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

July 19, 2018

Mr. George A. Lippard, III
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
P.O. Box 88, Mail Code 800
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1 – RELIEF REQUEST (RR-4-13) FOR USE OF A RISK-INFORMED PROCESS AS AN ALTERNATIVE FOR THE SELECTION OF CLASS 1 AND CLASS 2 PIPING WELDS (EPID L-2017-LLR-0133)

Dear Mr. Lippard:

By letter dated October 30, 2017, as supplemented by letter dated April 2, 2018, South Carolina Electric & Gas Company (SCE&G, the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for relief from certain American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PV code), Section XI, Inservice Inspection (ISI) requirements at Virgil C. Summer Nuclear Station (VCSNS), Unit 1. SCE&G requested authorization from NRC to continue use of its risk-informed ISI program for the fourth 10-year ISI interval.

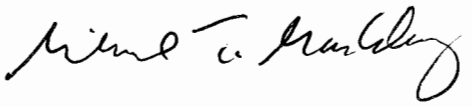
Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.55a(z)(1), the licensee requested to use the proposed alternative on the basis that the alternative provides an acceptable level of quality and safety.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that SCE&G has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1) and, thus, the proposed alternative provides an acceptable level of quality and safety. Therefore, the NRC authorizes the use of relief request, RR-4-13, for VCSNS, Unit 1, for the fourth 10-year ISI program interval, which began on January 1, 2014, and is scheduled to end on December 31, 2023.

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

If you have any questions, please contact the Project Manager, Shawn Williams, at 301-415-1009 or by e-mail at Shawn.Williams@nrc.gov.

Sincerely,



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

Docket No. 50-395

Enclosure:
Safety Evaluation

Cc: Listserv

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

ALTERNATIVE REQUEST RR-4-13

RISK-INFORMED INSERVICE INSPECTION PROGRAM

FOURTH 10-YEAR INTERVAL INSERVICE TESTING PROGRAM

RENEWED FACILITY OPERATING LICENSE NO. NPF-12

SOUTH CAROLINA ELECTRIC & GAS COMPANY

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1

DOCKET NO. 50-395

1.0 INTRODUCTION

By letter dated October 30, 2017 (Agencywide Document Access and Management System (ADAMS) Accession No. ML17303B183), as supplemented by letter dated April 2, 2018 (ADAMS Accession No. ML18092B606), South Carolina Electric & Gas Company (SCE&G, the licensee), requested approval from the U.S. Nuclear Regulatory Commission (NRC) to use a risk-informed inservice inspection (RI-ISI) program as an alternative from certain American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PV), Section XI, Inservice Inspection (ISI) requirements at Virgil C. Summer Nuclear Station (VCSNS), Unit 1, for the remainder of the fourth 10-year ISI interval. The fourth 10-year ISI program interval began on January 1, 2014, and is scheduled to end on December 31, 2023.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee proposed the alternative RI-ISI program, for the ASME Code Class 1 and 2 piping welds, on the basis that the alternative provides an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Paragraph 10 CFR 50.55a(g)(4), Inservice inspection standards, requirement for operating plants, states, in part:

> Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) that are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements, except design and access provisions and preservice examination requirements, set forth in Section XI of editions and addenda of the ASME BPV Code (or ASME OM Code for snubber examination and

testing) that become effective subsequent to editions specified in paragraphs (g)(2) and (3) of this section and that are incorporated by reference in paragraph (a)(1)(ii) or (iv) for snubber examination and testing of this section, to the extent practical within the limitations of design, geometry, and materials of construction of the components.

