From:	Schiller, Alina
Sent:	Friday, December 4, 2020 4:52 PM
To:	Vogtle PEmails
Cc:	Gleaves, Billy
Subject:	SNC Draft Proposed Alternative (ALT-15) for the 12/10 Vogtle Units 3 and 4 Presubmittal Meeting
Attachments:	DRAFT Proposed Alternative for ASME Section XI Examination Coverage of Weldolets.pdf

From: Leighty, Steven <sleighty@southernco.COM>
Sent: Friday, December 04, 2020 4:41 PM
To: Gleaves, Billy <Bill.Gleaves@nrc.gov>; Schiller, Alina <Alina.Schiller@nrc.gov>
Cc: Castell, Curtis A. <X2CACAST@SOUTHERNCO.COM>; Chapman, Nathan B. <NBCHAPMA@SOUTHERNCO.COM>; Roberts, Kelli Anne <KROBERTS@southernco.com>
Subject: [External_Sender] RE: RE: Status of Presubmittal Meetings for ALT-15

Billy and Alina,

Please find attached a draft of the proposed alternative related to RCS weldolets. This draft incorporates feedback from our first presubmittal discussion and includes additional analysis completed to support the alternative request.

We would like to discuss with the staff during the normal public call time next week on December 10, 2020.

Please let me know if you have any questions.

Thanks,

Steve Leighty | Southern Nuclear
Licensing Supervisor | Vogtle 3&4
706.848.6790 | sleighty@southernco.com

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Subject: SNC Draft Proposed Alternative (ALT-15) for the 12/10 Vogtle Units 3 and 4 Presubmittal Meeting
Sent Date: 12/4/2020 4:51:46 PM
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From: Schiller, Alina

Created By: Alina.Schiller@nrc.gov

Recipients:
"Gleaves, Billy" <Bill.Gleaves@nrc.gov>
Tracking Status: None
"Vogtle PEmails" <Vogtle.PEmails@nrc.gov>
Tracking Status: None

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Southern Nuclear Operating Company

ND-20-tbd

Enclosure

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Proposed Alternative VEGP 3&4-PSI/ISI-ALT-15 in Accordance with 10 CFR 50.55a(z)(2)

ASME Section XI Examination Coverage of Weldolet Branch Connection Welds

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(This Enclosure consists of 7 pages, including this cover page)

Plant Site-Unit:	Vogtle Electric Generating Plant (VEGP) – Units 3 and 4
Interval-Interval Dates:	Applies to Preservice and Inservice Inspection (PSI and ISI) activities
Requested Date for Approval:	Approval is requested by March 20, 2021 to support completion of preservice inspection activities for Unit 3, which is the scheduled RCS N-5 report due date.
ASME Code Components Affected:	ASME Section III Class 1 applies to branch connection welds on the Reactor Coolant System (RCS) pressure boundary for Automatic Depressurization System (ADS) Stage 1 piping (refer to UFSAR Figure 5.1-5 Sheet 2 of 3). The subject welds are ASME Section XI, Table IWB-2500-1, Category B-J, and are listed below.

Item	Description	Limitation	Component
B9.31	Branch Connection Weld	Branch Connection Geometry	SV3-RCS-PLW-013-SW3
B9.31	Branch Connection Weld	Branch Connection Geometry	SV3-RCS-PLW-01C-SW3
B9.31	Branch Connection Weld	Branch Connection Geometry	SV4-RCS-PLW-013-SW3
B9.31	Branch Connection Weld	Branch Connection Geometry	SV4-RCS-PLW-01C-SW3

Applicable Code Edition and Addenda:	ASME B&PV Code, Section XI, 2007 Edition through the 2008 Addenda
Applicable Code Requirements:	IWA-2200 Examination Methods All nondestructive examinations of the required examination surface or volume shall be conducted to the maximum extent practical. When performing VT-1, surface, radiographic, or ultrasonic examination on a component with defined surface or volume, essentially 100% of the

