September 30, 2003

Mr. J. T. Gasser
Vice President
Southern Nuclear Operating
Company, Inc.
Post Office Box 1295
Birmingham, Alabama 35201-1295

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 RE: RELIEF REQUEST FOR RISK-INFORMED INSERVICE INSPECTION PROGRAM (TAC NOS. MB6118 AND MB6119)

Dear Mr. Gasser:

By letter dated July 26, 2002, as supplemented by letters dated April 23 and June 20, 2003, you requested approval of an alternative risk-informed inservice inspection (RI-ISI) program for the Vogtle Electric Generating Plant (VEGP), Units 1 and 2, inservice inspection (ISI) program for the American Society of Mechanical Engineers (ASME) Class 1 and 2 piping welds. The July 26, 2002, letter included an enclosure describing the proposed program. Additional clarifying information was provided in letters dated April 23 and June 20, 2003.

A proposed RI-ISI program developed in accordance with Westinghouse Owners Group topical report WCAP-14572, "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report," Revision 1-NP-A is an alternative to the current ASME Code, Section XI, ISI program and is applicable to Class 1 and 2 piping at VEGP, Units 1 and 2. You deviated from the approved methodology for estimating the segment failure frequency for piping segments that include piping of different diameters. The NRC staff does not find your method to estimate failure frequency of piping segments with multiple pipe sizes an acceptable alternative to the approved methodology. However, you reevaluated these segments without this deviation and indicated that the number of welds selected for inspection under either approach would have been the same. The NRC staff concluded that the number of welds selected for inspection under the licensee's proposed RI-ISI program is consistent with those produced by the application of WCAP-14572, Revision 1-NP-A. As such, the results (number and locations of welds to be inspected) of the licensee's proposed RI-ISI program provides an acceptable alternative to the requirements of Section XI to the ASME Code, for ISI of Class 1 and 2 piping, Categories B-F, B-J, C-F-1, and C-F-2 welds. However, any future application of the proposed method for estimating the segment failure frequency for piping segments that include piping of different diameters will require prior NRC staff review and approval.

Therefore, your request for relief is authorized for the second 10-year ISI interval pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i) on the basis that the proposed alternative provides an acceptable level of quality and safety. This authorization does not constitute NRC approval of the licensee's method to estimate the failure frequency of segments that include piping of different diameters. RI-ISI programs are living programs

requiring feedback of new relevant information to ensure the appropriate identification of high safety significant piping locations.

Any modification to or re-evaluation of this RI-ISI program during the second 10-year ISI interval that uses the results of calculations based on the unapproved method to review or adjust the safety significance of piping locations will require NRC staff review and approval of a request for relief pursuant to 10 CFR 50.55a(a)(3)(i).

Sincerely,

/RA/

John A. Nakoski, Section Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-424 and 50-425

Enclosure: Safety Evaluation

cc w/encl: See next page

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cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RISK-INFORMED INSERVICE INSPECTION PROGRAM

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

VOGTLE ELECTRIC GENERATING STATION UNITS 1 AND 2

DOCKET NOS. 50-424 AND 50-425

1.0 INTRODUCTION

Current inservice inspection (ISI) requirements for Vogtle Electric Generating Plant (VEGP), Units 1 and 2, are contained in the 1989 Edition of Section XI, Division 1 of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, entitled *Rules for Inservice Inspection of Nuclear Power Plant Components* (Code). In a submittal dated July 26, 2002, the licensee, Southern Nuclear Operating Company (SNC), proposed a new program entitled "Risk-Informed Inservice Inspection Program - ASME Code Category B-F, B-J, C-F-1, and C-F-2 Piping" (Reference 1). Additional clarifying information was provided in revised submittals dated April 23 (Reference 2), and June 20, 2003 (Reference 3). The licensee's risk-informed inservice inspection (RI-ISI) program was developed in accordance with the Westinghouse Owners Group (WOG) Topical Report WCAP-14572, Revision 1-NP-A (WCAP) (Reference 4), which was previously reviewed and approved by the Nuclear Regulatory Commission (NRC) staff.