Pursuant to 10 CFR 50.55a(z), alternatives to the requirements of paragraph (g) of 10 CFR 50.55a may be used when authorized by the Director, Office of Nuclear Reactor Regulation. A proposed alternative must be submitted and authorized prior to implementation. The licensee must demonstrate (1) the proposed alternative would provide an acceptable level of quality and safety; or (2) compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

NRC Regulatory Guide (RG) 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (ADAMS Accession No. ML100910006), provides guidance on the use of probabilistic risk assessment (PRA) findings and risk insights to support licensee requests for changes to a plant's licensing basis. RG 1.174 also defines an acceptable approach to analyzing and evaluating proposed licensing basis changes. The approach includes traditional engineering evaluations supported by insights derived from the use of PRA methods about the risk significance of the proposed changes. In implementing risk-informed decision making, the NRC expects licensing basis changes to meet the acceptance guidelines and key principles of risk-informed regulation specified in RG 1.174. Directly relevant to RG 1.174 are:

- RG 1.200, Revision 2 "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities" (ADAMS Accession No. ML090410014)

- RG 1.178, Revision 1 "An Approach for Plant-Specific Risk-Informed Decision Making for Inservice Inspection of Piping" (ADAMS Accession No. ML032510128)

- Chapter 3.9.8 of NUREG 0800 Standard Review Plan (SRP) "SRP for the Review of Risk-Informed Inservice Inspection of Piping" (ADAMS Accession No. ML032510135).

RG 1.200 describes an approach to determine whether the technical adequacy of the PRA used to support a submittal is consistent with accepted practices. RG 1.178 describes methods acceptable to the NRC for integrating insights from PRA techniques with traditional engineering analyses into ISI programs for piping. Incorporating risk insights into the programs can focus inspections on the more important locations and reduce personnel exposure, while at the same time maintaining or improving public health and safety. The SRP provides guidance for evaluating the licensee's requests for changes to the licensing basis due to use of risk insights.

NUREG-1792, "Good Practices for Implementing Human Reliability Analysis" (ADAMS Accession No. ML051160213) was used to assess the PRA.

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 authorize the alternative requested by the licensee.

3.0 TECHNICAL EVALUATION

Background

During the third period of the second 10-year ISI interval and the third 10-year ISI interval of VCSNS, Unit 1, the licensee has implemented the RI-ISI program for the Class 1 piping welds (Examination Category B-F and B-J) and the Class 2 piping welds (Examination Category C-F-1 and C-F-2). The licensee developed the VCSNS, Unit 1, original RI-ISI program in accordance with the NRC approved methodology of the Electric Power Research Institute (EPRI) Topical Report (TR)-112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure. Reference Project No. 669" (ADAMS Accession No. ML013470102) in 2001. The NRC approved the VCSNS, Unit 1, RI-ISI program for the third 10-year ISI interval in a letter dated September 6, 2005 (ADAMS Accession No. ML052300616), and for the third period of the second 10-year ISI in a letter dated May 12, 2003 (ADAMS Accession No. ML031320443).

Components Affected

The ASME Code Class 1 and 2 piping is affected. In accordance with ASME Code, Section XI, IWB-2500 (Table IWB-2500-1), the Class 1 vessel nozzle-to-pipe dissimilar metal (DM) welds are classified as Examination Category B-F, and the Class 1 piping similar and DM welds are classified as Examination Category B-J. In accordance with IWC-2500 (Table IWC-2500-1), the Class 2 austenitic stainless steel or high alloy piping welds are classified as Examination Category C-F-1, and the Class 2 carbon or low alloy steel piping welds are classified as Examination Category C-F-2.

Applicable Code Edition and Addenda

The code of record for the fourth 10-year ISI interval is the 2007 Edition through 2008 Addenda of the ASME Code, Section XI.

Duration of Relief Request

The licensee submitted this relief request for remainder of the fourth 10-year ISI interval which commenced on January 1, 2014, and is scheduled to end on December 31, 2023.

ASME Code Requirement

Table IWB-2500-1, Examination Category B-F and B-J, require the Class 1 welds be subjected to the volumetric and/or surface examinations during successive 120-month (10-year) intervals. Based on the above, 100 percent of all nozzle-to-pipe DM welds in Examination Category B-F, and 25 percent of all piping welds with more than one inch nominal diameter in Examination Category B-J shall be inspected.

