



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

January 25, 2019

Ms. Cheryl A. Gayheart  
Regulatory Affairs Director  
Southern Nuclear Operating Co., Inc.  
3535 Colonnade Parkway  
Birmingham, AL 35243

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 – SAFETY  
EVALUATION FOR RELIEF REQUEST VEGP-ISI-RR-06, VERSION 1.0  
(EPID L-2018-LLR-0083)

Dear Ms. Gayheart:

By letter NL-18-0670 dated May 24, 2018, as supplemented by letter NL-18-1181 dated October 17, 2018, Southern Nuclear Operating Company (the licensee) submitted Relief Request No. VEGP-ISI-RR-06, Version 1.0 to the U.S. Nuclear Regulatory Commission (NRC) for the third 10-year inservice inspection (ISI) intervals of the Vogtle Electric Generating Plant (Vogtle), Units 1 and 2. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Paragraph 50.55a(g)(5)(iii), the licensee requested the NRC to grant relief per 10 CFR 50.55a(g)(6)(i) from volumetric examination requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) for certain high safety significant pressure-retaining welds. The licensee requested relief and to use alternative requirements because conformance with certain Code requirements is impractical.

The NRC staff reviewed the subject request and, as set forth in the enclosed safety evaluation, concludes that the licensee adequately addressed the regulatory requirements in 10 CFR 50.55a(g)(5)(iii). The NRC staff concluded that it is impractical for the licensee to comply with the ASME Code, Section XI requirements and that the proposed alternatives provide reasonable assurance of structural integrity or leak tightness of the subject welds. The NRC staff also concludes that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Therefore, the NRC staff grants the relief and imposes the alternatives requested in VEGP-ISI-RR-06, Version 1.0 for the third 10-year ISI intervals at Vogtle, Units 1 and 2, which commenced on May 31, 2007, and ended on May 30, 2017.

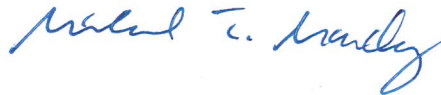
All other ASME Code, Section XI requirements for which relief was not specifically requested and granted herein by the NRC staff remain applicable, including the third-party review by the Authorized Nuclear Inservice Inspector.

C. Gayheart

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Any inquiries can be directed to Mr. Michael Orenak at 301-415-3229 or by e-mail at Michael.Orenak@nrc.gov.

Sincerely,

A handwritten signature in blue ink, appearing to read "Michael T. Markley".

Michael T. Markley, Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-424 and 50-425

Enclosure:  
Safety Evaluation

cc: Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST VEGP-ISI-RR-06, VERSION 1.0

SOUTHERN NUCLEAR OPERATING COMPANY

VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2

DOCKET NOS. 50-424 AND 50-425

1.0 INTRODUCTION

By letter NL-18-0670 dated May 24, 2018 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML18144B012), as supplemented by letter NL-18-1181 dated October 17, 2018 (ADAMS Accession No. ML18290A709), Southern Nuclear Operating Company (the licensee) submitted Relief Request No. VEGP-ISI-RR-06 to the U.S. Nuclear Regulatory Commission (NRC or the Commission) for the third 10-year inservice inspection (ISI) intervals of the Vogtle Electric Generating Plant (Vogtle), Units 1 and 2. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Paragraph 50.55a(g)(5)(iii), the licensee requested the NRC to grant relief per 10 CFR 50.55a(g)(6)(i) from volumetric examination requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for certain high safety significant pressure-retaining Class 1 and 2 piping welds. The licensee requested relief and to use alternative requirements because conformance with certain ASME Code requirements is impractical.

2.0 REGULATORY EVALUATION

Components (including supports) that are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements in 10 CFR 50.55a(g)(4), *Inservice inspection standards requirement for operating plants*, throughout the service life of a boiling or pressurized water reactor. The exception is the design and access provisions and preservice examination requirements set forth in Section XI of editions and addenda of the ASME Code that become effective subsequent to editions specified in paragraphs (g)(2) and (3) of 50.55a, which are incorporated by reference in paragraph (a)(1)(ii) of 50.55a to the extent practical within the limitations of design, geometry, and materials of construction of the components.

Pursuant to 10 CFR 50.55a(g)(4)(ii), *Applicable ISI Code: Successive 120-month intervals*, inservice examination of components and system pressure tests conducted during successive 120-month inspection intervals must comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in paragraph (a) of 50.55a 12 months before the start of the 120-month inspection interval (or the optional ASME Code Cases listed in NRC Regulatory Guide (RG) 1.147, when using ASME Code, Section XI, as incorporated by reference in paragraph (a)(3)(ii) of 50.55a), subject to the conditions listed in paragraph (b) of 50.55a.