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	required surface or volume shall be examined. Essentially 100% coverage is achieved when the applicable examination coverage is greater than 90%; however, in no case shall the examination be terminated when greater than 90% coverage is achieved, if additional coverage of the required examination surface or volume is practical. Non-mandatory Appendix S provides guidance that may be used for evaluating examination coverage.
Reason for Request:	The examination volume required by IWA-2200(c) for weldolet branch connections is not achievable due to the configurations of the weldolets used during construction of Vogtle 3&4. These weld configurations are widely used by the industry, and challenges for these configurations are typical and are frequently identified in relief requests for Inservice Inspection. 10 CFR 50.55a(g)(3)(ii) states that components classified as ASME Code Class 1, 2, and 3 must be designed and be provided with access to satisfy the preservice examination requirements set forth in ASME Section III and Section XI. The Vogtle Units 3 and 4 UFSAR (Section 5.2.4.2) states that components and welds requiring inservice inspection (and by default preservice inspection) are designed to allow for the application of the required inservice inspection methods (and preservice inspection methods). Weldolet branch connections are used in the design of the RCS to minimize the failure zone at the connection point by using a smaller bore hole of 4'' and to add reinforcement of the branch connection as required by the Code. This results in a greater weld thickness and minimizes stress concentrations at the branch connections. This alternative demonstrates the design allows for inspection by performance of volumetric inspections to the extent practical and by evaluating the configuration to conclude there is acceptable structural integrity margin for the weldolet to pipe location. Examination Category B-J for Pressure Retaining Welds in Piping as defined in Table IWB-2500-1 requires 100 percent surface and volumetric examinations for greater than or equal to NPS 4 branch connection welds (B9.31), while those with NPS less than 4 require surface examinations only. The applicable branch connection welds are NPS 4, Pipe-to-14x4'' weldolets, and are located on the RCS Automatic Depressurization System lines. Examinations of these welds are tied to the completion of preservice inspection activities required for completion of ITAAC for the Reactor Coolant System (RCS). Volumetric Examination by use of Ultrasonic testing (UT) of essentially 100 percent is not possible for the required coverage area for the identified weld locations and would result in hardship without a compensating increase in the level of quality and safety.

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Proposed Alternative and Basis for Use:	**Proposed Alternative:** As an alternative to ASME Section XI, subarticle IWA-2200(c) requirement for essentially 100 percent of volumetric and surface examination coverage for the listed weldolet branch connection welds listed above, SNC proposes to perform volumetric and surface examinations as follows: • The best effort volumetric examinations will be conducted to the maximum extent practical. Based on industry experience, examination coverage is not expected to be less than 40%. Acceptance will be based on the indications identified in the coverage area. • Surface examination will be conducted in addition to the best effort volumetric examination. Coverage of 100% is expected to be obtained. The ASME Section XI volumetric examination to be performed will be an ultrasonic examination in accordance with Appendix VIII, for austenitic welds. Surface examinations will be performed in accordance with IWA-2220. Acceptance criteria for examinations will be in accordance with IWB-3000 for Class 1 systems. **Basis for Use:** The proposed alternative establishes that best effort volumetric examinations with surface examinations that achieve essentially 100% provide sufficient coverage for the weldolet branch connection welds listed above. The proposed alternative has precedent within the industry, as demonstrated by an NRC Safety Evaluation Report issued to Brunswick Steam Electric Plant Unit 2 (ADAMS Accession ML11175A173). That precedence relies on the best effort volumetric examination complimented by an essentially 100% surface examination. The best effort volumetric examination provides assurance of the integrity of the pressure retaining boundary. The surface examination provides assurance that there are no rejectable surface indications. Typical UT coverage on these configurations range from 40% to 80%, depending on the sizes of the weldolet fabrication tapers. Section XI PDI-UT-2 examinations were performed on the subject weldolet branch connections located in Unit 3. Axial and circumferential coverages of greater than 50% were achieved. Similar coverages are expected to be achieved for the subject weldolet branch connections in Unit 4. Section III and Section XI surface examinations were performed on the subject weldolets, using liquid penetrant examination methods. Coverage of 100% was achieved on both weldolet welds. The

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examination results were acceptable.

A flaw tolerance evaluation was conducted to justify the reduced examination coverage for the weldolet locations, by demonstrating that a large postulated inside surface axial or circumferential flaw in the weld areas outside the exam coverage will not grow to the maximum end-of-evaluation flaw size for the 60-year design life of the plant.