Table IWC-2500-1, Examination Category C-F-1 and C-F-2, require the Class 2 piping welds be subjected to the volumetric or surface examination, or both, during successive 120-month (10-year) intervals. According to above requirements, 7.5 percent of non-exempt piping welds in Examination Category C-F-1 and C-F-2 shall be inspected.

Proposed Alternative

The licensee proposed to use the VCSNS, Unit 1, RI-ISI program for the Class 1 and 2 piping welds for the remainder of the fourth 10-year ISI interval.

Basis for Use

In its submittal dated October 30, 2017, as supplemented by letter dated April 2, 2018, the licensee requests NRC authorization to continue the implementation of its RI-ISI Program for the fourth 10-year ISI interval at VCSNS, Unit 1. The scope of the VCSNS, Unit 1, RI-ISI Program is limited to the inspection of ASME Code Class 1 and 2 pressure retaining piping welds. The licensee stated that it originally intended to submit its RI-ISI for VCSNS, Unit 1, prior to the beginning of its fourth 10-year interval, which began on January 1, 2014, and is scheduled to end on December 31, 2023. The licensee stated that since it did not submit its RI-ISI Program, the ASME Code required examinations were performed during the first period of the fourth 10-year interval. The first period of the fourth 10-year interval ended on June 1, 2017.

Table IWB-2500-1, Examination Category B-F, requires volumetric and surface examinations on all welds for Item Numbers B5.10, B5.40, and B5.70. Table IWB-2500-1, Examination Category B-J, requires volumetric and surface examinations on a sample of welds for Item Numbers B9.11 and B9.31, volumetric examinations on a sample of welds for Item Number B9.22, and surface examinations on a sample of welds for Item Numbers B9.21, B9.32, and B9.40. The weld population selected for inspection includes the following:

1. All terminal ends in each pipe or branch run connected to vessels.

2. All terminal ends and joints in each pipe or branch run connected to other components where the stress levels exceed either of the following limits under loads associated with specific seismic events and operational conditions:

   a. primary plus secondary stress intensity range of $2.4S_m$ for ferritic steel and austenitic steel.

   b. cumulative usage factor (CUF) of 0.4.

3. All dissimilar metal welds not covered under Examination Category B-F.

4. Additional piping welds, so that the total number of circumferential butt welds, branch connections, or socket welds selected for examination equals 25% of the circumferential butt welds, branch connection, or socket welds in the reactor coolant piping system. This total does not include welds exempted by IWB-1220 or welds in Item Number B9.22. For pressurized water reactor (PWR) plants these additional welds may be located as follows:

   a. one hot-leg and one cold-leg in one reactor coolant piping loop,

   b. one branch, representative of an essentially symmetric piping configuration among each group of branch runs that are connected to reactor coolant loops and that perform similar system functions, and

c. each piping and branch run exclusive of the categories of loop and runs that are part of system piping of (a) and (b) above.

5. A 10% sample of PWR high pressure safety injection system circumferential welds in piping ≥ NPS [Nominal Pipe Size] 1½ and < NPS 4 shall be selected for examination. This sample shall be selected from locations determined by the Owner as most likely to be subject to thermal fatigue. Thermal fatigue may be caused by conditions such as valve leakage or turbulence effects.

Table IWC-2500-1, Examination Categories C-F-1 and C-F-2 require volumetric and surface examinations on a sample of welds for Item Numbers C5.11, C5.21, C5.51, and C5.61 and surface examinations on a sample of welds for Item Numbers C5.30, C5.41, C5.70, and C5.81. The weld population selected for inspection includes the following:

