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

June 21, 2012

Mr. Kevin Walsh
Vice President, Seabrook Nuclear Plan
c/o Michael O'Keefe
Seabrook Station
NextEra Energy Seabrook, LLC
P.O. Box 300
Seabrook, NH 03874

SUBJECT: SEABROOK STATION, UNIT 1 - RELIEF FOR ALTERNATIVE 3AR-1, USE OF A RISK-INFORMED, SAFETY-BASED INSERVICE INSPECTION PROGRAM (TAC NO. ME7569)

Dear Mr. Freeman:

By letter dated November 7, 2011, as supplemented by letter dated March 8, 2012, NextEra Energy Seabrook, LLC (NextEra or licensee) submitted request for alternative 3AR-1 for the third 10-year inservice inspection (ISI) interval program at the Seabrook Station, Unit 1 (Seabrook). The licensee requested to implement a risk-informed, safety-based inservice inspection (RIS_B) program for the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code) Class 1 and Class 2 piping, Examination Categories B-F, B-J, C-F-1, and C-F-2 piping welds at Seabrook. The proposed RIS_B program is based, in part, on the ASME Code, Section XI, Code Case N-716, "Alternative Piping Classification and Examination Requirements, Section XI Division 1." The proposed alternative is applicable to Seabrook's third 10-year ISI interval which started on August 19, 2010, and ends August 18, 2020.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject request, and concludes that the proposed alternative provides an acceptable level of quality and safety. Therefore, the NRC staff authorizes the proposed alternative in accordance with paragraph 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* for Seabrook's third 10-year ISI interval. The NRC staff's approval of the licensee's RIS_B program does not constitute approval of ASME Code Case N-716.

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

The NRC staff's safety evaluation is enclosed. If you have any questions, please contact John G. Lamb at 301-415-3100 or via e-mail at John.Lamb@nrc.gov.

Sincerely,

for

Menna Khanna, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RISK-INFORMED, SAFETY-BASED INSERVICE INSPECTION PROGRAM

REQUEST FOR ALTERNATIVE 3AR-1

NEXTERA ENERGY SEABROOK, LLC

SEABROOK STATION, UNIT 1

DOCKET NO. 50-443

1.0 INTRODUCTION

By letter dated November 7, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11319A016), as supplemented by letter dated March 8, 2012 (ADAMS Accession No. ML12074A111), NextEra Energy Seabrook, LLC (NextEra or licensee), pursuant to paragraph 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR), submitted request for alternative 3AR-1. The relief request would implement a risk-informed, safety-based (RIS_B) inservice inspection (ISI) program for piping at Seabrook Station, Unit No. 1 (Seabrook), for the third 10-year ISI interval. NextEra proposed the use of the RIS_B process for the ISI of American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code) Class 1 and Class 2 piping, Examination Categories B-F, B-J, C-F-1, and C-F-2 piping welds.

NextEra requests to implement an RIS_B program based, in part, on ASME Code Case N-716, "Alternative Piping Classification and Examination Requirements, Section XI Division 1" (Code Case N-716) (Reference 1). The provisions of Code Case N-716 may be used in lieu of the requirements of IWB-2420, IWB-2430, Table IWB-2500-1 (Examination Categories B-F and B-J), IWC-2420, IWC-2430, and Table IWC-2500-1 (Examination Categories C-F-1 and C-F-2) for ISI of Class 1 or 2 piping and IWB-2200 and IWC-2200 for preservice inspection of Class 1 or 2 piping, or as additional requirements for Class 3 piping or non-class piping, for plants issued an initial operating license prior to December 31, 2000. The Code Case N-716 requirements are expected to reduce the number of inspections required but also define additional requirements for Class 3 piping or non-class piping.

Code Case N-716 has not been endorsed for generic use by the U.S. Nuclear Regulatory Commission (NRC). NextEra's relief request refers to the methodology described in Code Case N-716 instead of describing the details of the methodology in the relief request. NextEra has, however, modified the methodology described in Code Case N-716 while developing its proposed RIS_B program. When the methodology used by the licensee is accurately described in Code Case N-716, this safety evaluation (SE) refers to the details found in Code Case N-716.

Enclosure

When the methodology used by the licensee deviates or expands upon the methodology described in Code Case N-716, this SE refers to the licensee's submittals cited above. Therefore, Code Case N-716 is incorporated in this SE only as a source for some of the detailed methodology descriptions as needed, and the NRC staff is not endorsing the use of Code Case N-716.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, "except design and access provisions and preservice examination requirements" set forth in the Code to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations in 10 CFR 50.55a(g) also state that ISI of the ASME Code, Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable addenda, except where specific relief has been granted by the NRC. The objective of the ISI program, as described in Section XI of the ASME Code and applicable addenda, is to identify conditions (i.e., flaw indications) that are precursors to leaks and ruptures in the pressure boundary of these components that may impact plant safety.

