SCE&G
A SCANA COMPANY

April Rice
Manager
New Nuclear Licensing

February 9, 2017
NND-17-0095
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
Response to Requests for Additional Information related to Preservice Inspection Requirements for Steam Generator Nozzle to Reactor Coolant Pump Casing Welds Rev. 1 Supplement 1

References:

1. Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 Request for Alternative: Preservice Inspection Requirements for Steam Generator Nozzle to Reactor Coolant Pump Casing Welds (NND-16-0246) dated July 7, 2016 (Adams Accession Number ML16189A312).

2. Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 Response to Requests for Additional Information related to Preservice Inspection Requirements for Steam Generator Nozzle to Reactor Coolant Pump Casing Welds (NND-16-0425) dated October 25, 2016 (Adams Accession Number ML16301A311).

3. Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 Response to Requests for Additional Information related to Preservice Inspection Requirements for Steam Generator Nozzle to Reactor Coolant Pump Casing Welds Rev. 1 (NND-17-0035) dated February 1, 2017.

4. Southern Nuclear Operating Company, Vogtle Electric Generating Plant Units 3 and 4 Response to Requests for Additional Information related to Preservice Inspection Requirements for Steam Generator Nozzle to Reactor Coolant Pump Casing Welds (VEGP 3&4-PSI-ALT-05) Rev. 1 Supplement 1 (ND-17-0113) dated February 1, 2017.

By letter dated July 7, 2016, South Carolina Electric & Gas Company (SCE&G), acting on behalf of itself and the South Carolina Public Service Authority (Santee Cooper), submitted a request for an alternative in accordance with 10 CFR 50.55a for preservice inspection of the Steam Generator Nozzle to Reactor Coolant Pump Casing Welds (Reference 1). On August 5, 2016, the Nuclear Regulatory Commission (NRC) staff issued two draft requests for additional information (RAI) [ML16218A439]. On October 25, 2016, SCE&G submitted the response to the RAIs (Reference 2). Further discussions were held in which NRC requested clarification on the smallest detectable flaw size used in the flaw evaluation and clarification on the figure to which the inspection is requested to be performed. On February 1, 2017, SCE&G submitted a revised RAI response providing the requested clarification (Reference 3).

As further discussions with NRC staff were held on this issue, additional information was determined to be required justifying the use of constant flaw aspect ratios for axial and circumferential flaws included in Enclosure 3 of Response to Requests for Additional Information Related to Preservice Inspection Requirements for Steam Generator Nozzle to Reactor Coolant Pump Casing Welds Rev. 1 (Reference 3). By this letter, SCE&G elects to provide additional information justifying why only flaw depth was evaluated in determining flaw growth acceptability in the same enclosure.

In addition, the requested approval of the alternative is amended. Approval is requested by May 5, 2017.

Enclosures 1 and 2 provide the additional information described above.

Enclosure 1 contains the Non-Proprietary response.

Enclosure 2 contains the Proprietary response and is subject to withholding under 10 CFR 2.390.

Enclosure 3 provides an affidavit from SCE&G supporting withholding the Proprietary information under 10 CFR 2.390.

Enclosure 4 is Westinghouse's Proprietary Information Notice, Copyright Notice, and CAW-17-4534, Application for Withholding Proprietary Information from Public Disclosure and Affidavit. The affidavit sets forth the basis upon which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.390 of the Commission's regulations. Accordingly, it is respectfully requested that the information that is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavit should reference CAW-17-4534 and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 3 Suite 310, Cranberry Township, Pennsylvania 16066. Correspondence with respect to proprietary aspects of this letter and its enclosures should also be addressed to April Rice at the contact information within this letter.

The supplemental information provided in this letter does not impact the scope or conclusions of the original alternative.

This letter contains no regulatory commitments. Should you have any questions, please contact Nick Kellenberger by telephone at (803)941-9834, or by email at nicholas.kellenberger@scana.com.

This request is consistent in technical content with Southern Nuclear Operating Company (SNC) Response to Requests for Additional Information related to Preservice Inspection Requirements for Steam Generator Nozzle to Reactor Coolant Pump Casing Welds Rev. 1 Supplement 1 submitted February 1, 2017 (Reference 4).

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

Executed on this 9th day of February 2017.