1. Welds selected for examination shall include 7.5%, but not less than 28 welds, of all dissimilar metal, austenitic stainless steel or high alloy welds (Examination Category C-F-1) or of all carbon and low alloy steel welds (Examination Category C-F-2) not exempted by IWC-1220. (Some welds not exempted by IWC-1220 are not required to be nondestructively examined per Examination Categories C-F-1 and C-F-2. These welds, however, shall be included in the total weld count to which the 7.5% sampling rate is applied.) The examinations shall be distributed as follows:

   a. among the Class 2 systems prorated, to the degree practicable, on the number of nonexempt dissimilar metal, austenitic stainless steel or high alloy welds (Examination Category C-F-1) or nonexempt carbon and low alloy steel welds (Examination Category C-F-2) in each system;
   b. within a system, per the applicable Examination Category, among terminal ends, dissimilar metal welds, and structural discontinuities prorated, to the degree practicable, on the number of nonexempt terminal ends, dissimilar metal welds, and structural discontinuities in that system; and

   c. within each system, between line sizes prorated to the degree practicable.

As supplemented by letter dated April 2, 2018, the licensee provided the following additional information:

1. The fourth interval is a seven-outage interval, as opposed to the six-outage third interval. Exams performed during the third interval were scheduled in accordance with Section XI Table IWB-2500-1 requirements (with the use of Code Case N-663 per RG 1.147) and per the requirements of Section XI table IWB-2411-1.

2. During the first period of the fourth interval, 85 welds were examined for Categories B-J, C-F-1, and C-F-2. Of those 85 exams, only 26 were not part of the weld population selected for examination for the third interval RI-ISI Program. The additional 26 examinations were due to ASME Section XI requiring more examinations than the RI-ISI application and therefore are not relevant for the comparison of RI-ISI selections between the third and fourth Intervals. All exams for Categories B-J, C-F-1, and C-F-2, that were performed for the first period of the third interval, were also performed during the first period of the fourth interval.

3. The sequence of exams for the second and third period selections for the RI-ISI program will be scheduled per the selection scheduling of the third interval as required. The variance will be due to the 7-outage versus 6-outage difference between the intervals.

NRC Staff Evaluation

The NRC staff has evaluated this relief request pursuant to 10 CFR 50.55a(z)(1). The NRC staff focused on whether the proposed alternative provides an acceptable level of quality and safety.

For support of this relief request, the licensee used the methodology of the NRC approved EPRI TR-112657, Revision B-A, to develop the VCSNS, Unit 1, RI-ISI program. The EPRI TR provides technical guidance on an alternative for selecting and categorizing the risk significance of piping components for the purpose of developing an RI-ISI program. The guidance in RG 1.174 and RG 1.178 defines an approach that is acceptable to the NRC for developing risk-informed applications for a licensing basis change that considers engineering issues and applies risk insights. As part of evaluating the proposed change to the VCSNS, Unit 1, ISI program, the licensee performed an engineering analysis (i.e., traditional engineering evaluation methods supported by risk insights derived from the use of PRA methods about the risk significance of the proposed changes) to demonstrate that the proposed changes are in conformance with the key principles of risk-informed regulation in RG 1.174 and will not compromise defense-in-depth and safety margins. As part of the RI-ISI process, the licensee performed periodic performance evaluations of the VCSNS, Unit 1, RI-ISI program and updated it in accordance with RG 1.174 and RG 1.178.

The key principles of risk-informed regulation in RG 1.174 are as follows:

Principle 1. The proposed licensing basis change meets the current regulations unless it is explicitly related to a requested exemption (i.e., a specific exemption under 10 CFR 50.12).

Principle 2. The proposed licensing basis change is consistent with the defense-in-depth philosophy.

Principle 3. The proposed licensing basis change maintains sufficient safety margins.

Principle 4. When proposed licensing basis changes result in an increase in risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement on safety goals for the operations of nuclear power plants.

Principle 5. The impact of the proposed licensing basis change should be monitored using performance measurement strategies.

In evaluating this relief request, the NRC staff focused on whether the licensee's proposed RI-ISI program conforms to these five key principles of risk-informed regulation. The NRC staff evaluation is discussed below.