The regulations also require, during the first 10-year ISI interval and during subsequent intervals, that the licensee's ISI program complies with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference into 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. Seabrook is in its third 10-year ISI interval which started on August 19, 2010.

Pursuant to 10 CFR 50.55a(g), a certain percentage of ASME Code Category B-F, B-J, C-F-1 and C-F-2 pressure retaining piping welds must receive ISI during each 10-year ISI interval. The ASME Code requires 100 percent of all B-F welds and 25 percent of all B-J welds greater than 1-inch nominal pipe size be selected for volumetric or surface examination, or both, on the basis of existing stress analyses. For Categories C-F-1 and C-F-2 piping welds, 7.5 percent of non-exempt welds are selected for volumetric or surface examination, or both. According to 10 CFR 50.55a(a)(3), the NRC may authorize alternatives to the requirements of 10 CFR 50.55a(g), if an applicant demonstrates that the proposed alternatives would provide an acceptable level of quality and safety, or that compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee has proposed to use an RIS_B program for ASME Code Class 1 and Class 2 piping (Examination Categories B-F, B-J, C-F-1 and C-F-2 piping welds), as an alternative to the ASME Code, Section XI requirements. As stated in Section 1.0 of this SE, the provisions of Code Case N-716 are expected to reduce the number of required examinations but may also define additional requirements for Class 3 piping or non-class piping. The application states that this proposed program will be substituted for the current program in accordance with 10 CFR 50.55a(a)(3)(i) by alternatively providing an acceptable level of quality and safety.

By letter dated November 7, 2011, the licensee states that Code Case N-716 is founded, in large part, on the risk-informed inservice inspection (RI-ISI) process as described in the Electric Power Research Institute (EPRI) Topical Report (TR)-112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure" (Reference 2), which was previously reviewed and approved by the NRC. The NRC staff has reviewed the development of the proposed RIS_B and RI-ISI programs using the following documents.

- Regulatory Guide 1.174 (RG 1.174), "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (Reference 3),
- Regulatory Guide 1.178 (RG 1.178), "An Approach for Plant-Specific Risk-Informed Decisionmaking - Inservice Inspection of Piping" (Reference 4), and
- Regulatory Guide 1.200 (RG 1.200), Revision 1, An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities (Reference 5).

RG 1.174 provides guidance on the use of probabilistic risk analysis (PRA) findings and risk insights in support of licensee requests for changes to a plant's licensing basis. RG 1.178 describes an RI-ISI program as one that incorporates risk insights that can focus inspections on more important locations while at the same time maintaining or improving public health and safety. RG 1.200 describes an acceptable approach for determining whether the quality of the PRA, in total or the parts that are used to support an application, is sufficient to provide confidence in the results, such that the PRA can be used in regulatory decision-making.

3.0 TECHNICAL EVALUATION

Code Case N-716 is based, in large part, on the RI-ISI process, as described in Electric Power Research Institute, Topical Report (TR)-112657 Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure (PWRMRP-05)," which was previously reviewed and approved by the NRC. In general, the licensee simplified the EPRI TR method because it does not evaluate system parts that have been generically identified as high-safety-significant (HSS), and uses screening PRA to evaluate in detail only system parts that cannot be screened out as low-safety-significant (LSS).

An acceptable RI-ISI program replaces the number and locations of nondestructive examination (NDE) inspections based on ASME Code, Section XI requirements with the number and locations of these inspections based on the RI-ISI guidelines. The proposed RIS_B program permits alternatives to the requirements of IWB-2420, IWB3-2430, and IWB-2500 (Examination Categories B-F and B-J) and IWC-2420, IWC-2430, and IWC-2500 (Examination Categories C-F-1 and C-F-2), or as additional requirements for Subsection IWD, and may be used for ISI and preservice inspection of Class 1, 2, 3, or non-class piping. All piping components, regardless of risk classification, will continue to receive ASME Code-required pressure and leak testing, as part of the current ASME Code, Section XI program.

The EPRI TR RI-ISI process includes the following steps which, when successfully applied, satisfy the guidance provided in RGs 1.174 and 1.178:

- Scope definition
- Consequence evaluation
- Degradation mechanism evaluation
- Piping segment definition
- Risk categorization
- Inspection/NDE selection
- Risk impact assessment
- Implementation monitoring and feedback

These processes result in a program 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 the protection of public health and safety. In general, the methodology in Code Case N-716 replaces a detailed evaluation of the safety significance of each pipe segment with a generic population of HSS segments, followed by a screening flooding analysis to identify any plant-specific HSS segments. The screening flooding analysis is performed in accordance with the flooding PRA approach described in Section 4.5.7 of ASME RA-Sb-2005, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," Addendum B to ASME RA-S-2002 (Reference 6, as endorsed in RG 1.200).

