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SOUTHERN COMPANY

June 13, 2012

Docket Nos.: 50-424
50-425

NL-12-1240

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Vogtle Electric Generating Plant – Units 1 and 2
Request for Additional Information Response Regarding
Proposed Inservice Inspection Alternative VEGP-ISI-ALT-07

Ladies and Gentlemen:

By letter dated March 23, 2012 (Agencywide Documents Access and Management System Accession No. ML12086A106), Southern Nuclear Operating Company (SNC) submitted a request for alternative for the Inservice Inspection Program (VEGP-ISI-ALT-07). The Nuclear Regulatory Commission (NRC) responded by letter dated May 2, 2012 (ML12117A191) with a Request for Additional Information (RAI).

This letter contains no NRC commitments. If you have any questions, please contact Jack Stringfellow at (205) 992-7037.

Respectfully submitted,

Mark J Ajluni

M. J. Ajluni
Nuclear Licensing Director

MJA/RMJ/lac

Enclosure: SNC Response to NRC RAI Regarding VEGP-ISI-ALT-07

cc: Southern Nuclear Operating Company
Mr. S. E. Kuczynski, Chairman, President & CEO
Mr. D. G. Bost, Executive Vice President & Chief Nuclear Officer
Mr. T. E. Tynan, Vice President – Vogtle
Mr. B. L. Ivey, Vice President – Regulatory Affairs
Mr. B. J. Adams, Vice President – Fleet Operations
RType: CVC7000

U. S. Nuclear Regulatory Commission
Mr. V. M. McCree, Regional Administrator
Mr. P. G. Boyle, NRR Senior Project Manager - Vogtle
Mr. L. M. Cain, Senior Resident Inspector – Vogtle

Vogtle Electric Generating Plant – Units 1 and 2
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Enclosure

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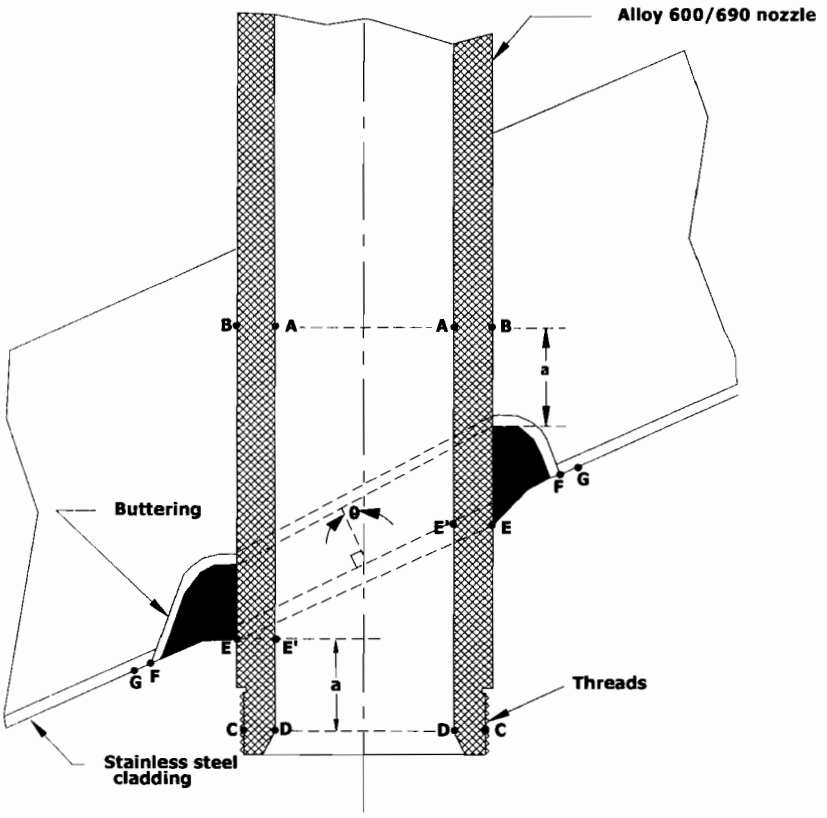
1. NRC RAI