Principle 1

The NRC staff determined that the licensee met Principle 1 of RG 1.174 because the proposed RI-ISI program is an alternative to the ASME Code ISI program as may be requested for NRC approval pursuant to 10 CFR 50.55a(z)(1). An exemption request is not required because the licensee's proposed R-ISI is an alternative ISI program.

Principle 2 and 3

The second and third principles require assurance that the alternative program is consistent with the defense-in-depth philosophy and that sufficient safety margins are maintained, respectively. Assurance that the second and third principles are met is based on the application of the approved methodology and not on the particular inspection locations selected. In accordance with RG 1.174, the engineering analysis should evaluate whether the impact of the proposed RI-ISI program (i.e., the proposed change to the ISI program) is consistent with the defense-in-depth philosophy, and sufficient safety margins are maintained.

The NRC staff confirmed that, as part of the RI-ISI process, the licensee performed a plant-specific engineering analysis according to the guidance in the NRC approved EPRI TR-112657, Revision B-A, to develop the RI-ISI program for VCSNS, Unit 1. The NRC staff also confirmed that the licensee has periodically reviewed the VCSNS, Unit 1, RI-ISI program at a minimum on an ASME Code inspection period basis as specific new information identified or became available and, therefore, the risk ranking of piping segments has been adjusted to determine the risk significant locations and the number of locations to inspect. Furthermore, the NRC staff notes that there are no changes made by the RI-ISI process to the evaluation of design basis accidents in the final safety analysis report, as discussed in EPRI TR-112657, Revision B-A. Therefore, the NRC staff determined that the licensee met Principles 2 and 3 of RG 1.174, and that the proposed RI-ISI program is consistent with a defense-in-depth philosophy and maintains sufficient safety margins.

Principle 4

Principle 4 of RG 1.174 requires an evaluation of the change in risk between the proposed RI-ISI program and the program the licensee would otherwise be required to implement. The change in risk estimate is dependent on the location of inspections in the proposed RI-ISI program compared to the location of inspections that would be performed using the requirements of the ASME Code, Section XI. In accordance with 10 CFR 50.55a, it is not necessary to develop a new deterministic ASME program for each new 10-year ISI interval. NRC staff found it acceptable to compare the new proposed RI-ISI program with the ASME program.

NRC staff requested additional information in letter dated February 15, 2018 (ADAMS Accession No. ML18023B069) related to Principle 4. In RAI 1, the NRC staff requested the licensee to "clarify that the negative value of the CDF and large early release frequency (LERF) risk metrics represent risk reductions and not 'negative reductions,' in which a reduction of a negative value as provided in the license amendment request (LAR) could imply an increase in risk." In its letter dated April 2, 2018, the licensee stated, in part, that, as part of the RI-ISI living program evaluation and update, "A new Risk Impact Analysis was performed, and the revised program continues to represent a risk reduction when compared to the last deterministic Section XI inspection program when POD [probability of detection] is considered. The revised program represents an overall reduction of plant risk of -1.17E-08 in regards to CDF and -4.86E-09 in

regards to LERF. Note that a negative value in the Risk Impact Analysis represents a decrease in risk."

In response to RAI 7, the licensee performed a sensitivity study that involved removing the conservatisms and noted there was no change in risk values. From the results of the sensitivity study, the licensee concluded that the conservatisms in the PRA model do not underestimate the possible increase in risk. The NRC staff finds the change in risk results to be conservative and not underestimated by conservatisms in the licensee's PRA model.

For the disposition of the Finding and Observation (F&O) for Supporting Requirement (SR) IE-C1, the licensee observed the frequency of a medium loss-of-coolant accident increase by almost a factor of four that caused certain welds to move from medium to high risk. This appeared to contradict the licensee's statement that there would be no impact on the risk metrics. In response to RAI 3, the licensee stated they performed a sensitivity study and concluded the updated risk impact analysis with the high risk welds results in a decrease to overall risk. Based on the licensee's sensitivity study and response to the RAI, the NRC staff finds these high risk welds will have an overall decrease is risk.