Pursuant to 10 CFR 50.55a(g)(5)(iii), *ISI Program Update: Notification of Impractical ISI Code Requirements*, if the licensee has determined that conformance with the ASME Code requirement is impractical for its facility, the licensee must notify the NRC and submit, as specified in § 50.4, information to support the determinations. Determinations of impracticality in accordance with 50.55a must be based on the demonstrated limitations experienced when attempting to comply with the Code requirements during the inservice inspection interval for which the request is being submitted. Requests for relief made in accordance with 50.55a must be submitted to the NRC no later than 12 months after the expiration of the initial or subsequent 120-month inspection interval for which relief is sought.

Pursuant to 10 CFR 50.55a(g)(6)(i), *Impractical ISI requirements: Granting of relief*, the Commission will evaluate determinations under paragraph (g)(5) of 50.55a that ASME Code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines are authorized by law, and will not endanger life or property or the common defense and security, and are otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the NRC to grant the relief requested by the licensee.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Background

By letter dated March 3, 2010 (ADAMS Accession No. ML100610470), the NRC approved implementation of the risk-informed inservice inspection (RI-ISI) program for the Class 1 piping welds (Examination Categories B-F and B-J) and the Class 2 piping welds (Examination Categories C-F-I and C-F-2) in the third 10-year ISI interval of Vogtle, Units 1 and 2. The licensee developed the Vogtle RI-ISI program in accordance with methodology described in ASME Code Case N-716, "Alternative Piping Classification and Examination Requirements, Section XI."

#### 3.2 Applicable Components

The licensee identified the applicable ASME Code Class 1 and 2 piping welds in Table RR-6 of VEGP-ISI-RR-06. The licensee stated that the subject welds belong to the piping of the chemical and volume control, reactor coolant, and safety injection systems, and the main steam line. The licensee stated that the Vogtle RI-ISI program governs the examination of these welds. In accordance with Table 1 of ASME Code Case N-716, the licensee classified these welds in the RI-ISI program as Examination Category R-A, Item No. R1.11 (i.e., elements subject to thermal fatigue), Item No. R1.16 (i.e., elements subject to intergranular or transgranular stress corrosion cracking), or Item No. R1.20 (i.e., elements not subject to a degradation mechanism) based on potential degradation mechanisms. In Section 4 and Table RR-6 of VEGP-ISI-RR-06, the licensee provided the nominal pipe size (NPS), materials of construction, and additional details for each weld. The welds and associated components include the pipe-to-reducer, pipe-to-valve, pipe-to-elbow, pipe-to-tee, and pipe-to-flange welds. The licensee stated that Class 1 welds and associated components are made of austenitic stainless steel materials, except Class 2 welds and associated components, which are made of carbon steel materials.

### 3.3 Applicable Code Edition and Addenda

The code of record for the third 10-year ISI interval is the ASME Code, Section XI, 2001 Edition through 2003 Addenda.

### 3.4 Duration of Relief Request

The licensee submitted this relief request for the Vogtle, Units 1 and 2, third 10-year ISI interval, which started on May 31, 2007, and ended on May 30, 2017.

### 3.5 ASME Code Requirement

The ASME Code requirements applicable to the Class 1 welds originate in Table IWB-2500-1, and requirements applicable to the Class 2 welds originate in Table IWC-2500-1 of Section XI to the ASME Code. By letter and safety evaluation dated March 3, 2010, the NRC authorized an alternative to these requirements (i.e., the Vogtle RI-ISI program). The licensee developed the RI-ISI program in accordance with the methodology in ASME Code Case N-716. In the ASME Code requirements and the NRC safety evaluation, the welds applicable to VEGP-ISI-RR-06 are required to be volumetrically examined during each 10-year ISI interval, and 100 percent coverage of the required examination volume must be achieved. The extent of required examination coverage is reduced to *essentially 100 percent* by ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI." Section 50.55a of 10 CFR incorporated this code case by reference with the inclusion of RG 1.147, Revision 18.

### 3.6 Impracticality of Compliance

The licensee stated that it was not possible to obtain greater than 90 percent of the ASME Code required examination volume because of limitations that included the configuration and geometry of the welds and/or the associated components and metallurgical constraints. In Section 4, Table RR-6, and the diagrams in VEGP-ISI-RR-06, the licensee described and illustrated the limitations that prevented ultrasonic scanning of the welds. Examples included a valve body that limits access to the valve side of the weld, a geometry of an elbow, tee, fitting, or flange that limits access to the elbow, tee, fitting, or flange side of the weld, and a pipe support that restricts full access to the weld and, thus, ultrasonic scanning. The licensee stated that addressing the burden caused by compliance would involve major modification of plant components, including the redesign and replacement of the welds and associated components.