The licensee referenced Figure 2 in ASME Code Case N-729-1 for the examination of the reactor vessel head nozzle penetrations. It appears that the penetration at Vogtle is slightly different from Figure 2 of N-729-1 in that the lower region of the Vogtle penetration nozzle is threaded. Figure 2 of Code Case N-729-1 uses alphabetic letters to identify specific areas/regions of interest for the J-groove weld and nozzle. The relief request discussed the following areas/regions of interest: the bottom of the fillet, the toe of the J-groove weld, chamfered regions, regions having a radius, the distance between the lowest point at the toe of the J-groove weld and the bottom of the scanned region, the proposed alternative examination zone, incidence angle, thread sections, thread relief, and shadow zone in the threaded region. It is not clear to the staff how these terms relate to the "lettered" dimensions in Figure 2 of ASME Code Case N-729-1. (a) Please provide a drawing(s) of a typical control rod drive mechanism penetration nozzle showing the threaded region with a tapered inside surface at the bottom of the CRDM nozzle. (b) In the drawing, please identify the items that correspond to the letters used in Code Case N-729-1 and to the areas/regions mentioned in the relief request.

SNC Response to NRC RAI # 1

Southern Nuclear (SNC) is providing four sketches to provide additional details for the actual configuration of the nozzles. Figure RAI # 1-1a shows the configuration of the Unit-1 CRDM nozzles 1 through 78 and the Unit-2 CRDM nozzles 74 through 78. Also enclosed is Figure RAI # 1-1b which provides the details of the threaded/chamfered nozzle end (Type X). The toe of the weld is located above the reduced cross section. Figure RAI # 1-2 shows the configuration of the Unit-2 CRDM nozzles 1 through 73. In addition, Figure RAI # 1-3 shows a top view of the Units 1 and 2 reactor pressure vessel (RPV) head CRDM configuration in order to show the relative location of the CRDMs. Figures RAI # 1-1a and 1-2 were generated from Figure 2 from ASME Code Case N-729-1 to help identify the required examination volume and the physical limitations. The coverage lengths listed in Tables 1 and 2 of the proposed ISI alternative corresponds to the "a" dimension (below the J-groove weld) identified in Figure 2 of ASME Code Case N-729-1.

FIGURE RAI #1-1a TYPICAL CONFIGURATION OF VOGTLE UNIT 1 CRDM NOZZLES 1 THROUGH 78 AND VOGTLE UNIT 2 CRDM NOZZLES 74 THROUGH 78 AS DEPICTED ON FIGURE 2 OF CODE CASE N-729-1 NOT TO SCALE



The below Notes are taken from Code Case N-729-1 and do not indicate actual dimensions of penetration.

a = 1.5 in. (38mm) for Incidence Angle, θ, =30 deg and for all nozzles =4.5 in. (115 mm) OD or 1 in. (25 mm) for Incidence Angle, θ, >30 deg; or to the end of the tube, whichever is less

A-B-C-D = Extent of volumetric examination for the tube (base metal)

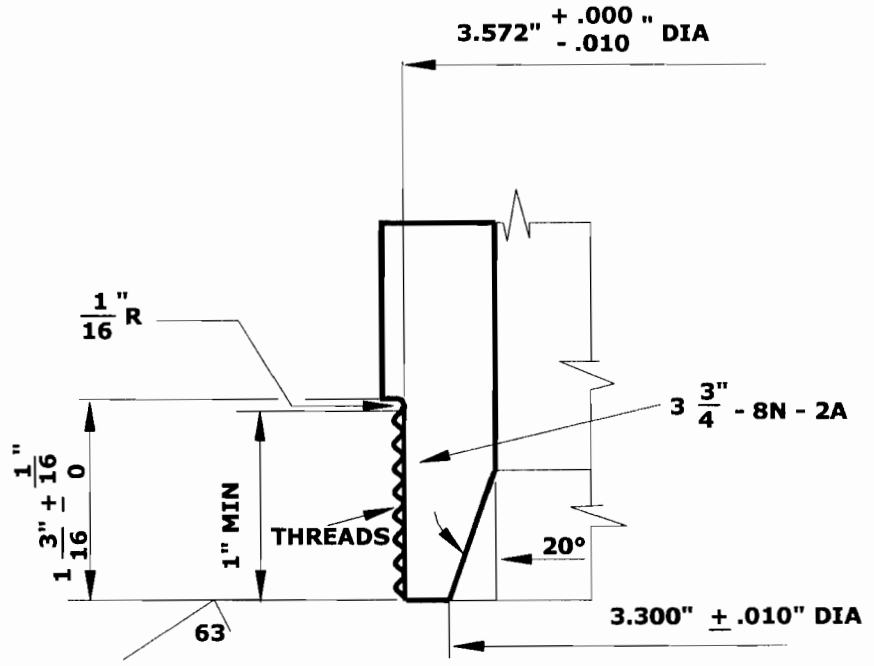
A-D = Extent of surface examination for the tube inside surface