As described below, the acceptability of the licensee's proposed RIS_B program is evaluated by comparing the processes it has applied to develop its program with the steps from the EPRI TR process.

3.1 Scope Definition

The scope of the risk evaluation to support RIS_B program development includes ASME Code Class 1, 2, and 3 and non-class piping welds. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," (SRP) Section 3.9.8, "ASME Code Class 1, 2, and 3 Components, and Component Supports, and Core Support Structures," and RG 1.178 addresses the scope issues. The primary acceptance guideline in the SRP and RG 1.178 is that the selected scope needs to support the demonstration that any proposed increase in core damage frequency (CDF) and risk are small. The scope of Seabrook's evaluation included all piping where ASME inspections could be discontinued, providing assurance that the change in risk estimate would, as a minimum, capture the risk increase associated with implementing the RIS_B program in lieu of the ASME program. RG 1.178 identifies different groupings of plant piping that should be included in an RI-ISI program, and also clarifies that a "full-scope" risk-informed evaluation is acceptable. The scope of the RIS_B program as defined in Code Case N-716 is consistent with the definition of full-scope in RG 1.178. The licensee confirmed in letter dated November 7, 2011, that the safety significance determination based on the PRA results may include Class 3 or non-class piping. Therefore, the NRC staff concludes that the "full-scope" extent of the piping included in the RIS_B program changes satisfies the SRP and RG 1.178 guidelines and is, therefore, acceptable.

3.2 Consequence Evaluation

The methodology described in RG 1.178 and the EPRI TR divides all piping within the scope of the proposed EPRI RI-ISI program into piping segments. The consequence of each segment's failure must be estimated as a conditional core damage probability (CCDP) and conditional large early release probability (CLERP) or by using a set of tables in the EPRI TR that yield equivalent results. The consequences, coupled with the degradation mechanism, are used to determine the safety significance of the segments.

In contrast to the EPRI TR methodology, Code Case N-716 does not require that the consequence of each segment failure be estimated to determine the safety significance of piping segments. Instead, Code Case N-716 identifies portions of systems that should be generically classified as HSS at all plants. A consequence analysis is not required for system parts generically classified as HSS because there is no higher safety significance category to which the system part can be assigned and degradation mechanisms, not consequence, are used to select inspection locations in the HSS weld population. The licensee's PRA is subsequently used to search for any additional, plant-specific HSS segments that are not included in the generic HSS population.

Sections 2(a)(1) through 2(a)(4) in Code Case N-716 provide guidance that identifies the portions of systems that should be generically classified as HSS based on a review of almost 50 RI-ISI programs. These previous RI-ISI programs were all developed by considering both direct and indirect effects of piping pressure boundary failures and the different failure modes of piping. This is consistent with the guidelines for evaluating pipe failures with PRA as described in RG 1.178 and the EPRI TR. Therefore, the generic results are derived from analyses that are acceptable to the NRC staff.

Section 2(a)(5) in Code Case N-716 provides guidance that defines additional, plant-specific HSS segments that should be identified using a plant-specific PRA of pressure boundary failures. Adequate identification of plant-specific HSS segments requires the use of a technically adequate PRA, and a flooding analysis that considers both direct and indirect effects of pressure failure and the different failure modes of piping. The technical adequacy of the PRA is addressed in Section 3.7 of this SE.

Each of the licensee's consequence evaluations (the generic and the plant-specific flooding analysis) considers both direct and indirect effects of piping pressure boundary failures and the different piping failure modes to systematically use risk insights and PRA results to characterize the consequences of piping failure. This is consistent with the guidelines for evaluating pipe failures with PRA described in RG 1.178 and is, therefore, acceptable.

3.3 Degradation Mechanism Evaluation

The EPRI TR requires a determination of the susceptibility to all degradation mechanisms of every weld within the scope of the proposed program. The degradation mechanisms which should be identified are described in the EPRI TR. This information is used to support the safety significance determination for all segments, to target inspections toward the locations with damage mechanisms in the segments that require inspections, and to provide estimates of

weld failure frequencies to support the change in the risk calculation. Once a segment is placed in the LSS category, the degradation mechanisms at the welds in that segment are not used further in the development of an EPRI RI-ISI program because inspections are not required in LSS segments and the discontinued inspections in LSS segments are not included in the change in the risk estimate.