2.0 BACKGROUND

2.1 Applicable Requirements

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g) requires that ISI of the ASME Code Class 1, 2, and 3 components be performed in accordance with Section XI of the ASME Code and applicable addenda, except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states in part that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the applicant demonstrates that the proposed alternatives would provide an acceptable level of quality and safety or if the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The regulations require that ISI of components conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of the Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

2.2 Summary of Proposed Approach

In the licensee's proposed RI-ISI program, piping failure potential estimates were determined using a software program contained in Supplement 1 to Reference 4, entitled "Westinghouse Structural Reliability and Risk Assessment (SRRA) Model for Piping Risk-Informed Inservice Inspection," that utilizes probabilistic fracture mechanics technology, industry piping failure history, plant-specific piping failure history, and other relevant information. Using the failure potential and supporting insights on piping failure consequences from the licensee's probabilistic risk assessment (PRA), safety significance ranking of piping segments were established to determine inspection locations. The RI-ISI program maintains the fundamental requirements of the Code, such as the examination technique, frequency, and acceptance criteria. However, the RI-ISI program is intended to reduce the number of required examination locations significantly while maintaining an acceptable level of quality and safety.

The licensee plans to implement the RI-ISI program by performing the examinations required under the program during the planned outages of the second inspection period of the second 10-year ISI interval. Other non-related portions of the Code requirements, as well as the ongoing augmented inspection programs at both Vogtle units, will remain unchanged. The RI-ISI program follows a previously approved methodology delineated in Reference 4.

3.0 EVALUATION

Pursuant to 10 CFR 50.55a(a)(3), the NRC staff has reviewed and evaluated the licensee's proposed RI-ISI program, including those portions related to the applicable methodology and processes contained in Reference 4, based on guidance and acceptance criteria provided in Regulatory Guides (RGs) 1.174 (Reference 5) and 1.178 (Reference 6) and in Standard Review Plan (SRP) Chapter 3.9.8 (Ref. 7).

3.1 Proposed Changes to the ISI Program

The scope of the licensee's proposed RI-ISI program is limited to ASME Class 1 and Class 2 piping only, consisting of Category B-F and B-J welds, and Class 2 piping, Categories C-F-1 and C-F-2 welds. The RI-ISI program was proposed as an alternative to the existing ISI program that is based on the requirements of the Code. A general description of the proposed changes to the ISI program was provided in Sections 3 and 5 of the initial licensee's submittal. In Tables 5-1a and 5-1b of Reference 1, a comparison of inspection location selection between the current ISI program and the proposed RI-ISI program is provided. In Reference 2, the licensee reclassified one chemical and volume control system segment in each unit from Structural Element Selection Matrix Region two to Region one. This minor change does not affect the RI-ISI program inspection number or locations and modified Tables 5-1a and 5-1b were not, and need not be, submitted. The NRC staff finds that the information submitted adequately defines the proposed changes resulting from the RI-ISI program.

3.2 Engineering Analysis

In accordance with the guidance provided in RGs 1.174 and 1.178, the licensee provided the results of an engineering analysis of the proposed changes, using a combination of traditional engineering analysis and PRA. The licensee stated that the results of the engineering analysis demonstrate that the proposed changes are consistent with the principle of defense-in-depth.

This is accomplished by evaluating a location's susceptibility to each potential degradation mechanism that may be a precursor to leak or rupture and then performing an independent assessment of the consequence of a failure at that location. No changes to the evaluation of design basis accidents in the final safety analysis report are being made by the RI-ISI process. Therefore, sufficient safety margins will be maintained.