G-F = $\frac{1}{4}$ in. (6 mm) from the theoretical point "F" in accordance with the design drawings, including tolerances, unless the point "F" can be physically determined.

G-F-E-C = Extent of surface examination for the J-groove weld (filler metal and buttering) and tube outside surface below the weld

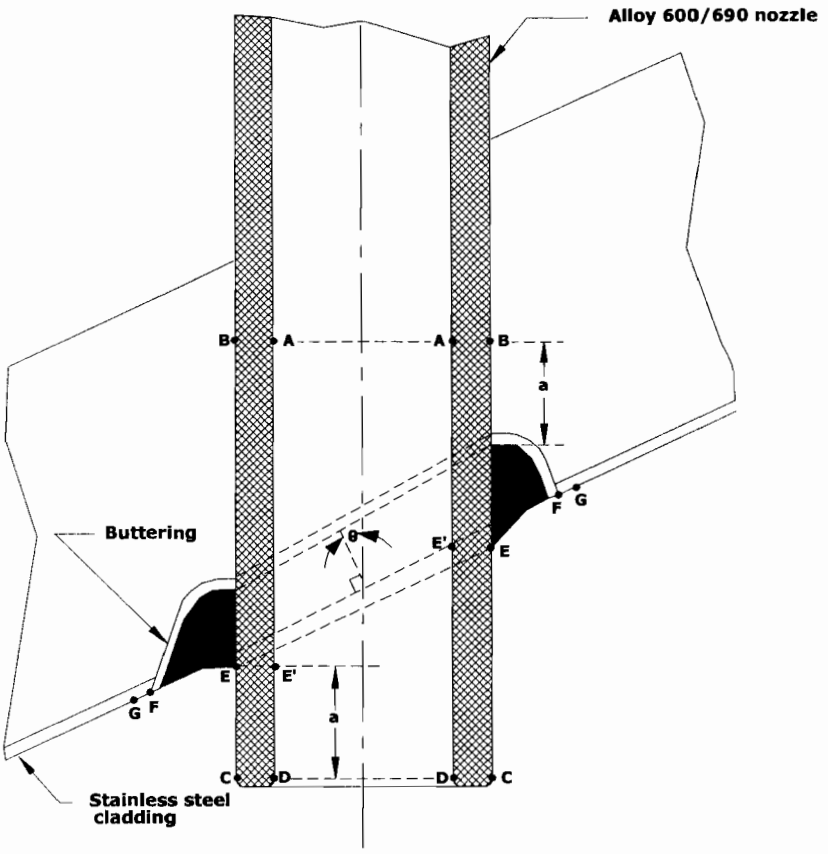
G-F-E = Extent of surface examination zone for the J-groove weld (filler metal and buttering)

FIGURE RAI #1-1b TYPICAL CONFIGURATION OF THREADED PORTION OF CRDM NOZZLES ON VOGTLE UNIT 1 CRDM NOZZLES 1 THROUGH 78 AND VOGTLE UNIT 2 CRDM NOZZLES 74 THROUGH 78
NOT TO SCALE



Note: The above figure was taken from Vogtle drawings 1/2X6AA00-00320. This configuration is designated as TYPE "X" on the drawings.