The engineering work performed in the flaw tolerance evaluation was based on the technical work supporting code alternative request VEGP 3&4 PSI/ISI-ALT-06 (ADAMs Accession ML19087A143). The weldolet to pipe weld locations were evaluated based on the guidelines in paragraph IWB-3640 and Appendix C of the 2007 Edition with 2008 Addenda ASME Section XI code. The maximum allowable end-of-evaluation period flaw size was calculated at the stainless steel weldolet locations for a postulated inside surface axial and circumferential flaw using the guidance of ASME Section XI Appendix C-5000. Geometry, pipe loadings, design transients, and ASME reference material properties specific to the AP1000 design were considered when calculating the maximum allowable end-of-evaluation period flaws and fatigue crack growth analysis. Loadings under normal, upset, test, emergency and faulted conditions were considered with the applicable safety factors for the corresponding service conditions required in the ASME Code Section XI. The primary crack growth mechanism considered for postulated flaws is Fatigue Crack Growth (FCG) in PWR water environments. Crack growth due to Primary Water Stress Corrosion Crack (PWSCC) growth does not need to be investigated due to the low susceptibility to stress corrosion cracking of the materials of construction.

The evaluation demonstrated a very large flaw tolerance in the region of interest. Specifically, the evaluation showed very low fatigue loadings in the region, so the calculated fatigue crack growth was less than one percent of the thickness over sixty years of service, for a total depth of the postulated flaw plus growth of 34% of the thickness, regardless of orientation, after 60 years.

The allowable end-of-evaluation period flaw depth was determined to be 71% of the wall thickness, for a postulated axial inside surface flaw, and 75% of the thickness for a postulated circumferential surface flaw. This shows that a postulated flaw equal to the area of missed coverage would not grow to the maximum allowable end-of-evaluation flaw size during the 60-year design life of the plant. Therefore, there is acceptable structural integrity margin for the weldolet to pipe location, as demonstrated in the table below.

Postulated Flaw Configuration	Maximum Potential Inspection Zone Flaw	60-year FCG Final Flaw Size (a_p/t)	Maximum Allowable End of Evaluation

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	Size (1/3 of wall thickness) (a/t)		Flaw Size (a_f/t)
Axial Surface Flaw	0.33	0.34	0.71
Circumferential Surface Flaw	0.33	0.34	0.75

Note: a_p = final potential flaw depth, a_f = ASME Code Maximum Allowable flaw depth, t = thickness, a = initial flaw depth encompassing the missing inspection zone

The other ASME Section XI examinations that verify structural integrity are performed in accordance with ASME Section XI (e.g., visual).

The surface examination and acceptance criteria required by the code provide reasonable assurance of structural integrity by detection of surface flaws in the affected component welds.

This proposed alternative provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a based on precedence, and the results of the representative flaw tolerance evaluation performed in support of this alternative, as detailed in this section.

Compliance with ASME Section XI for performing 100% volumetric examinations results in hardship without a compensating increase in the level of quality and safety; therefore, this proposed alternative provides reasonable assurance of structural integrity and should be granted pursuant to 10 CFR 50.55a(z)(2).

Duration of Proposed Alternative:

During applicability of the PSI program until transition to the ISI program for each unit.

References:

ASME Section XI Boiler & Pressure Vessel Code, 2007 Edition through 2008 Addenda – Rules for Inservice Inspection of Nuclear Power Plant Components

Brunswick Steam Generating Plant, Unit 2 – Relief Request NRC Approval Letter and Safety Evaluation (ADAMS Accession ML11175A173)

Monticello Nuclear Generating Plant – Relief Request NRC Approval Letter and Safety Evaluation (ADAMS Accession ML003763033)

Vogtle Electric Generating Plant – Alternative Request under Title 10 of the Code of Federal Regulations, Section 50.55a(z)(1): Preservice

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	and Inservice Inspection Requirements for Specific Valve-to-Pipe Welds – VEGP 3&4-PSI/ISI-ALT-06 (ADAMS Accession ML19087A143)
Status:	Awaiting NRC authorization

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