The licensee stated that the applicable aspects of the ASME Code not affected by the proposed alternative RI-ISI program and the ongoing augmented inspection programs will be retained. This is consistent with the approved WCAP-14572, Revision 1-NP-A; therefore, it is acceptable. WCAP-14572, Revision 1-NP-A states, in part, that the SRRA computer models are to be used to estimate the failure probabilities of the structural elements in each of the piping segments. In Reference 1, the licensee stated that the failure probabilities for VEGP piping segments were all derived using the SRRA software program where the SRRA program was applicable. Piping failure mechanisms identified by the licensee include thermal fatigue, stress corrosion cracking, erosion/corrosion, and vibratory fatigue. The consequence of each segment break is based on the direct and indirect effects of the segment failure. These methods are consistent with the guidelines in WCAP-14572, Revision 1-NP-A, and in conformance with SRP 3.9.8.

The NRC staff reviewed the qualifications, experience, and training of the users of the SRRA code on the capabilities and limitations of the code described in Reference 1 and finds them to be adequate. The licensee stated in Reference 1 that an engineering team was established having expertise in the following areas: ISI, non-destructive examination, materials, stress analysis, and system engineering. The engineering team was trained in the failure probability assessment methodology and the Westinghouse SRRA code, including the identification of the software capabilities and limitations as described in WCAP-14572, Revision 1-NP-A. The licensee also stated that the effects of ISI of existing augmented programs were included in the risk evaluations and were used in categorizing the segments as described in the approved WCAP-14572, Revision 1-NP-A. When the SRRA code is used to calculate failure probabilities for flow accelerated corrosion (FAC), the licensee used Electric Power Research Institute's CHECKWORKS™ program and plant-specific FAC wall-thinning monitoring data to develop SRRA program input. The licensee further stated in Reference 1 that the SRRA code was used to calculate failure probabilities for the failure modes, materials, degradation mechanisms, input variables, and uncertainties it was programmed to consider as discussed in Reference 4, Supplement 1, "Westinghouse Structural Reliability and Risk Assessment (SRRA) Model for Piping Risk Informed Inservice Inspection."

The licensee reported the following two deviations from the WCAP-14572, Revision 1-NP-A, methodology: (1) the evaluation of the potential impact of parameter uncertainty, and (2) the credit taken for leak detection when calculating pipe failure probabilities. The WCAP states that an initial calculation of the risk reduction worth (RRW) using point estimate input values should be followed by a sensitivity study that assigns uncertainty to the input values. The aim of the sensitivity analysis is to investigate the potential movement of segments from low to high safety significance based on the uncertainty of quantitative inputs and the guideline values defining the low, medium and high RRW ranges. Instead of performing an uncertainty analysis as a sensitivity study, the licensee incorporated the uncertainty analysis directly into the initial calculation of the RRW values. This process also identifies the segments that might move to higher safety-significance based on the uncertainty in the inputs and, is therefore, acceptable.

WCAP-14572, Revision 1-NP-A allows credit for detecting (and isolating, repairing, or otherwise terminating a potential accident sequence) a leak in the reactor coolant system (RCS) piping before it develops into a pipe break for piping inside of containment. This credit reflects the highly developed leak detection systems used to monitor leakage from the reactor coolant piping. Detection of a leak before break is plausible for any non-RCS segment located inside the containment that interfaces with the RCS by use of radiation and sump level monitors that can detect a leak in the segment as reliably as that of an RCS leak. The licensee identified two non-RCS segments inside the containment and credited leak detection for these segments. Since the segments are subject to essentially the same leak detection capabilities as that of an RCS leak, the extension of credit for leak detection in these segments is reasonable and acceptable.

The licensee reported no other deviations from WCAP-14572, Revision 1-NP-A, however, in response to a NRC staff question, a third deviation from the WCAP methodology was identified. The failure frequency calculated by the SRRA computer code is calculated for an individual weld, i.e., a specific weld geometry, material properties, and environmental conditions. The WCAP methodology develops and uses a single-failure frequency estimate to characterize each pipe segment's likelihood of failure regardless of the number of welds within the segment. The NRC staff's approval of the use of a single segment failure frequency independent of the number of welds was based on Westinghouse's proposal that the failure frequencies obtained from the SRRA code are calculated by inputting the conditions (typically the most limited or bounding) for the entire piping segment. Essentially, the piping failure probability is a representation or characterization of the material properties and environment in the piping segment.