Sincerely,

April Rice
Manager
New Nuclear Licensing

BB/ARR/bb

Enclosure 1: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Westinghouse LTR-PAFM-17-6, Rev. 0, NP-Enclosure 1 (Non-Proprietary) – Additional Information Regarding AP1000 Vogtle Units 3 & 4 and V. C. Summer Units 2 & 3 Steam Generator to Reactor Coolant Pump Suction Nozzle Weld Flaw Evaluation

Enclosure 2: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Westinghouse LTR-PAFM-17-6, Rev. 0, P-Enclosure 2 (Proprietary) – Additional Information Regarding AP1000 Vogtle Units 3 & 4 and V. C. Summer Units 2 & 3 Steam Generator to Reactor Coolant Pump Suction Nozzle Weld Flaw Evaluation

Enclosure 3: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Affidavit for Withholding SCE&G's Information Under 10CFR 2.390

Enclosure 4: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 – Westinghouse Application for Withholding Proprietary Information from Public Disclosure CAW-17-4534, accompanying Affidavit, Proprietary Information Notice, and Copyright Notice

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NND-17-0095

Enclosure 1

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

Westinghouse LTR-PAFM-17-6, Rev. 0, NP-Enclosure 1 (Non-Proprietary) - Additional Information Regarding AP1000 Vogtle Units 3 & 4 and V. C. Summer Units 2 & 3 Steam Generator to Reactor Coolant Pump Suction Nozzle Weld Flaw Evaluation

(Enclosure consists of 5 pages, not including this cover page.)

Attachment B

NP-Attachment (Non-Proprietary)

Additional Information Regarding AP1000 Vogtle Units 3 & 4 and V. C. Summer Units 2 & 3 Steam Generator to Reactor Coolant Pump Suction Nozzle Weld Flaw Evaluation

This document contains Westinghouse Electric Company LLC proprietary information and data which has been identified by brackets. Coding [(a,c,e)] associated with the brackets sets forth the basis on which the information is considered proprietary. These codes are listed with their meanings in WCAP-7211 Revision 8 (September 2015), "Proprietary Information and Intellectual Property Management Policies and Procedures."

The proprietary information and data contained in this report were obtained at considerable Westinghouse expense and its release could seriously affect our competitive position. This information is to be withheld from public disclosure in accordance with the Rules of Practice 10CFR2.390 and the information presented herein is to be safeguarded in accordance with 10CFR2.903. Withholding of this information does not adversely affect the public interest.

This information has been provided for your internal use only and should not be released to persons or organizations outside the Directorate of Regulation and the ACRS without the express written approval of Westinghouse Electric Company LLC. Should it become necessary to release this information to such persons as part of the review procedure, please contact Westinghouse Electric Company LLC, which will make the necessary arrangements required to protect the Company's proprietary interests.

The proprietary information in the brackets has been deleted in this report. The deleted information is provided in the proprietary version of this report.

Additional Information Regarding *AP1000*® Vogtle Units 3 & 4 and V. C. Summer Units 2 & 3 Steam Generator to Reactor Coolant Pump Suction Nozzle Weld Flaw Evaluation

1. Additional information regarding justification of the constant flaw aspect ratios (AR) of 2 and 6 for axial and circumferential flaws in Reference 1 is provided below.

   Axial Flaw

   For the postulated axial flaw, the analysis in Reference 1 considers an AR = 2 (flaw length/flaw depth). This flaw shape is based on the understanding that in the DM (dissimilar metal) weld, the axial flaw will follow the characteristic shape of the DM weld width and thickness. The DM weld inspection volume consists of the width of the dissimilar metal weld and the Heat Affected Zone (HAZ) – see Figure 1. The width of the dissimilar metal weld is approximately [ ]a,c,e based on the AP1000 steam generator and pump drawings. The inspection volume includes the ¼" examination zones adjacent to the weld on either side to account for the HAZ. Therefore, the total width of the DM weld inspection region is approximately [ ]a,c,e. The weld thickness is [ ]a,c,e (Reference 1). Therefore the shape or aspect ratio of the weld is 0.6 [ ]a,c,e, thus an aspect ratio of 2 is sufficiently large to account for any existing and hypothetical axial flaws.

   Also, based on the fabrication ultrasonic testing (UT) results, the flaw aspect ratios that are observed are bounded by the analyzed aspect ratio of 2 for axial flaws. For example, based on the available axial flaw UT results for the AP1000 Vogtle and V. C. Summer units, [

   ]a,c,e This particular detected aspect ratio is bounded by the axial flaw aspect ratio of 2 analyzed in Reference 1.

Trademark Note:

Circumferential Flaw

For the postulated circumferential flaw, the analysis in Reference 1 considers AR = 6 (flaw length/flaw depth). This flaw shape is a typical aspect ratio for various applications in fracture mechanics. For instance, the Pressure Temperature (P-T) limits evaluation in ASME Section XI Appendix G also considers postulated flaw shapes to have an aspect ratio of 6:1. Industry experiences have also shown that the flaws found in-service are typically below AR = 6 (on the order of AR = 2 to 4 or even less). It should be noted that the AP1000 steam generator to pump DM weld region does not experience any high thermal stratification, as evident by the minimal fatigue usage discussed in Section 3 of Reference 1; therefore, there is low susceptibility for any fatigue crack initiations or propagation of existing fabrication indications. Therefore, the aspect ratio of 6 is sufficient to account for any existing and hypothetical circumferential flaws.