Code Case N-716 identifies a generic population of HSS welds, followed by a search for plant-specific HSS welds. Code Case N-716 requires a determination of the susceptibility to all degradation mechanisms of all welds assigned to the HSS category. The degradation mechanisms to be considered in Code Case N-716 are consistent with those identified in the EPRI TR which the NRC staff has concluded previously is a sufficiently comprehensive list of the applicable mechanisms.

In lieu of conducting a degradation mechanism evaluation for all the LSS piping, all locations were conservatively assigned to the medium-failure potential for the purpose of assigning a failure frequency to be used to calculate the change in risk. The licensee reviewed the LSS piping to verify that it was not susceptible to flow-accelerated corrosion (FAC) or water hammer which would require a higher failure frequency estimate. This results in an equal or greater estimated increase in risk from discontinued inspections because the failure frequencies would always be equal to or less than those used in the licensee's analysis if the susceptibility of all LSS welds to all degradation mechanism was determined.

The NRC staff concludes that the bounding analysis for specific welds, where inspections will be added or discontinued, is acceptable because the process fulfills the requirements for identifying locations that should be inspected (i.e., identifying plant-specific HSS segments) and develops a bounding estimate for the change in risk.

3.4 Piping Segment Definition

Previous guidance on RI-ISI, including RG 1.178 and the EPRI TR, centered on defining and using piping segments. RG 1.178 states, for example, that the analysis and definition of a piping segment must be consistent and technically sound.

The primary purpose of segments is to group welds so that consequence analyses can be done for the smaller number of segments instead of for each weld. Sections 2(a)(1) to 2(a)(4) in Code Case N-716 identify system parts (segments and groups of segments) that are generically assigned HSS without requiring a plant-specific consequence determination and any subdivision of these system parts is unnecessary. Section 2(a)(5) in Code Case N-716 uses a PRA to identify plant-specific piping that might be assigned HSS. A flooding PRA consistent with ASME RA-Sb-2005 searches for plant-specific HSS piping by first identifying zones that may be sensitive to flooding, and then evaluating the failure potential of piping in these zones. Lengths of piping whose failure impacts the same plant equipment within each zone are equivalent to piping segments. Therefore, piping segments are either not needed to reduce the number of consequence analyses required (for the generic HSS piping) or, when needed during the plant-specific analysis, the length of pipe included in the analysis is consistent with the definition of a segment in RG 1.178.

An additional purpose of piping segments in the EPRI TR is as an accounting/tracking tool. In the EPRI methodology, all parts of all systems within the selected scope of the RI-ISI program are placed in segments and the safety significance of each segment is developed. For each safety significant classification, a fixed percentage of welds within all the segments of that class are selected. Additional selection guidelines ensure that this fixed percentage of inspections is distributed throughout the segments to ensure that all damage mechanisms are targeted and all piping systems continue to be inspected. Code Case N-716 generically defines a large population of welds as HSS. An additional population of welds may be added based on the risk-informed search for plant-specific HSS segments. When complete, the Code Case N-716 process yields a well-defined population of HSS welds from which inspections must be selected accomplishing the same objective as accounting for each weld throughout the analysis by using segments. Code Case N-716 provides additional guidelines to ensure that this fixed percentage is appropriately distributed throughout the population of welds subject to inspection, all damage mechanisms are targeted, and all piping systems continue to be inspected.

The NRC staff concludes that the segment identification in RG 1.178, as used as an accounting tool, is not needed within the generic population of HSS welds. A flooding PRA, consistent with ASME RA-Sb-2005, utilizes lengths of piping consistent with the segment definition in RG 1.178 whenever a consequence evaluation is needed. Therefore, the proposed method accomplishes the same objective as the approved methods without requiring that segments be identified and defined for all piping within the scope of the RIS_B program.

3.5 Risk Categorization

Sections 2(a)(1) through 2(a)(4) in Code Case N-716 identify the portions of systems that should be generically classified as HSS, and Section 2(a)(5) requires a search for plant-specific HSS segments. Application of the guideline in Section 2(a)(5) in Code Case N-716 identifies plant-specific piping segments that are not assigned to the generic HSS category but that are risk-significant at a particular plant. Code Case N-716 requires that any segment with a total estimated CDF greater than 1E-6/year be assigned the HSS category. A review of the internal flood PRA was performed to identify any piping whose failure could cause flooding that could significantly impact safety significant components. During the review, it was determined by the licensee that the 4" and 6" diameter Fire Protection piping segments contributed to a CDF greater than 1E-06/yr due to flooding in the Control Building Stairwell. These piping segments, which supply fire water hose stations, are part of the fire protection system that runs within the Control Building and Diesel Generator Building stairwells and was designated as HSS. A pipe break in the Control Building stairwell, greater than design basis, has the potential to propagate to the essential switchgear rooms and impact essential electrical power. To mitigate this risk, the licensee installed a flow orifice upstream of the Control Building Stairwell, in the RCA Access Walkway, to limit break flow rate. The licensee finds that the flood risk will be reduced to less than 1E-6/year and that the piping segments can be removed from the RIS_B scope. The licensee has reviewed the results of its flooding analysis and did not identify any segments other than the fire protection piping segments that had a CDF greater than 1E-6/year.