In Reference 2, the licensee stated that some segments included piping of multiple pipe sizes. The licensee created sub-segments based on pipe size to facilitate estimating the failure frequency using the SRRA code. Failure frequency estimates for segments made up of multiple pipe sizes were determined by performing multiple SRRA cases, one SRRA case for each sub-segment. The most limiting inputs, based on the expected degradation mechanism(s) for the individual sub-segment, were developed for each SRRA case in accordance with the guidance in the WCAP. The highest sub-segment failure probability was used to represent the segment failure probability for risk ranking and change in risk purposes. The licensee's proposed method only combines limiting inputs for each sub-segment and not for the entire segment and is, therefore, a deviation from the approved methodology.

The WCAP methodology allows, but does not require, multiple sized piping within a segment. Although emphasis is placed on defining piping segments as lengths of piping that have the same consequences caused by pipe failure, pipe size is one of the four criteria that can be used to define segments. The NRC staff has determined that there are two alternative methods to incorporate multiple pipe size segments into the analysis that comport with the approved methodology. One method would involve combining the most limiting inputs in the entire segment into a single weld and use the estimated failure frequency of that weld to represent the segment. The other method would be to divide the segment into new segments, each with similar or the same size. In Reference 3, the licensee reported the results of an evaluation of the difference in the number and locations of inspections between the methodology used by the licensee as compared to the approved methodology described above.

The licensee reported that the analysis for nine high safety significant (HSS) segments with multiple pipe sizes fully comported with the requirements for estimating a segment frequency, (i.e., that the highest sub-segment analysis was identical to combining all the most limiting inputs in the entire segment). For the two remaining HSS segments with multiple pipe sizes, the same number of examinations are selected as would have been selected if the segments were divided into multiple segments with the same pipe size.

The licensee separated each low safety significant (LSS) segment with multiple pipe sizes and multiple Section XI inspections into sub-segments based on pipe diameter for the change in risk evaluation. The change in risk analysis was performed as described in the WCAP using this new population of LSS segments. Use of the original multiple-pipe-size-segment failure frequency for each of the LSS sub-segments is conservative because the highest sub-segments' frequency was selected and, therefore, all other sub-segments' failure frequency would be the same frequency or lower. The licensee reported that all the change in risk guidelines continued to be met and no additional inspections were required.

The licensee compared the number and location of ISI inspections developed using its methodology to the number and location of ISI inspections that would have been developed using the approved methodology. In Reference 3, the licensee stated that the number and location of inspections would have been the same if the approved methodology had been used. Although, the NRC staff does not find the licensee's method to estimate the failure frequency of piping segments with multiple pipe sizes an acceptable alternative to the methodology, the NRC staff finds the proposed RI-ISI program acceptable because overall, the results (number and locations to be inspected) are consistent with the approved methodology. This acceptance does not constitute NRC staff endorsement of the licensee's method as a generally acceptable modification of the WCAP methodology. Any RI-ISI program that uses this method to estimate the failure frequency to review or adjust the safety significance of piping locations will require NRC staff review and approval of a request for relief.

3.3 Probabilistic Risk Assessment

The licensee used Revision 2C of the Vogtle Level 1 and 2 PRA models to evaluate the impacts on plant risk. Revision 2C of the PRA is dated August, 28, 2001, and estimated the core damage frequency (CDF) and large early release frequence (LERF) as 1.6E-5/year and 7.85E-8/year respectively. The individual plant examination model was submitted in December 1992, and each subsequent revision to the model has been internally reviewed and approved in accordance with applicable SNC procedures. In December 2001, a WOG peer review was conducted on Revision 2C of the PRA.