FIGURE RAI #1-2 TYPICAL CONFIGURATION OF VOGTLE UNIT 2 CRDM NOZZLES 1 THROUGH 73 AS DEPICTED ON FIGURE 2 OF CODE CASE N-729-1 NOT TO SCALE



The below Notes are taken from Code Case N-729-1 and do not indicate actual dimensions of penetration.

a = 1.5 in. (38mm) for Incidence Angle, θ, ≤ 30 deg and for all nozzles ≥ 4.5 in. (115 mm) OD or 1 in. (25 mm) for Incidence Angle, θ, >30 deg; or to the end of the tube, whichever is less

A-B-C-D = Extent of volumetric examination for the tube (base metal)

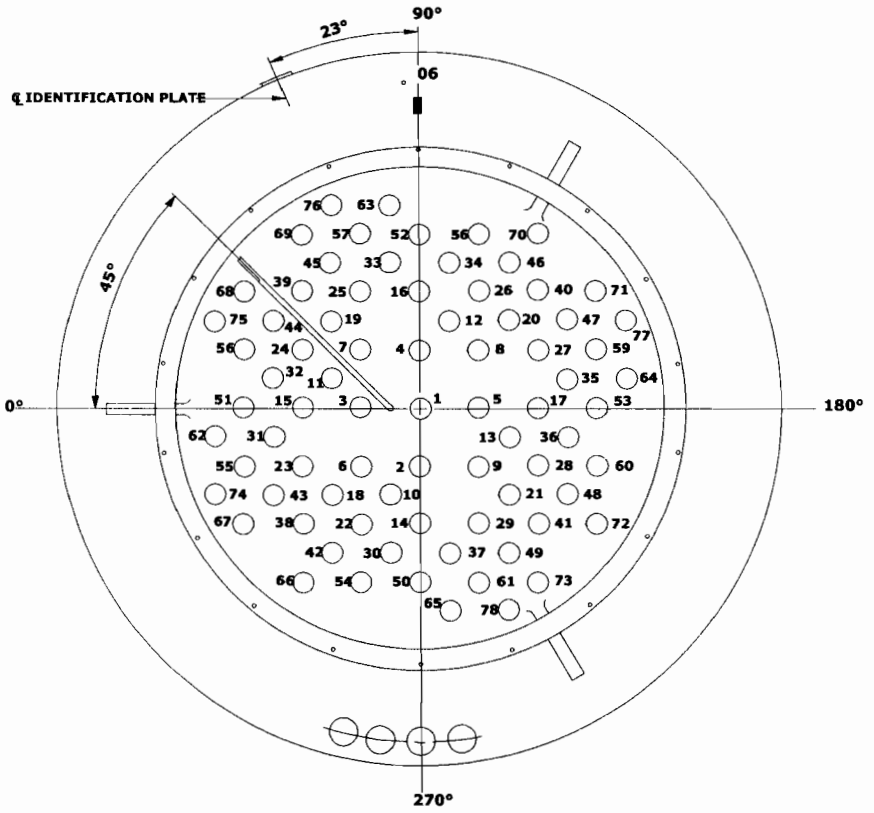
A-D = Extent of surface examination for the tube inside surface

G-F = ¼ in. (6 mm) from the theoretical point "F" in accordance with the design drawings, including tolerances, unless the point "F" can be physically determined.

G-F-E-C = Extent of surface examination for the J-groove weld (filler metal and buttering) and tube outside surface below the weld

G-F-E = Extent of surface examination zone for the J-groove weld (filler metal and buttering)

FIGURE RAI #1-3 LAYOUT OF VOGTLE UNIT 1 AND 2 REACTOR PRESSURE VESSEL HEAD CRDM CONFIGURATION



2. NRC RAI

It is not clear to the staff under which regulation is the RR submitted. Paragraph 10 CFR 50.55a(a)(3) states, in part, that alternatives to the requirements of 10 CFR 50.55a(g) may be used, when authorized by the NRC, if the licensee demonstrates (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. It is staff's expectation that for the control rod drive mechanism nozzle configuration including J-groove weld, 10 CFR 50.55a(a)(3)(ii) would be the appropriate regulation to be used for the RR. Additionally, the authorization per 10 CFR 50.55a(a)(3) is required by 10 CFR 50.55a(g)(6)(D)(6). Confirm that the relief request is submitted under 10 CFR 50.55a(a)(3)(ii).