In the letter dated November 7, 2011, the licensee states that the Seabrook Probabilistic Safety Assessment (PSA) model underwent a formal industry peer review in 2009 against the ASME PRA standard RA-Sb-2009 and RG 1.200 Rev 2. A self assessment was performed against the recommended modeling supporting requirements (SRs) identified in EPRI Topical Report (TR) 1021467, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs." (Reference 7) In response to the RAI and a subsequent teleconference to clarify the licensee's position, the licensee confirmed that the SRs identified in EPRI TR 1021467 will conform to the report, as amended by the NRC Staff's Safety Evaluation (Reference 8).

Findings from the peer review indicate 26 "not-met" SRs to capability category II. The vast majority of these findings are considered documentation and/or minor plant and model change or model error related and have no technical impact on the PRA model. The findings and observations in relation to Internal Flooding as well as the licensee's explanations and changes were reviewed by staff and found to be acceptable. The licensee complied with most of the resolutions to the findings and observations. Finding and Observation (F&O) 5.2 and 5.3 were both resolved by the licensee explaining that they took a more realistic and conservative approach to addressing the concerns made by the peer review. With respect to F&O 5.2, the NRC staff concurs with the licensee's resolution because the tripping of the flooding source, the CW pumps, at a more conservative flow rate than what the F&O suggests would bound any impacts an internal flood would cause. The maximum probable flood has a higher chance of propagating quickly, causing doors to fail, which would vent the water outside causing a Loss of Offsite Power (LOOP), and subsequent CW pump trip, before reaching the Essential Switchgear Room. The staff concurs with the licensee's resolution of F&O 5.3 because they assume all doors fail the same way regardless of whether or not they open into the flooding area. The staff also concurs with the licensee's realistic approach of assuming a door fails once it exceeds its capacity rather than a conservative generic "alarmed" door approach. The assumption that all doors fail open regardless of water flow path based on door capacity ensures that all potential flooding sources are accounted for. The CDF and large early release frequency (LERF) values were also found to be in acceptable range. In the letter dated March 8, 2012, the licensee affirmed that the PRA SSPSS-2011 meets or exceeds the Capability Category for the individual SRs as reflected in Reference 8. The NRC staff concurs that the licensee provided sufficient resolution for each of the outstanding SRs to verify that they do not impact the ISI application.

The NRC staff finds that the CDF and LERF metrics proposed by the licensee are acceptable because they address the risk elements that form the basis for risk-informed applications (i.e., core damage and large early release). The NRC staff accepts the proposed guideline values because these ancillary guidelines are applied in addition to the change in risk acceptance guidelines in RG 1.174, and only add plant-specific HSS segments to the RIS_B program (i.e., they may not be used to reassign any generic HSS segment into the LSS category).

The NRC staff finds that the risk categorization performed by Seabrook provides confidence that HSS segments have been identified. Sections 2(a)(1) through 2(a)(4) in Code Case N-716, which identify generic HSS portions of systems, were applied to Seabrook piping. The licensee's PRA used to fulfill the guideline in Section 2(a)(5) was performed using a PRA of adequate technical quality based on consistency between the PRA and the applicable characteristics of the NRC-endorsed industry standard.

3.6 Inspection/NDE Selection

The licensee's submittals discuss the impact of the proposed RIS_B application on the various augmented inspection programs.

A plant augmented inspection program was implemented by the licensee in response to NRC Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems." This program was updated in response to MRP-146, "Materials Reliability Program, Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines." The thermal fatigue concern addressed was explicitly considered in the application of the RIS_B process and is subsumed by the RIS_B Program.

Code Case N-716 contains no provisions for changing the FAC-augmented program developed in response to NRC Generic Letter 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning" (ADAMS Accession No. ML031470660). Seabrook's FAC program is relied upon to manage this damage mechanism but is not otherwise affected or changed by the RIS_B program.

Code Case N-770-1 will be used as an augmented inspection program for the inspection and management of primary water stress-corrosion cracking (PWSCC) susceptible dissimilar metal welds and will supplement the RI-ISI program. In the relief request (RR), the licensee stated that the susceptible dissimilar welds have been removed from the Seabrook RI-ISI program. The staff finds the removal acceptable because it satisfies the requirements of Code Case N-770-1 and the conditions imposed in 10 CFR 50.55a(g)(6)(ii)(F).