For the disposition of F&O IFEV-A7, the licensee states the risk due to human induced flooding is reduced since online maintenance is limited. Although online maintenance is limited, the NRC staff finds that it cannot be eliminated. In response to RAI 6, the licensee stated that two valve isolation is required for systems and tanks that can cause major flooding. Since the licensee has two valve isolation for these systems and tanks, they are allowed to be qualitatively screened per EPRI 1019194, "Guidelines for Performance of Internal Flooding Probabilistic Risk Assessment." Based on the above, the NRC staff finds human induced flooding does not impact the risk metrics and, therefore, acceptable to screen out for this RI-ISI application.

Principle 4 also requires demonstration of the technical adequacy of the licensee's PRA. As discussed in RG 1.178 and RG 1.200, an acceptable change in risk evaluation requires the use of a PRA of appropriate technical quality that models the as-built and as-operated plant. EPRI TR-1021467-A, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs," provides guidance on the minimum acceptable quality requirement for a PRA used to support a risk-informed ISI program. In response to RAI 2, the licensee stated in 2016 that a full scope peer review for internal events and internal flooding was performed against RG 1.200, Revision 2. The NRC staff finds the licensee's PRA to be technically adequate based on the licensee's full scope peer review.

The licensee provided dispositions in the LAR for the unresolved F&Os from the 2016 full scope peer review that are applicable to the RI-ISI application. For F&O SY-A4, the NRC staff noted that walkdowns of system modifications may have been performed six or more years ago when the licensee submitted an application for the National Fire Protection Association (NFPA) 805 "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants" LAR on November 15, 2011 (ADAMS Package Accession No. ML113210199) and may not represent the as-built and as-operated plant. In response to RAI 4, the licensee clarified that walkdowns have been completed for PRA applications from 2014 and the present, and any modifications have been incorporated into the simulator and have been routinely observed by PRA personnel. The NRC staff finds that walkdowns of recent modifications are adequate to represent the as-built and as-operated plant.

For the disposition of F&O HR-G7, the licensee did not identify the joint human error probability (HEP) floors that were used in the sensitivity study. The NRC accepted guidance in

NUREG-1792, "Good Practices for Implementing Human Reliability Analysis" requires justification for joint HEP floors less than 1.0E-06 for internal events and less than 1.0E-05 for fire PRA. In response to RAI 5, the licensee stated no joint HEP floors were less than 1.0E-05. The NRC staff concludes F&O HR-G7 is resolved and meets the guidance of NUREG-1792. The remaining open F&Os are not applicable to the RI-ISI application or have no risk impact on the application.

The change in risk results satisfy the acceptance guidelines of RG 1.174 and EPRI TR-112657, Revision B-A. Therefore, the NRC staff finds the impact on CDF and LERF due to the implementation of the RI-ISI program is consistent with the acceptance guidelines of RG 1.174. The NRC staff also finds that the licensee has assessed the technical adequacy of its PRA using RG 1.200, Revision 2, and the PRA is consistent with the quality requirements in EPRI TR-1021467-A. Therefore, the NRC staff finds Principle 4 of RG 1.174 is met.

Principle 5

In accordance with RG 1.178 and RG 1.174, implementation and performance monitoring strategies should be planned to ensure that the engineering evaluation conducted to examine the impact of the proposed changes continues to reflect the actual reliability and availability of systems that have been evaluated. When the examination of a weld under the proposed RI-ISI program is not practical or is limited because of physical constraints or radiation hazards, alternative inspection intervals, scope, and methods should be developed to ensure that piping degradation is detected and structural integrity is maintained. From review of RR-4-13, the NRC staff found that the licensee has considered the VCSNS, Unit 1, RI-ISI program as a living program, and in the application, the licensee stated that it will require feedback of new relevant information and adjust the proposed RI-ISI program as a minimum on an ASME Code inspection period basis to ensure the appropriate identification of high safety significant piping locations. The licensee will require more frequent adjustments and updates if significant changes are directed by the NRC, industry, or plant specific feedback. Therefore, the NRC staff finds that the licensee demonstrated that its proposed RI-ISI program is a living program that will be periodically reviewed and updated, and that Principle 5 of NRC RG 1.174 is met.