The NRC staff evaluation report for the Individual Plant Examination (IPE) dated April 15, 1996, noted that excessive removal of observed industry common cause failures (CCFs) as not being applicable to VEGP caused the CCF probabilities to be lower than general industry values. The NRC staff comments regarding CCF are similar to the WOG peer review comments and are discussed below. The NRC staff evaluation report also stated that the human reliability analysis (HRA) did not include diagnosis or calibration errors. In reference 2, SNC stated that, contrary to the NRC staff comments regarding the IPE analysis, diagnosed errors are included in the HRA analysis and provided an illustrative example. SNC further stated that calibration errors only contribute to the likelihood of simultaneous multiple failures and, although not included as separate failure events, they are included in the CCF estimates. There are often different PRA

methods that, when appropriately applied, can incorporate the required plant characteristics into the PRA models. The licensee's response indicates that diagnosis and calibration errors are incorporated into the PRA and the NRC staff finds that this incorporation is sufficient to support the assignment of segments into broad safety significance categories reflecting the relative importance of pipe segment failures on CDF and LERF for the development of a RI-ISI program.

The WOG peer review identified 13 issues that were important and necessary to address, but may be deferred until the next PRA update. In Reference 2, SNC discusses 11 of the issues and states that resolution of the issues would not significantly affect the RI-ISI conclusions. The remaining two issues are related to the CCF estimates used in the VEGP PRA that are lower than general industry values. SNC performed a sensitivity study addressing these issues related to the CCF estimates and determined that although the estimated CDF increased by approximately seven percent as a consequence of using the generally higher industry CCF values the safety significance of the segments did not change. The NRC staff finds that resolution related to the CCF values will not significantly affect the RI-ISI evaluation and the use of the current values to support the relief request is acceptable. The NRC staff did not review the PRA analysis to assess the accuracy of the quantitative estimates. Quantitative results of the PRA are used, in combination with a quantitative characterization of the pipe segment failure likelihood, to support the assignment of segments into broad safety significance categories reflecting the relative importance of pipe segment failures on CDF and LERF. Inaccuracies in the models or assumptions large enough to invalidate the broad categorizations developed to support the RI-ISI should have been identified in the licensee's or in the NRC staff's review. Minor errors or inappropriate assumptions will only affect the consequence categorization of a few segments and will not invalidate the general results or conclusions. The continuous use and maintenance of the PRA provides further opportunities to identify inaccuracies and inappropriate assumptions, if any, in the PRA models. The NRC staff finds that the quality of the PRA is sufficient to support the submittal.

The licensee reported changes in CDF and LERF and provided in the following Table:

Unit 1	Unit 2	CDF without operator action
- 3E-9/year	- 2E-9/year	CDF with operator action
No change reported	No change reported	LERF without operator action
- 1.3E-11/year	- 1E-11/year	LERF without operator action
- 6E-12/year	- 4E-12/year	

The submittal reported identical CDFs to three significant digits for the CDF "with operator action" for the Section XI and the RI-ISI programs for Units 1 and 2. Such very small numbers should not suggest a calculational precision beyond what is supported by the inherent uncertainty of the analysis methods. Rather, the numbers indicate that the revised program is essentially risk neutral. The licensee reported no deviations from the quantitative criteria and, therefore, the NRC staff concludes that the change in CDF "with operator action" is risk neutral or a very small risk decrease.

The licensee did not submit estimates for the other risk change criteria in Section 4.4.2 of WCAP-14572, Revision 1-NP-A, but stated in Reference 1 that all the change in risk

calculations were performed according to the guidance on page 213 of the WCAP-14572, Revision 1-NP-A (as applicable), and all four criteria for evaluating the results were applied. Based on the use of the approved methodology and on the reported results, the NRC staff finds that any change in risk associated with the implementation of the RI-ISI program is small and consistent with the intent of the Commission's Policy Statement (Reference 8) and, therefore, is consistent with RG 1.178.