Section 3.6 of the EPRI TR addresses the selection of pipe segments for inspection. This section presents the current code requirements. It also establishes requirements for the RI-ISI program related to:

Class 1 category BJ welds
Class 1, 2, 3 piping
Piping subject to localized corrosion
Impact of augmented inspection programs on the selection of pipe segments for RI-ISI
Guidance for selecting individual welds for inspection within a group of welds
Reinspection sample size

In its RR, the licensee has chosen to base its selection of pipe segments on Code Case N-716. The code case has adopted a pipe selection procedure which differs from that in the EPRI TR. While the approach adopted by the Code Case may or may not be more conservative than that adopted by the EPRI TR, the change in risk evaluation required by the code case, and described elsewhere in this SE, mandates that the increase in risk (CDF and LERF), as compared to the current Code requirements, for any given system cannot exceed 1×10^{-7} and 1×10^{-8} per year and that the total increase in CDF and LERF may not exceed 1×10^{-6} and 1×10^{-7} per year. The staff finds the approach used in the code case and by the licensee to be acceptable because the CDF and LERF associated with the piping under consideration is generally lower and in no case is significantly greater than the risk currently accepted when the existing code requirements are used.

In addition to the information regarding the number of welds to be inspected, the EPRI TR contains information concerning additional criteria to be considered when selecting welds for inspection. The EPRI TR states that licensees should consider:

Plant-specific service history
Predicted severity of postulated damage mechanisms
Configuration/accessibility of element to enable effective examination
Radiation exposure
Stress concentration
Physical access to element

The code case also contains additional information for consideration in weld selection. This list includes:

Plant-specific cracking experience
Weld repairs
Random selection
Minimization of worker exposure

Additionally, the code case contains requirements that inspection locations be divided among the systems under consideration and that certain percentages of inspections will be conducted in specific locations. In its RR, the licensee has addressed these issues. The staff finds this acceptable because the information provided in the RR is consistent with that required by the EPRI TR and the code case.

The NRC staff reviewed the tables provided in the original RR which address degradation mechanisms, failure potential and the number of welds selected for evaluation. The NRC staff finds that the data contained in these tables is consistent with the requirements of the EPRI TR.

3.7 Risk Impact Assessment

The licensee uses a change in risk estimation process approved by the NRC staff in the EPRI TR. The change in risk assessment in the EPRI TR permits, using each segment's CCDP and CLERP or, alternatively, placing each segment into high-, medium-, or low-consequence "bins" and using a single bounding CCDP and CLERP for all segments in each consequence bin. Code Case N-716 also includes both alternatives, and the bounding values to be used in the bounding analysis are the same as those approved for use in the EPRI TR. The licensee uses the alternative of placing each segment into consequence bins and using the associated bounding values for all segments in each bin during the change in risk assessment.

In the submittal, the licensee identified the different types of pipe failures that cause major plant transients such as those causing loss-of-coolant accidents (LOCAs) and corresponding types of feedwater and steam piping breaks. Conservative CCDP estimates were based on pipe break locations. The NRC staff concludes that the scenarios described are reasonable because they are modeled in the PRA or include the appropriate equipment failure modes that cause each sequence to progress.

The licensee relied on its flooding analysis to identify the appropriate consequence bin for welds whose failure does not cause a major plant transient and for which a consequence estimate is required. As discussed above, the licensee performed its flooding analysis consistent with ASME RA-Sa-2009. Only segments with locations at which an inspection is being discontinued need to be included in the change in risk calculation so limiting the consequence evaluation to segments that are inspected is acceptable.

Section 5 in Code Case N-716 requires that any piping that has NDE inspections[1] added or removed per Code Case N-716 be included in the change in risk assessment. The licensee used nominally the upper-bound estimates for CCDP and CLERP. Acceptance criteria provided in Section 5(d) in Code Case N-716 include limits of 1E-7/year and 1E-8/year for increase in CDF and LERF for each system, and limits of 1E-6/year and 1E-7/year for the total increase in CDF and LERF associated with replacing the ASME Code, Section XI program with the RIS_B program. These guidelines and guideline values are consistent with those approved by the NRC staff in the EPRI TR and are, therefore, acceptable.

