DOCKET NOS.: 52-027 AND 52-028

1.0 INTRODUCTION

By letter dated September 24, 2012, South Carolina Electric and Gas Company (SCE&G/the licensee), acting on behalf of itself and South Carolina Public Service Authority (Santee Cooper) submitted an alternative for Virgil C. Summer Nuclear Station (VCSNS), Units 2 and 3, that would allow the licensee to use an alternative to the requirements of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (hereinafter referred to as the "ASME Code"), Section III, with respect to the jurisdictional boundary of the reactor vessel (RV) flow skirt weld. The proposed alternative is applicable to the weld between the RV flow skirt and the RV, and is needed so that the RV may have the appropriate ASME Code Certification Mark or Code Symbol Stamp (hereinafter referred to as "Code stamp") applied at the fabricator's shop prior to shipping the RV to the VCSNS site.

The regulations in Section 50.55a(c) of Title 10 of the *Code of Federal Regulations* (10 CFR) require that reactor coolant pressure (RCP) boundary components meet the ASME Code, Section III, requirements for Class 1 components. Specifically, ASME Code, Section III, paragraph NB-1132.2(d), requires attachment welds to be part of the jurisdictional boundary of the RV, which is part of the RCP boundary. Therefore, all welding and inspections on the RV component shall be completed prior to applying the ASME Code stamp as required by ASME Code, Section III, paragraph NCA-8321. The licensee's alternative proposes to exclude the RV flow skirt weld from the jurisdictional boundary of the RV so that the ASME Code stamp may be applied to the RV prior to shipping the RV to the VCSNS site. The weld would be performed at the VCSNS site using the requirements of the ASME Code, Section III, Subsection NB for Class 1 components.

2.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.55a require that components which are part of the reactor coolant pressure boundary meet the requirements for Class 1 components in Section III of the ASME Code, except where alternatives have been authorized by the Commission pursuant to paragraphs (a)(3)(i) or (a)(3)(ii) of 10 CFR 50.55a. In proposing alternatives, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety, or (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Section 50.55a allows the Commission to authorize alternatives upon making the necessary findings.

In its letter dated September 24, 2012, SCE&G has determined that the RV flow skirt weld will not be in compliance with 10 CFR 50.55a(c), in that it will not meet paragraph NB-1132.2(d) of the ASME Code, Section III, since it will not be in the jurisdictional boundary of the RV. Pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee proposes to allow the RV flow skirt weld to be excluded from the RV jurisdictional boundary, but continue to use the requirements of Subsection NB of Section III to the ASME Code during installation of the RV flow skirt at the VCSNS site.

3.0 EVALUATION OF THE ALTERNATIVE

3.1 Items for Which an Alternative is Requested:

The scope of the alternative includes the welds between the RV flow skirt and the RV. As indicated in the VCSNS Units 2 and 3 Updated Final Safety Analysis Report (UFSAR) plant-specific DCD (Design Control Document), Table 3.2-3, the RV is classified as a Safety Class A component and the principal construction code is the ASME Code, Section III. The RV flow skirt is classified as Safety Class D with the principal construction code as “per manufacturer’s standards.”

3.2 Code Requirement

The regulations in 10 CFR 50.55a(c) require that components which are part of the RCP boundary meet the requirements for Class 1 components in Section III of the ASME Code. As indicated in UFSAR (plant-specific DCD) Section 5.2, the baseline used for the evaluations to support the safety analysis report and the Design Certification is the ASME Code, Section III, 1998 Edition, 2000 Addenda. The flow skirt design specification identifies the RV flow skirt attachment weld as within the jurisdictional boundary of the RV, based on the 1998 Edition with the 2000 Addenda of the ASME Code, Section III, paragraph NB-1132.2(d). Note that even though the RV flow skirt is not classified as a core support, the requirements of Subsection NG-3000 were chosen for the design of the RV flow skirt, which the NRC staff found acceptable in its review of the generic DCD.

3.3 Proposed Alternative

The licensee proposes that the RV flow skirt attachment weld be excluded from the RV jurisdictional boundary in order to permit application of the ASME Code stamp to the RV prior to shipping the RV to the site. The attachment weld will be performed at the VCSNS site in accordance with Subsection NB of Section III to the ASME Code requirements and will be identified in an ASME Code N-5 Data Report.

The licensee stated that in previously licensed pressurized-water reactors (PWRs), the RV flow skirt attachment welds were performed at the site rather than the fabricator’s shop. In addition, the plant-specific DCD states that the RV flow skirt attachment welds will be made at the plant site.

3.4 Basis for the Alternative

The licensee stated that including the RV flow skirt attachment weld to the RV in the jurisdictional boundary as specified in the ASME Code, Section III, Subsection NB, would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety because completing the RV flow skirt attachment weld at the RV fabricator’s shop would

interfere with the custom fitting and machining of the RV internals, which is performed at the plant site.