3.4 Integrated Decisionmaking

The proposed RI-ISI program presents an integrated approach that considers, in concert, the traditional engineering analysis, the risk evaluation, and the implementation and performance monitoring of piping. This is consistent with the guidelines of RG 1.178. The selection of pipe segments to be inspected is described in References 1 and 2 using the results of the risk category rankings and other operational considerations. Tables 3.7-1 and 3.7-2 in Reference 1 identified the number of segments in the different systems that met or exceeded the quantitative criteria to be assigned HSS and LSS. Segments defined as HSS were those with a relative RRW of ≥1.005, while LSS segments had calculated RRW values of <1.005. The tables also identified the number of LSS segments that were changed to HSS by the Expert Panel and a final column indicating the total number of pipe segments classified as HSS following review by the Expert Panel. Inspection of the table indicated that in some systems, segments quantitatively classified as HSS (RRW ≥ 1.005) were subsequently changed to LSS by the Expert Panel.

The WCAP methodology provides the following guidance on the reclassification of the safety-significance of segments by the Expert Panel:

> The expert panel (such as the expert panel used for the Maintenance Rule) evaluates the risk-informed results and makes the final decision be identifying the high-safety-significant pipe segments for ISI. The piping segments that have been determined by quantitative methods to be high safety significant should not be classified lower by the expert panel without sufficient justification that is documented as part of the program. The expert panel should be focused primarily on adding piping to the higher classification.

In Reference 2, the licensee stated that ten segments in each of the Vogtle units had "nominal" values greater than 1.005 for the "without operator action" RRWs, the quantitative criteria used to classify segments as HSS. All of these pipe segments are in the chemical and volume control system (CVCS) and, with the exception of a charging pump casing drain, are located downstream of the charging pumps. Reference 2 identified several potential degradation mechanisms for the Class 1 and 2 CVCS piping. The licensee explained that four of the ten segments in each unit were changed to LSS because the calculated RRW values were slightly less then 1.005 and were originally classified as HSS because of computer "round up." The remaining six segments were reclassified by the Expert Panel as LSS.

In Reference 2, the licensee provided justification for classifying the final six segments in each unit as LSS. Failure of the segments will cause a low tank level alarm and automatic realignment to an alternative water source with sufficient water supply for a period of 24 hours during which a leak could be isolated using motor operated valves. The NRC staff finds that the justification allows an independent reviewer to reach the same conclusion and that there is

a very high probability that the operators would initiate proper action within the time that the action will be effective and is, therefore, acceptable.

The selection of pipe segments to be inspected is described in Section 3.8 of Reference 1 using the results of the risk category rankings and other operational considerations. Tables 5-1a and 5-1b of Reference 1 provide a summary table comparing the number of inspections required under the existing ASME, Section XI, ISI program at VEGP-1 and VEGP-2 with the alternative RI-ISI program. The WCAP-14572, Revision 1-NP-A, methodology includes a statistical calculation that is applied to determine the number of examinations required in the population of HSS welds, excluding susceptible locations, to satisfy certain statistical criteria. One hundred percent of susceptible locations were selected for inspection. This approach is consistent with the concept that by focusing inspections on the most safety significant welds the number of inspections can be reduced while at the same time maintaining public health and safety and, therefore, this approach is acceptable. The NRC staff finds that the licensee's selection process uses "defense-in-depth" considerations and is consistent with the WCAP-14572, Revision 1-NP-A.

The objective of ISI required by the Code is to identify service-induced conditions (i.e., flaws or other degradation) that may challenge the structural integrity of components and adversely impact plant safety. Therefore, the RI-ISI program must meet this objective to be found acceptable for use. Further, since the RI-ISI program is partially based on inspection for cause, examination element selection should target specific degradation mechanisms.

Section 4 of WCAP-14572, Revision 1-NP-A, provides guidelines for the areas and/or volumes to be inspected as well as the examination method, acceptance standard, and evaluation criteria for each degradation mechanism. Based on a review of the cited portion of WCAP-14572, Revision 1-NP-A, the NRC staff concludes that the examination methods are appropriate since they are selected based on specific degradation mechanisms, pipe sizes, and materials of concern. The licensee stated in Reference 2 that unless NRC-approved relief has been granted all requirements in Table 4.1-1 of WCAP-14572, Revision 1-NP-A, will be implemented. Further, the licensee reported no deviations in this area from the WCAP-14572, Revision 1-NP-A, methodology; therefore, it is acceptable.