The change in risk evaluation approved in the EPRI TR method is a final screening to ensure that a licensee replacing the Section XI program with the risk-informed alternative evaluates the potential change in risk resulting from that change and implements it only upon determining with reasonable confidence that any increase in risk is small and acceptable. The licensee's method is consistent with the approved EPRI TR method with the exception that the change in risk calculation in Code Case N-716 includes the risk increase from discontinued inspection in LSS locations. CCDP and CLERP values greater than 1E-4 and 1E-5 were used for LSS welds to bound plant internal flooding study results. These values used for CCDP and CLERP were determined based on results from the plant internal flooding study and are conservatively applied as an upper bound for all LSS welds. In lieu of conducting a formal degradation mechanism evaluation for all LSS piping (e.g., thermal fatigue), these locations were conservatively assigned to the medium failure potential category for use in the change in risk assessment. The high failure potential category is not applicable since a review was conducted to ascertain LSS piping is not susceptible to FAC or water hammer. The NRC staff concludes that the licensee's method described in the submittal is acceptable because the deviation from the approved EPRI TR method expands the scope of the calculated change in risk.

The licensee provided the results of the change in risk calculations in the submittal and noted that most of the results indicate a small and acceptable increase in risk and that all the estimates satisfy both the system level and the total guidelines. Therefore, the NRC staff finds the change in risk acceptable for this application.

---

[1]Code Case N-716 requires no estimated risk increase for discontinuing surface examinations at locations that are not susceptible to outside diameter attack [e.g., external chloride stress-corrosion cracking]. The NRC staff determined during the review and approval of the EPRI TR that the surface exams do not appreciably contribute to safety and need not be included in the change in risk quantification and, therefore, exclusion of surface examinations from the change in risk evaluations is acceptable.

3.8 Implementation Monitoring and Feedback

The objective of this element of RG 1.174 and RG 1.178 is to assess performance of the affected piping systems under the proposed RI-ISI program by implementing monitoring strategies that conform to the assumptions and analysis used in developing the RIS_B program. In letter dated November 7, 2011, the licensee states that upon approval of the RIS_B program, procedures that comply with the guidelines described in Code Case N-716 will be prepared to implement and monitor the program.

The list of possible changes include: 1) all changes at the facility or in the PRA that could affect the evaluation used to develop the RIS_B program; and 2) performing the reevaluation every ISI period coinciding with the inspection periods in the ASME Section XI inspection program requirements. The NRC staff concludes that the proposed procedures are consistent with the performance monitoring guidelines described in RG 1.178 and are, therefore, acceptable.

3.9 Examination Methods

In accordance with Code Case N-716, LSS welds will be exempt from the volumetric, surface, VT-1 and VT-3 visual examination requirements of ASME Code, Section XI. Ten percent of the HSS welds will be selected for examination as addressed in Section 3.6 of this SE. Section 4 of Code Case N-716 directs users to Table 1 for the examination requirements of the welds selected for examination. The examination method is based on the postulated degradation for the selected weld. In addition, the Code Case N-716 methodology provides for increased inspection volumes for those locations that are included in the NDE portion of the program. Table 1 of Code Case N-716 is consistent with the traditional RI-ISI approach for examination methods as approved in EPRI TR-112657. The examination methods are based on an inspection-for-cause philosophy so that when there is a potential for a certain degradation mechanism, the examination method selected would be one that would be able to detect that type of degradation. This is consistent with the guidelines for inspection strategies described in SRP 3.9.8 and is, therefore, acceptable.

4.0 REGULATORY COMMITMENTS

In the letter dated November 7, 2011, the licensee made the following commitment:

> NextEra internal flood risk assessment SSPSS-2011 identified that 4" and 6" diameter Fire Protection piping segments located in the Control Building stairwell contributed greater than 1 E-06/yr to the core damage frequency. Therefore, NextEra is committing to a prudent risk management measure to reduce the Fire Protection flooding risk in the Control Building. The modification will limit the postulated maximum fire protection break flow rate in the Control Building, and thus reduce the flood risk from the Fire Protection pipe segments to less than 1E-06/yr. These fire protection piping segments are, therefore, not included in the RIS_B scope. This modification will be completed prior to implementation of risk-informed inservice inspections.

As discussed in Section 4 of the submittal, and Section 3.8 of this SE, the RIS_B program is a living program. Changes to the facility or to the PRA are expected to occur and the licensees periodically review these changes to ensure the appropriate identification of HSS piping locations. The NRC staff agrees that a modification to limit the postulated maximum fire protection break flow rate is a prudent risk management measure. The licensee's commitment management program provides sufficient control over the related commitment to perform this modification.