Under the 1998 Edition, with the 2000 Addenda of the ASME Code, Section III, the RV flow skirt attachment weld is within the jurisdictional boundary of the RV, requiring the RV flow skirt to be welded to the RV at the RV fabricator's shop in order to permit ASME Code stamping of the RV prior to shipping the RV to the site. However, the need for a customized fit-up of the RV internals at the plant site prevents the flow skirt attachment weld from being completed at the RV fabricator's shop. On-site installation of the RV internals necessitates custom fitting and machining of the clevis inserts for proper interface between the core support clevis and radial support keyways. The position of an installed RV flow skirt would prohibit effective measurement and final machining of the core support clevis and clevis inserts.

Another method would be to ship the RV internals to the RV fabricator's shop for custom fitting and machining. However, performance of reactor coolant system pipe welding and RV setting and installation at the site could cause changes in the alignment between the RV internal core barrel and the RV, thereby negating the customized fit-up and machining performed at the RV fabricator's shop.

Under the proposed alternative, the attachment welds completed at the site would be made in accordance with ASME Code, Section III requirements for a weld governed by Subsection NB. This will assure the same level of quality and safety as if the welds were within the RV ASME Code jurisdictional boundary. The weld configuration of the attachment weld consists of eight full penetration welds between the RV flow skirt and the RV support pads on the bottom head of the RV. The requirements for performing the welds as part of the proposed alternative include the following:

- Installation welding completed by an NA Certificate Holder in accordance with ASME Code, Section III, paragraph NB-4430;
- Nondestructive examination (NDE) completed in accordance with ASME Code, Section III, paragraph NB-5262;
- NDE acceptance criteria satisfied in accordance with ASME Code, Section III, paragraph NB-5350;
- Quality records data package will be identified in an N-5 Code Data Report.
- Activities will be monitored by third party inspector; and
- Requirements for pre-service inspection (PSI) and in-service inspection (ISI) will not be changed and will be in accordance with ASME Code, Section XI, paragraphs IWB-2200 and IWB-2500, respectively.

Therefore, based on the above, the licensee concluded that excluding the RV flow skirt attachment weld from the RV jurisdictional boundary would allow Code stamping of the RV at the fabricator's shop prior to shipping and for the customized fitting and machining of the RV internals at the site to ensure adequate fit-up. Including this weld in the jurisdictional boundary of the RV would result in hardship without a compensating increase in the level of quality and safety. Therefore, the licensee requested that the NRC authorize the proposed alternative pursuant to 10 CFR 50.55a(a)(3)(ii).

3.5 Staff Evaluation

10 CFR 50.55a(c) through 10 CFR 50.55a(e) provide that Quality Groups A (reactor coolant pressure boundary), B and C components must meet the requirements of Class 1, 2 and 3 components, respectively, in Section III of the ASME Code. Subsections NB, NC and ND in ASME Code, Section III, provide requirements for the design and construction of Class 1, 2 and 3 components, respectively. Subsection NCA in ASME Code, Section III, provides general requirements that are applicable to these three classes of components. As indicated by the licensee, the RV flow skirt identified in the licensee's letter dated September 24, 2012, is considered a Quality Group D component. Therefore, the requirements of the ASME Code do not apply. However, the licensee states that the RV flow skirt was conservatively designed to ASME Code, Section III, Subsection NG, for core supports.

Paragraph NB-1132.2 in Section III of the ASME Code defines the jurisdictional boundary between a pressure-retaining component and an attachment. Figures NB-1132.2-1 through NB-1132.2-3 are referenced in paragraph NB-1132.2 to Section III of the ASME Code as aids in defining the boundary and the associated construction requirements (i.e., NB, NC, ND, or outside of the ASME Code jurisdiction). Paragraph NB-1132.2(d) in Section III of the ASME Code specifies that the first attachment (i.e., RV flow skirt) weld to a pressure retaining component (i.e., RV) within a distance of two times the component wall thickness shall be considered part of the pressure retaining component (i.e., RV). Therefore, the attachment weld between the RV flow skirt and the RV shall meet the requirements of Subsection NB of the ASME Code, Section III.

The licensee stated that Subsection NB of the ASME Code, Section III, will be used during the installation of the RV flow skirt in the RV. The staff finds the alternative to use Subsection NB of Section III to the ASME Code to be acceptable because the same ASME Code requirements will be applied to this weld at the VCSNS site as if it were performed at the fabricator's shop, and the change in timing to perform this weld at the plant site as opposed to the fabricator's shop does not adversely affect the quality or safety of the component. The alternative changes the jurisdictional boundary but does not change the substantive requirements for construction. The jurisdictional boundary specified in paragraph NB-1132.2(d) in Section III of the ASME Code is used to delineate each part of a component so that the appropriate ASME Code requirements (Class 1, 2 or 3) for each part can be established when designing and constructing the component. Therefore, the ASME Code places the RV flow skirt weld in the jurisdictional boundary of the RV so that the requirements of Subsection NB (Class 1) in Section III of the ASME Code will be used to design and fabricate this weld. The licensee's alternative will continue to use the appropriate requirements of Subsection NB (Class 1) in Section III of the ASME Code, but excludes the weld from the jurisdictional boundary of the RV in order to allow the RV fabricator to Code stamp the RV. Before the RV fabricator can Code stamp the RV component, all welding and associated inspections must be completed that make up the RV component as required by paragraph NCA-8321 of Section III of the ASME Code. Excluding the RV flow skirt attachment weld will allow the RV to be Code stamped by the RV fabricator, so that the RV flow skirt attachment weld can be installed at the VCSNS site. Therefore, this weld is only excluded from the RV jurisdictional boundary to allow application of the ASME Code stamp to the component at the fabricator's shop prior to shipping the component to the plant site.