Also, based on the fabrication ultrasonic testing results, the circumferential flaw aspect ratios that are observed are bounded by the analyzed aspect ratio of 6 for circumferential flaws. For example, based on the available circumferential flaw UT results for the AP1000 Vogtle and V. C. Summer units, [

]a,c,e This particular detected aspect ratio is bounded by the circumferential aspect ratio of 6 in the analysis (Reference 1).

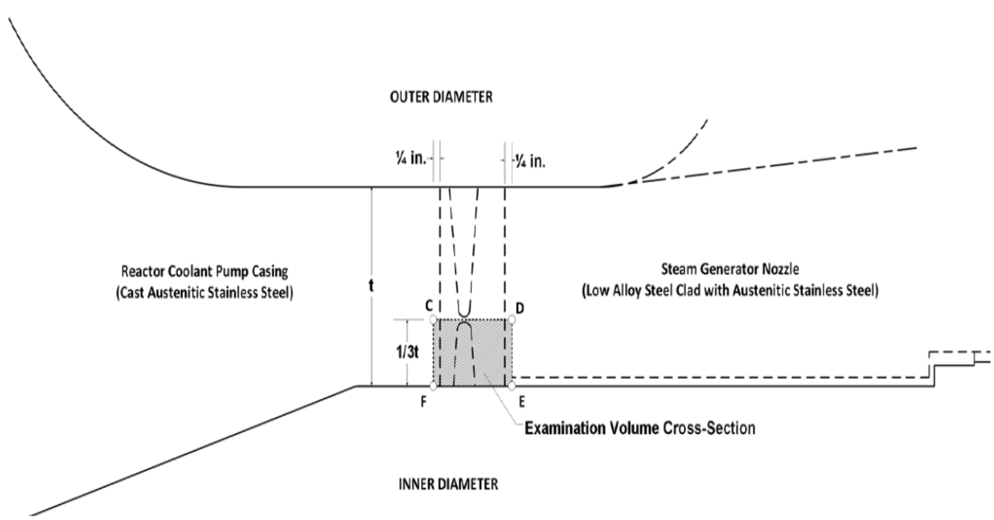

Figure 1: Schematic of AP1000 Steam Generator and Reactor Coolant Pump Inspection Region

2. Appendix C, Paragraph C-5300, requires that the allowable flaw depth and length be evaluated to determine acceptability. However, only flaw depth was evaluated. Additional information justifying this approach is provided below.

For the Appendix C-5000 evaluation, the evaluation is per fully-plastic fracture mechanics using limit load. The limiting allowable flaw parameter for failure of this type is the flaw depth which was reported in the analysis (Reference 1). The allowable flaw length was not reported as it is not the limiting flaw parameter. However, based on the maximum end-of-evaluation allowable flaw sizes that were calculated (see Table 1), the allowable axial and circumferential flaw lengths can be calculated by multiplying the allowable flaw depths by the aspect ratios (see Table 1).

Table 1: Maximum End-of-Evaluation Allowable Flaw Size, Depth, and Length

Flaw Orientation	AR (flaw length /flaw depth)	Maximum End of Evaluation Allowable Flaw size (a/t)	Thickness (in.)	Allowable Flaw Depth (in.)	Allowable Flaw Length (in.)
Axial	2	0.75 (Reference 1, Table 3)	[ ]a,c,e	[ ]a,c,e	[ ]a,c,e
Circumferential	6	0.47 (Reference 1, Table 3)	[ ]a,c,e	[ ]a,c,e	[ ]a,c,e

a = flaw depth, t = wall thickness

The axial and circumferential maximum end-of-evaluation allowable flaw lengths are [

]a,c,e Therefore, the detected flaw lengths are below the calculated maximum end-of-evaluation allowable flaw lengths.

If fatigue crack growth is considered, then the maximum allowable initial flaw depths and lengths for 60 years of growth are shown in Table 2.

Table 2: Maximum Allowable Initial Flaw Size, Depth, and Length Accounting for 60 Years of Fatigue Crack Growth

Flaw Orientation	AR	Maximum Allowable Initial Flaw Size for 60 Years (a/t)	Thickness (in.)	Allowable Flaw Depth- 60 years (in.)	Allowable Flaw Length- 60 years (in.)
Axial	2	0.60 (Reference 1, Fig 2)	[ ]a,c,e	[ ]a,c,e	[ ]a,c,e
Circumferential	6	0.30 (Reference 1, Fig 3)	[ ]a,c,e	[ ]a,c,e	[ ]a,c,e

a = flaw depth, t = wall thickness

The maximum allowable initial flaw lengths for 60 years are [

]a,c,e

Reference:

1. LTR-PAFM-16-59-P, Revision 1, "NRC RAI Response Regarding Inspection of AP1000 Vogtle Units 3 & 4 and V. C. Summer Units 2 & 3 Steam Generator to Reactor Coolant Pump Suction Nozzle Weld," November 2016.