### 3.7 Bases for Relief

The licensee stated that it performed the ultrasonic testing (UT) to the maximum extent possible utilizing qualified personnel and demonstrated procedures in accordance with Appendix VIII of Section XI. The licensee stated that radiographic testing is not a desired option because it is limited in the ability to detect service-induced flaws. The licensee stated that it inspected additional welds by UT in the third 10-year ISI interval (i.e., 6 welds with Examination Category R-A, Item No. R1.11, and 147 welds with Examination Category R-A, Item No. R1.20). For the welds in this relief request with single-sided access, as shown in the diagrams in VEGP-ISI-RR-06, the licensee extended the ultrasonic beam path into the far side of the weld centerline to examine to the extent practical the other side of weld as a "Best Effort" examination. However, the licensee did not claim credit for the "Best Effort" examination because a UT procedure must be qualified with flaws on the inaccessible side of the weld.

Currently, there are no qualified single-side examination procedures, and the existing UT technology is not capable of reliably detecting or sizing flaws on the far side of an austenitic weld. The licensee did not identify any unacceptable indications. In its letter dated October 17, 2018, the licensee provided the available cumulative fatigue usage (CFU) factor for the lines containing Class 1 welds with reduced examination coverage. The licensee stated that the welds in this relief request have been subjected to system leakage testing in the third 10-year ISI interval, and the licensee has not identified any sign of leakage.

3.8 Proposed Alternative

In Table RR-6 of VEGP-ISI-RR-06, the licensee reported the percent coverage achieved for each weld examined. This is summarized in Table 1 below. The licensee proposed the alternative coverage listed below in lieu of the Code-required essentially 100 percent coverage.

**Table 1- ASME Code Coverage for Welds in Relief Request VEGP-ISI-RR-06**

<b>Weld Designation</b>	<b>ASME Code Class</b>	<b>Percent Coverage Obtained</b>
11208-007-1-RB	1	50
11208-007-2-RB	1	50
11201-030-38-RB	1	83
11201-031-2-RB	1	46
11201-042-2-RB	1	46
11201-046-2-RB	1	46
11201-051-2-RB	1	46
11204-126-15-RB	1	50
11204-024-13-RB	1	50
11204-023-21-RB	1	50
11204-076-42-RB	1	50
11204-078-10-RB	1	62
11204-021-26-RB	1	50
11204-021-27-RB	1	50
11204-021-28-RB	1	50
11204-025-20-RB	1	50
11208-012-5-RB	1	41.75
21208-007-1-RB	1	50
21208-007-2-RB	1	50
21204-124-15-RB	1	50
21204-024-15-RB	1	50
21204-023-21-RB	1	50
21201-030-19-RB	1	50
21204-021-26-RB	1	50
21204-021-17-RB	1	50
21204-024-16-RB	1	50
21204-025-22-RB	1	50
11301-001-6-RB	2	75

### 3.9 NRC Staff Evaluation

The NRC staff has evaluated relief request VEGP-ISI-RR-06 pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on whether: (1) a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) the imposition of the Code-required inspections would result in a burden to the licensee; and (3) the licensee's proposed alternative (i.e., accepting the reduced inspection coverage) provides reasonable assurance of structural integrity and leak tightness of the subject welds. The NRC staff finds that if these three criteria are met, then the requirements of 10 CFR 50.55a(g)(6)(i) will also be met (i.e., granting the requested relief will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility).

#### 3.9.1 Impracticality of Compliance

As described and demonstrated in the licensee's submittal, Table RR-6, and the sketches in VEGP-ISI-RR-06, the predominant limitations that prevented the licensee's UT from achieving essentially 100 percent coverage of the ASME Code-required volume were the pipe-to-valve, pipe-to-reducer, pipe-to-elbow, pipe-to-tee, and pipe-to-flange configurations and/or the metallurgical constraints. The licensee performed the UT from one side of the welds (i.e., a single-sided scan) because scanning from the other side of the welds was not possible. The NRC staff confirmed that each weld's particular design configuration prevented the licensee from scanning the welds from both sides. Therefore, the NRC staff finds that a technical justification exists to support the determination that achieving essentially 100 percent coverage is impractical.

#### 3.9.2 Burden of Compliance

The licensee proposed that making the welds accessible for inspection from both sides would require replacement or significant design modification to the welds and their associated components. The NRC staff finds that replacing or reconfiguring the components of the subject welds is the only reasonable means to achieve dual-sided coverage of these welds and that replacement or reconfiguration of the pipe, valve, elbow, tee, reducer, or flange constitutes a burden on the licensee.