5.0 CONCLUSION

Pursuant to 10 CFR 50.55a(a)(3)(i), alternatives to the requirements of 10 CFR 50.55a(g) may be used, when authorized by the NRC, if the licensee demonstrates that the proposed alternatives will provide an acceptable level of quality and safety. In this case, the licensee proposed to use an alternative to the risk-informed process described in Code Case N-716 which is based, in large part, on NRC-approved EPRI TR-112657. The implementation strategy is consistent with the EPRI TR guidelines because the number and location of inspections is a product of a systematic application of the risk-informed process. Other aspects of the licensee's ISI program, such as system pressure tests and visual examination of piping structural elements, will continue to be performed on all Class 1, 2, and 3 systems in accordance with ASME Code, Section XI. This provides a measure of continued monitoring of areas that are being eliminated from the NDE portion of the ISI program. As required by the EPRI TR methodology, the existing ASME Code performance measurement strategies will remain in place. In addition, the Code Case N-716 methodology provides for increased inspection volumes for those locations that are included in the NDE portion of the program.

RG 1.174 establishes guidelines for risk-informed decisions involving a change to a plant's licensing basis. RG 1.178 establishes guidelines for risk-informed decisions involving alternatives to the ISI program requirements of 10 CFR 50.55a(g), and its directive to follow the requirements of the ASME Code, Section XI. The EPRI TR methodology contains details for developing an acceptable RI-ISI program. Code Case N-716, modified as described by the licensee in its submittals, describes a methodology similar to the EPRI TR methodology but with several differences as described above in this SE. The NRC staff has evaluated each of the differences and determined that the licensee's proposed methodology, when applied as described, meets the intent of all the steps endorsed in the EPRI TR, is consistent with the guidance provided in RG 1.178, and satisfies the guidelines established in RG 1.174.

The NRC staff concludes that the licensee's proposed RIS_B program will provide an acceptable level of quality and safety pursuant to 10 CFR 50.55a(a)(3)(i) for the proposed alternative to the piping ISI requirements with regard to (1) the number of locations, (2) the locations of inspections, and (3) the methods of inspection. Therefore, the proposed RI-ISI program is authorized for the third 10-year ISI inspection interval, which started on August 19, 2010, and ends August 18, 2020, pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that this alternative will provide an acceptable level of quality and safety.

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

6.0 REFERENCES

1. ASME Code Case N-716, Alternative Piping Classification and Examination Requirements, Section XI Division 1, ASME Code, New York, New York, April 19, 2006.

2. EPRI TR-112657 Revision B-A, Revised Risk-Informed Inservice Inspection Evaluation Procedure, December 1999 (ML013470102).

3. RG 1.174, An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis, November 2002 (ADAMS Accession No. ML02320437).

4. RG 1.178, An Approach for Plant-Specific Risk-Informed Decision making for Inservice Inspection of Piping, September 2003 (ADAMS Accession No. ML032510128).

5. RG 1.200, An Approach for Determining The Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities, January 2007 (ADAMS Accession No. ML070240001).

6. ASME RA-Sb-2005, Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications, Addendum B to ASME RA-S-2002, ASME Code, New York, New York, December 30,2005.

7. EPRI TR 1021467, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs," July 2011.

8. Nelson, Robert A., "Safety Evaluation by the Office of Nuclear Reactor Regulation and the Office of New Reactors for the Electric Power Research Institute Topical Report 1021467, Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed Inservice Inspection Programs, Project No. 669" (ADAMS Accession Number ML11325A375).

Principal Contributors: Jonathon Evans
Jigar Patel
Margaret Audrain

Date: June 21, 2012

The NRC staff's safety evaluation is enclosed. If you have any questions, please contact John G. Lamb at 301-415-3100 or via e-mail at John.Lamb@nrc.gov.

Sincerely,

/RA by Rick Ennis for/

Meena Khanna, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

DISTRIBUTION:
PUBLIC
LPLI-2 r/f
RidsAcrsAcnw_MailCTR Resource
RidsNrrDeEpnb Resource
RidsNrrDorlDpr Resource
RidsNrrDorlLplI-2 Resource
RidsNrrDraApla Resource
RidsNrrLAABaxter Resource
RidsNrrPMSeabrook Resource
RidsOgcRp Resource
RidsRgn1MailCenter Resource
MMcCoppin, EDO RI
MAudrain, NRR/DE/EPNB
JPatel, NRR/DRA/APLA

ADAMS Accession No. ML121320552 *via memorandum **via email

OFFICE	NRR/LPLI-2/PM	NRR/LPLI-2/LA	NRR/DE/EPNB/BC	NRR/DRA/APLA/BC	NRR/LPLI-2/BC
NAME	JLamb	ABaxter **	TLupold (JTsao for)*	DHarrison(BBeasley for)**	MKhanna (REnnis for)
DATE	6/21/12	06/20/12	05/18/12	06/14/12	6/21/12

OFFICIAL AGENCY RECORD