SNC Response to NRC RAI # 2

SNC is submitting VEGP-ISI-ALT-07 under 10 CFR 50.55a(a)(3)(ii). Selected CRDM nozzles cannot be fully examined due to the configuration of the RPV head penetrations. The option of using either surface or eddy current to supplement the volumetric examinations is not viable due to the threaded outside diameter (OD) surfaces. In addition, the radiation levels under the RPV head have historically been observed in the range of 1 REM/hour to 5 REM/hour.

3. NRC RAI

Tables 1 and 2 of the relief request provide the previous inspection coverage length obtained for CRDM in units 1 and 2, respectively. (a) Explain why there are more nozzles in Unit 1 that could not achieve the required coverage than in Unit 2. Also explain why the nozzles in unit 1 that could not achieve the required coverage but the same nozzles in unit 2 were able to achieve the required coverage, assuming the nozzle penetration configurations between two units are identical. (b) In Table 1, Nozzle Numbers 2 and 5 have an actual coverage length of 1.52 inches from the previous examination. The required length is 1.5 inches. The small difference of 0.02 inches between the actual and required coverage length provides a very small margin between the acceptable coverage and coverage for which relief is required. Discuss the accuracy (or tolerance) of the measured lengths in Tables 1 and 2. Discuss whether the coverage length recorded in Tables 1 and 2 includes any measurement uncertainty. Discuss whether Nozzle Nos. 2 and 5 and other similar nozzles should be included in Table 3 of the relief request as nozzles that require relief from 10 CFR 50.55a(g)(6)(ii)(D).

SNC Response to NRC RAI # 3

a) The limitations observed for the Unit-1 volumetric examinations are based on the additional chamfered/threaded regions. This is clearly seen in Figures RAI # 1-1a and -1b, which portray the Unit-1 CRDM penetrations. The configuration on Unit-2 does not have the same limitation (except for nozzles 74 through 78).

b) The ultrasonic (UT) length measurement is performed in increments of 0.04-inches. The lengths referenced in Tables 1 and 2 do not address measurement uncertainty. Our vendor has proposed, and SNC agreed, that all nozzles within 0.04-inches of the Code Case specified coverage length be included in the ISI alternative. Therefore, in addition to the thirteen CRDM penetrations presently shown in Table 3, eight Unit-1 and one Unit-2 CRDM penetrations are being added. See the SNC Response to NRC RAI # 4 for the updated Table 3 showing the applicable nozzles covered by this ISI alternative.

4. NRC RAI

Section 1 of the relief request states that affected components are UNS N06600 nozzles and UNS N06082 or UNS W86182 partial penetration welds in reactor vessel head in units 1 and 2. Table 3 of the relief request lists the nozzles that require relief from the volumetric and surface examinations of Code Case N-729-1. It is staff's expectation that only those nozzles that require relief need to be referenced in the relief request. Discuss whether the relief request is applicable to only those nozzles that are stated in Section 1 of the relief request or cited in Table 3.

SNC Response to NRC RAI # 4

The entry in Section 1 of VEGP-ISI-ALT-07 is the generic description of the components to be addressed in this ISI alternative. The listing in Table 3 of the ISI alternative lists the actual VEGP CRDM penetrations with limitations.

Since the ultrasonic (UT) length measurement is performed in increments of 0.04-inches, our vendor has proposed and SNC agreed that all nozzles within 0.04-inches of the Code-specified coverage length be included in the ISI alternative. Therefore, in addition to the thirteen CRDM penetrations presently shown in Table 3, eight Unit-1 and one Unit-2 CRDM penetrations are being added.