3.5 Implementation and Monitoring

Implementation and performance monitoring strategies require careful consideration by the licensee and are addressed in Element 3 of RG 1.178 and SRP 3.9.8. The objective of Element 3 is to assess performance of the affected piping systems under the proposed RI-ISI program by implementing monitoring strategies that confirm the assumptions and analyses used in the development of the RI-ISI program. To approve an alternative pursuant to 10 CFR 50.55a(a)(3)(i), implementation of the RI-ISI program, including inspection scope, examination methods, and methods of evaluation of examination results, must provide an adequate level of quality and safety.

In Reference 1, the licensee stated that upon approval of the RI-ISI program, procedures that comply with the WCAP-14572, Revision 1-NP-A, guidelines will be prepared to implement and monitor the RI-ISI program. The licensee confirmed that the applicable portions of the Code not affected by the change, e.g., inspection methods, acceptance guidelines, pressure testing, corrective measures, documentation requirements, and quality control requirements, would be

retained. In addition, the licensee stated in Reference 2, that should additional examinations be performed due to the identification of an unacceptable flaw or relevant condition, these examinations would be performed in the outage where the flaws or relevant conditions were identified.

The licensee stated in Section 4 of Reference 1 that the RI-ISI program is a living program and its implementation will require feedback of new relevant information to ensure the appropriate identification of HSS piping locations. Reference 1 also stated that as a minimum, risk ranking of piping segments will be reviewed and evaluated every ISI period and that significant changes may require more frequent adjustments as directed by any NRC Bulletin or Generic Letter or by industry and plant-specific feedback. The NRC staff finds that the proposed process for RI-ISI program updates meets the guidelines of RG 1.174 that risk-informed applications should include performance monitoring and feedback provisions; therefore, the process for program updates and monitoring is acceptable.

As discussed in Section 3.2 of this safety evaluation, the NRC staff does not find the licensee's method to estimate the failure frequency of piping segments with multiple pipe sizes an acceptable alternative to the approved methodology. Any RI-ISI program that uses the results of calculations based on the unapproved method to review or adjust the safety significance of piping locations will require NRC staff's review and approval of a request for relief pursuant to 10 CFR 50.55a(a)(3)(i).

The licensee's existing second 10-year ISI program is, at present, within the second 40-month inspection period. The licensee intends to integrate the RI-ISI program into the existing Code ISI program, i.e., the RI-ISI program will supercede the Code for selection of piping welds in Categories B-F, B-J, C-F-1 and C-F-2. In Reference 2 the licensee provides an implementation schedule that includes one-third of the RI-ISI examinations to be completed by the end of the second (current) inspection period, and two-thirds of the RI-ISI examinations by the end of the current interval. The completion of approximately one-third of all examinations during each of the inspection periods is the same as existing Code requirements. To determine the selection and distribution of examination locations for the remainder of the current interval, variables such as failure mechanisms, industry and site-specific experience, inspection history, and stress were considered. The NRC staff finds the logic used for selecting the extent of examinations to be performed during the remainder of the second 10-year intervals at Vogtle, Units 1 and 2, to be consistent with ASME requirements and is, therefore, acceptable.

4.0 CONCLUSION

10 CFR 50.55a(a)(3)(i) permits alternatives to regulatory requirements when authorized by the NRC if the applicant demonstrates that the alternative provides an acceptable level of quality and safety. In this case, the licensee's proposed alternative is to use the RI-ISI process described in the NRC-approved WCAP-14572, Revision 1-NP-A. The licensee identified two deviations from the approved methodology and the NRC staff identified an additional deviation. Inclusion of the parameter uncertainty in the initial calculation of the RRW values and crediting of leak detection for several non-RCS piping segments were identified by the licensee and found acceptable by the NRC staff as discussed in 3.2. The third deviation whereby the failure frequency for segments made up of multiple pipe sizes is developed by combining limiting inputs for each different sized sub-segment and not for the entire segment is not endorsed by the NRC staff as a generally acceptable modification of the WCAP methodology. In

Reference 3, the licensee reevaluated these segments and stated that the proposed RI-ISI program would have been the same if the approved methodology had been used. Consequently, our review finds that the results of the licensee's proposed RI-ISI program is consistent with WCAP-14572, Revision 1-NP-A.