#### 3.9.3 Structural Integrity and Leak Tightness

The NRC staff considered whether the licensee's proposed alternative provides reasonable assurance of structural integrity and leak tightness of the subject weld based on the examination coverage achieved and the safety significance of unexamined volumes or unachievable coverage. The NRC staff considered the presence or absence of known active degradation mechanisms and essentially 100 percent coverage achieved for similar welds in similar environments subject to similar degradation mechanisms.

##### *Examination Coverage Achieved*

In evaluating the licensee's proposed alternative coverage, the NRC staff assessed whether the licensee obtained as much coverage as reasonably possible and in the manner in which the

licensee reported the coverage achieved. Based on its review of the submittal and the sketches in VEGP-ISI-RR-06, the NRC staff verified the following:

- The licensee examined the welds using the appropriate equipment, ultrasonic modes of propagation, probe angles, frequencies, and scanning directions to obtain maximum coverage.
- The licensee calculated the coverage in a reasonable manner.
- The licensee used UT procedures that were qualified.
- Physical access limited the coverage (i.e., the configuration of one side of the weld did not permit access for scanning).
- The licensee did not identify unacceptable indications.

Therefore, the NRC staff found that the licensee adequately obtained as much coverage as reasonably possible with the ASME Code-required UT.

#### *Safety Significance of Unexamined Volumes - Unachievable Coverage*

In addition to the coverage analysis described above, the NRC staff evaluated the safety significance of the unexamined volumes of welds or unachievable coverage. Based on its review of the submittal and the sketches in VEGP-ISI-RR-06, and the supplement dated October 17, 2018, the NRC staff verified the following:

- The licensee's UT has covered, to the extent possible, the regions that are typically susceptible to higher stresses and, therefore, potential degradation (i.e., the weld root and the heat affected zone of the base material near the inner diameter surface of the joint).
- For the austenitic stainless steel welds, the coverage obtained was limited to the volume up to the weld centerline (i.e., near-side) because claiming coverage for the volume on the opposite side of the weld centerline (i.e., far-side) requires meeting the 10 CFR 50.55a(b)(2)(xv)(A)(2) far-side UT qualifications, which has not been demonstrated in any qualification attempts to date. The NRC staff verified that the licensee inspected the far-side volume by the "Best Effort" examination, did not identify indications, and did not take credit for the coverage achieved from the "Best Effort" examination.
- For the lines containing Class 1 welds, the licensee's calculated CFU factor does not exceed the limit of Section III of the ASME Code. The licensee based the calculated CFU factor on the actual plant operating cycles. Therefore, this demonstration that the CFU remains below the ASME Code limit provides reasonable assurance that the potential for initiation and growth of fatigue cracks is low, and the risk associated with fatigue-related issues is minimal.
- During the third 10-year ISI interval, the licensee inspected additional austenitic stainless steel pipe welds subject to similar operating conditions and environment (i.e., 6 welds with the degradation mechanism of thermal fatigue and 147 welds with no degradation mechanism), and the licensee did not detect unacceptable indications.



Therefore, the NRC staff determined that based on the coverage achieved by the qualified UT, the supplemental "Best Effort" examinations, the examination of the weld root and its heat affected zone to the extent possible, and bounding CFU, it is reasonable to conclude that if significant service-induced degradation had occurred, the licensee's examinations would have detected evidence of it. In addition to the required volumetric examinations, the NRC staff has found that these welds have received the required system leakage test according to the ASME Code, Section XI, IWB-2500 (Table IWB-2500-1, *Examination Category B-P*) during each refueling outage, and IWC-2500 (Table IWC-2500-1, *Examination Category C-H*) each inspection period. Despite reduced coverage of the required examination volume, the NRC staff finds that this inspection provides additional assurance that the licensee would detect any pattern of degradation if it were to occur and take appropriate correction actions. Therefore, the NRC staff finds that the volumetric examinations performed to the extent possible provide a reasonable assurance of structural integrity and leak tightness of the subject welds and that compliance with the ASME Code requirements for these welds would be a burden on the licensee.

#### 4.0 CONCLUSION

As set forth above, the NRC staff determines that it is impractical for the licensee to comply with the ASME Code, Section XI requirement; that the proposed inspection provides reasonable assurance of structural integrity or leak tightness of the subject welds; and that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants VEGP-ISI-RR-06 for Vogtle, Units 1 and 2, for the third 10-year ISI interval, which commenced on May 31, 2007, and ended on May 30, 2017.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including the third party review by the Authorized Nuclear In service Inspector.

Principal Contributor: Ali Rezai, NRR/DMLR/MPHB

Date: January 25, 2019