An updated Table 3 of the ISI alternative is provided below to show the applicable nozzles:

Updated Table 3: VEGP Units 1 and 2 Reactor Vessel Head Penetrations Requiring Relief from Volumetric and Surface Examination Coverage Requirements

	Incidence Angle (θ) ≤ 30 degrees Required Coverage (a) = 1.5 inches	**Incidence Angle (θ) > 30 degrees Required Coverage (a) = 1.0 inch**
VEGP Unit 1	2, 5, 9, 14, 15, 18, 19 and 21	63, 64, 65, 66, 67, 68, 69, 72, 73, 74, 77 and 78
VEGP Unit 2	None	75 and 77

5. NRC RAI

Section 5.2, 3rd paragraph, of the relief request states that the flaw tolerance chart in Figures 5 through 8 demonstrates that a postulated through-wall flaw at the bottom edge of the proposed alternative examination zone will not grow to the toe of the J-groove weld. (a) Identify the alternative examination zone in the drawing that the staff has requested above. (b) Provide the as-designed (i.e., as-analyzed) and as-built dimensions of the J-groove weld. (c) Discuss whether the flaw evaluation in WCAP-16493-P, Revision 0 is based on the as-designed or as-built J-groove weld dimensions. If the flaw evaluation was based on the as-designed dimensions, demonstrate that it bounds the flaw evaluation of the as-built dimensions.

SNC Response to NRC RAI # 5

a) Table RAI # 5-1 shows the twenty-two Vogtle CRDM penetration nozzles included in this ISI alternative. The two sections of the table show the initial thirteen nozzles and the nine additional nozzles. The alternative examination zone extends from the toe of the weld down the nozzle for the dimension identified in Table RAI # 5-1, as noted in the column listing "a". This is the "a" dimension below the weld shown in Figures RAI # 1-1a and RAI # 1-2 added to address RAI question # 1.

b) The as-built dimensions of the J-groove weld for the CRDM head penetrations where full examination coverage is not possible are shown in Table RAI # 5-1. These tables include the L3 (elevation of the downhill weld toe) and L4 (the top or root of the downhill weld) as-built dimensions. The as-designed dimensions of the J-groove welds given in Table RAI # 5-2.

c) The flaw evaluation performed in WCAP-16493-P was based on the as-designed J-groove weld dimensions. Westinghouse has performed a separate analysis using arbitrarily larger weld heights for the peripheral nozzles (48.7-degree downhill side angle, 1.46-inch design dimension). The analysis cases included 1.46-inches, 2.35-inches, and 2.97-inches to determine their stress profiles. The 20 ksi criterion is reached in a shorter distance for the larger length welds; therefore, the 1.46-inch design value bounds the as-built dimensions of the CRDM nozzles for the current analysis.

Table RAI # 5-1

Original Listing of Nozzles with Limitations

Pen #		Coverage below Weld in Inches "a"	L3 (Inches)	L4 (Inches)	Weld Thickness (Inches)
Unit 1	9	1.40	2.54	4.02	1.48
Unit 1	14	1.40	2.62	3.82	1.20
Unit 1	15	1.48	2.62	3.98	1.36
Unit 1	18	1.44	2.78	4.10	1.32
Unit 1	19	1.44	2.62	3.94	1.32
Unit 1	21	1.36	2.50	3.86	1.36
Unit 1	63	0.92	1.94	4.58	2.64
Unit 1	65	0.92	2.02	4.34	2.32
Unit 1	66	0.96	2.18	4.66	2.48
Unit 1	67	0.80	1.90	4.22	2.32
Unit 1	68	0.96	2.14	4.26	2.12
Unit 1	78	0.72	1.78	3.90	2.12
Unit 2	77	0.72	1.46	4.14	2.68

Additional Nozzles with Expected Limitations

Pen #		Coverage below Weld in Inches "a"	L3 (Inches)	L4 (Inches)	Weld Thickness (Inches)
Unit 1	*2	1.52	2.66	3.74	1.08
Unit 1	*5	1.52	2.66	3.70	1.04
Unit 1	*64	1.00	2.18	4.34	2.16
Unit 1	*69	1.00	2.10	4.54	2.44
Unit 1	*72	1.04	2.34	4.70	2.36
Unit 1	*73	1.00	2.26	4.42	2.16
Unit 1	*74	1.04	1.82	4.10	2.28
Unit 1	*77	1.04	1.86	4.34	2.48
Unit 2	*75	1.04	1.82	3.78	1.96