The NRC staff finds that the results of different elements of the engineering analysis are considered in an integrated decision-making process. The impact of the proposed changes in the ISI program is founded on the adequacy of the engineering analysis and acceptable estimation of changes in plant risk in accordance with RG 1.174 and RG 1.178 guidelines.

The SNC methodology also considers implementation and performance monitoring strategies. Inspection strategies ensure that failure mechanisms of concern have been addressed and there is adequate assurance of detecting damage before structural integrity is affected. The risk significance of piping segments is taken into account in defining the inspection scope for the RI-ISI program. System pressure tests and visual examination of piping structural elements will continue to be performed on all Code Class 1 and 2 systems in accordance with the ASME Code Section XI program. The RI-ISI program applies the same performance measurement strategies as existing ASME Code requirements.

The SNC risk-informed methodology provides for conducting an analysis of the proposed changes using a combination of engineering analysis with supporting insights from a PRA. Defense-in-depth and quality are not degraded in that the methodology provides reasonable assurance that any reduction in existing inspections will not lead to degraded piping performance when compared to existing performance levels. Inspections are focused on locations with active degradation mechanisms as well as selected locations that monitor the performance of system piping.

As discussed above, the NRC staff's review of the licensee's proposed RI-ISI program concludes that it is an acceptable alternative to the current ISI program for Code Class 1, Categories B-F and B-J piping welds, and for Code Class 2, Categories C-F-1 and C-F-2 piping welds. In addition, the licensee has met the applicable criteria described in SRP 3.9.8. Based on risk considerations and the criteria of the SRP, it is concluded that the licensee's proposed alternative will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the licensee's proposed RI-ISI program is authorized for the remainder of the second 10-year inspection interval at Vogtle, Units 1 and 2. This authorization does not constitute NRC approval of the licensee's method to estimate the failure frequency for segments made up of multiple pipe sizes. RI-ISI programs are living programs requiring feedback of new relevant information to ensure the appropriate identification of high safety significant piping locations. Any modification to or reevaluation of this RI-ISI program during the second 10-year ISI interval that uses the results of calculations based on the unapproved method to review or adjust the safety significance of piping locations will require NRC staff review and approval of a request for relief pursuant to 10 CFR 50.55a(a)(3)(i).

5.0 <u>REFERENCES</u>

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2. Letter, dated April 23, 2003, Jeffrey T. Glasser, (Southern Nuclear Operating Company, Inc.) to U.S. Nuclear Regulatory Commission, containing *Vogtle Electric Generating Plant, Response to Request for Additional Information Regarding Risk Informed Inservice Inspection Program Submittal.*

3. Letter, dated June 20, 2003, Jeffrey T. Glasser (Southern Nuclear Operating Company, Inc.) to U.S. Nuclear Regulatory Commission, *Vogtle Electric Generating Plant, Clarification of the Response to Request for Additional Information Regarding Risk Informed Inservice Inspection Program Submittal.*

4. WCAP-14572, Revision 1-NP-A, *Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report*, February 1999.

5. NRC Regulatory Guide 1.174, *An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis*, July 1998.

6. NRC Regulatory Guide 1.178, *An Approach for Plant-Specific Risk-Informed Decision Making: Inservice Inspection of Piping*, September 1998.

7. NRC NUREG-0800, Chapter 3.9.8, *Standard Review Plan for Trial Use for the Review of Risk-Informed Inservice Inspection of Piping*, May 1998.

8. USNRC, "Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities; Final Policy Statement," *Federal Register*, Vol. 60, p. 42622, August 16, 1995.

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