Augmented Inspection Program

The NRC staff verified that the licensee implemented augmented inspection programs to address generic piping degradation problems, as required either by the NRC to preclude piping failure or by the industry's good practice guidelines. The augmented inspection programs that will not be changed by the proposed RI-ISI program and will continue to be implemented, and those that will be subsumed by the RI-ISI program, are as follows, as stated in the application:

> The augmented examination program for flow accelerated corrosion per Generic Letter GL 89-08 is relied upon to manage this damage mechanism but is not otherwise affected or changed by the RI-ISI program.
>
> The augmented examinations for thermal fatigue in non-isolable reactor coolant system branch lines are performed in accordance with Materials Reliability Program MRP-146 which is relied upon to manage this damage mechanism but is not otherwise affected or changed by the RI-ISI program.
>
> The augmented inspection program for the service water intake and piping is addressed in Procedure ES-505, "Service Water System Corrosion Monitoring and Control Program."

This procedure is relied upon to manage this damage mechanism (i.e., microbiologically influenced corrosion and pitting) but it is not otherwise affected or changed by the RI-ISI program.

The augmented visual examinations for pressure retaining welds in Class 1 components fabricated with Alloy 600/82/182 materials are performed in accordance with Code Case N-722-1 which is relied upon to manage the damage mechanism of Primary Water Stress Corrosion Cracking (PWSCC) but is not otherwise affected or changed by the RI-ISI program.

The augmented examinations and acceptance standards for Class 1 piping and vessel nozzle butt welds fabricated with UNS N06082 or UNS W86182 weld filler metal were performed during the Third Interval in accordance with Code Case N-770-1 which was relied upon to manage the damage mechanism of PWSCC but was not otherwise affected or changed by the RI-ISI program. Note that the welds selected for examination in accordance with Code Case N-770-1 were considered as part of the RI-ISI population such that they were evaluated for other potential degradation mechanisms. However, they were excluded from selection under the RI-ISI Program. In the Fourth Interval these examinations will be performed in accordance with the version of Code Case N-770 that is references in the published version of 10 CFR 50.55a. Per the Final Rule for 10 CFR 50.55a dated August 17, 2017, Code Case N-770-2 is the current applicable version.

NRC Staff Conclusion

Based on the above, the NRC staff concludes that the proposed RI-ISI program for the fourth 10-year ISI interval met the five key principles of risk-informed regulation, therefore, the proposed RI-ISI program provides an acceptable level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff has determined that the licensee has demonstrated that the proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the use of this proposed alternative, RR-4-13, at VCSNS, Unit 1, for the remainder of the fourth 10-year ISI interval, which commenced on January 1, 2014, and is scheduled to end on December 31, 2023.

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

Principal Contributors: Bart Fu, NRR/DMLR
Brandon Hartle, NRR/DRA

Date: July 19, 2018

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1 – RELIEF REQUEST (RR-4-13) FOR USE OF A RISK-INFORMED PROCESS AS AN ALTERNATIVE FOR THE SELECTION OF CLASS 1 AND CLASS 2 PIPING WELDS (EPID L-2017-LLR-0133) DATED JULY 19, 2018

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OFFICE	DORL/LPL2-1/PM	DORL/LPL2-1/LA	NRR/DMLR/MPHB/ABC*	NRR/DRA/APLA/BC*
NAME	SWilliams	KGoldstein	SCumblidge	SRosenberg
DATE	7/11/18	7/9/18	6/7/18	6/15/18
OFFICE	DORL/LPL2-1/BC	DORL/LPL2-1/PM		
NAME	MMarkley	SWilliams		
DATE	7/19/18	7/19/18		

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