*** These nine CRDM nozzles are added as discussed in the SNC Response to RAI questions 3 and 4.**

Table RAI # 5-2

J-Groove Design Dimensions

Analyzed Angle (degrees)	As-Designed J-Groove Dimension (inches)	Pen #s
0.0	0.94	1 - 21
44.3	1.31	62 - 65
45.4	1.30	66 - 73
48.7	1.37	74 - 78

6. NRC RAI

In Section 5.1 of the relief request, the licensee stated that it recently reviewed WCAP-16493-P and confirmed the report's continued applicability. Discuss how the review and confirmation was conducted. For example, discuss the parameters that were reviewed to confirm the continued applicability. Alternatively, the licensee may submit Reference number 9 in Section 8 of the relief request which is the Letter from Westinghouse to Southern Nuclear Operating Company dated January 31, 2012.

SNC Response to NRC RAI # 6

Westinghouse personnel reviewed WCAP-16493-P to determine its applicability to Mandatory Appendix I of ASME Code Case N-729-1. The conclusions of this review, as documented in Westinghouse letter GP-18861, dated January 31, 2012 included the following points:

- "Compliance with the reactor vessel head inspection requirements of ASME Code Case N-729-1 (Reference 4 of the Westinghouse letter) which replaces the requirements of NRC Order EA-03-009, subjected to the conditions imposed by the NRC, is now required. Mandatory Appendix I of ASME Code Case N-729-1 provides the analysis procedures that can be used to define alternative examination zone if full compliance of the required examination zone cannot be achieved. In accordance with Mandatory Appendix I of ASME Code Case N-729-1, for alternative examination zones below the J-groove weld, the analyses shall be performed using at least the stress analysis method (I-2000) or the deterministic fracture mechanics analysis method (I-3000) to demonstrate the applicable criteria are met."

- "Based on a review of the deterministic fracture mechanics analysis documented in WCAP-16493-P, the evaluation procedure used in generating the crack growth results shown in Figures 6-12 through 6-16 of WCAP-16493-P is consistent with those discussed in Mandatory Appendix I paragraph I-3200 of ASME Code Case N-729-1. The hoop stress distribution below the J-groove weld shown in Appendix A of WCAP-16493-P remains applicable. The crack growth rate expression used in WCAP-16493-P for Primary Water Stress Corrosion Cracking (PWSCC) is the same as that given in Appendix O of the 2004 Edition of the ASME Section XI code (Reference 5 of the Westinghouse letter). The temperature used in the crack growth rate calculation in WCAP-16493-P was based on a temperature of 565°F. The operating temperature for Vogtle Units 1 and 2 continue to be slightly less than 560°F. A head temperature of 565°F (560°F plus 5°F) was conservatively chosen for this calculation. The use of a higher temperature in the crack growth rate calculation would result in a conservative PWSCC crack growth rate. Therefore, the crack growth results in Figures 6-12 through 6-16 in WCAP-16493-P are conservative. Since the future inspection interval is every four refueling outages or approximately six calendar years, Figures 6-12 through 6-16 in WCAP-16493-P remain applicable to use for seeking relaxation from the ASME Code Case N-729-1 inspection coverage requirements below the J-groove weld. The alternative inspection coverage below the lowest point of the J-groove welds

proposed previously in SNC letter NL-06-0739 remains valid." This letter is titled "Vogtle Electric Generating Plan, Request for Relaxation of the First Revised Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," dated May 18, 2006. The NRC ADAMS Accession Number for this letter is ML061390036.

- "Based on the results of the review on WCAP-16493-P, it can be concluded that Figures 6-12 through 6-16 in WCAP-16493-P comply with the analysis procedures and acceptance criteria given in Mandatory Appendix I paragraph I-3200 of ASME Code Case N-729-1. Figures 6-12 through 6-16 of WCAP-16493-P are therefore acceptable to use as the technical basis for seeking relaxation from the ASME Code Case N-729-1 inspection coverage requirements below the J-groove weld."