As part of the alternative, the licensee included six requirements (restated in Section 3.4 of this safety evaluation) that will be necessary to install the RV flow skirt at the VCSNS site. The staff finds these requirements as part of the proposed alternative to be acceptable as follows:

- Installation welding at the VCSNS to be completed by an NA Certificate Holder meets the requirements of ASME Code, Section III, paragraph NB-4430 for welding attachments to Class 1 components.
- Having NDE completed in accordance with ASME Code, Section III, paragraph NB-5262 is the same inspection requirement that would be used at the RV fabricator's shop.
- NDE acceptance criteria satisfied in accordance with ASME Code, Section III, paragraph NB-5350 is the same acceptance requirement that would be used at the RV fabricator's shop.
- Quality records data package identified in an N-5 Code Data Report provides an appropriate documentation of the weld. The staff notes that typically, paragraph NCA-8400 and Table NCA-8100-1 in Section III of the ASME Code requires that an N-1 Data Report be used for the RV since the vessel component is fabricated by an N Certificate Holder (component fabricator). However, since the installer (NA Certificate Holder) will perform the attachment weld, the N-5 Data Report can be used to document this weld as shown in Table NCA-8100-1. The staff finds that completing these N-5 Data Reports is an acceptable method to ensure the appropriate information on weld quality is documented and becomes part of the quality assurance records required by paragraph NCA-4134.17 to Section III of the ASME Code as lifetime records for the plant. These N-5 Data Reports will also ensure that these welds are part of the PSI and ISI programs in accordance with Section XI of the ASME Code. The staff notes that the licensee has included the completion of an N-5 Data Report in its commitment tracking program for which the staff has no objection.
- Having activities monitored by a third party inspector is consistent with the requirements of Section III of the ASME Code.
- The requirements for PSI and ISI will not change, which the staff finds acceptable because the same requirements (ASME Code, Section XI, paragraphs IWB-2200 and IWB-2500) will be used.

The reason stated by the licensee for fabricating the RV flow skirt weld at the VCSNS site is to allow custom fitting and machining of the RV internals at the VCSNS site to ensure that the specified interference fit between the core support clevis and radial support keyways is achieved. This custom fitting and machining require measurements to be taken from the inside of the RV, below the core plate, in the area where the RV flow skirt would interfere with associated measurements required for the custom fitting and machining process. In addition, paragraph 5.3.2.2 in the plant-specific DCD states that this RV flow skirt weld will be made at the site after the reactor vessel internals are set. Installing the RV flow skirt at the fabricator's shop would result in a hardship or unusual difficulty because it would adversely impact the process used for the fit-up of the RV internals. In addition, there would be no compensating increase in the level of quality and safety because the installation requirements to be employed by the licensee under its proposed alternative will ensure appropriate installation of the RV flow skirt. In particular, the same Subsection NB requirements in Section III of the ASME Code will be applied to the RV Flow skirt attachment weld whether it is made at the VCSNS site or at the fabricator's shop. Therefore, the staff finds that compliance with ASME Code, Section III, Subparagraph NB-1132.2(d) requirements for including this attachment weld in the jurisdictional boundary of the RV would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

4.0 CONCLUSION

The staff concludes that the proposed alternative to the requirements of 10 CFR 50.55a(c) is authorized for VCSNS Units 2 and 3 on the basis that compliance with the jurisdictional requirements specified in the ASME Code, Section III, paragraph NB-1132.2(d) for Class 1 components would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety pursuant to 10 CFR 50.55a(a)(3)(ii). The licensee's proposed alternative provides reasonable assurance that the RV flow skirt attachment weld to the RV will meet the requirements of ASME Code, Section III, Subsection NB, even though it is not classified in the jurisdictional boundary of the RV. This change in jurisdictional boundary will not change the associated NDE requirements during construction, or the PSI and ISI programs required by Section XI of the ASME Code. In addition, the licensee's alternative includes completing N-5 Data Reports for the RV flow skirt attachment welds for VCSNS Units 2 and 3 to ensure the weld quality data is documented and becomes part of the quality assurance records required by Section III of the ASME Code as lifetime records for the plants. All other requirements of the ASME Code, Section III, for which an alternative has not been specifically requested and authorized, remain applicable, including third-party review by the Authorized Nuclear Inspector.

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(Revised 09/26/2012)

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