April 25, 2003

Mr. J. A. Stall
Senior Vice President, Nuclear and
Chief Nuclear Officer
Florida Power and Light Company
P.O. Box 14000
Juno Beach, Florida 33408-0420

SUBJECT: SAINT LUCIE NUCLEAR PLANT, UNIT 2 - EVALUATION OF RELIEF REQUEST 29 CONCERNING RISK-INFORMED INSERVICE INSPECTION (TAC NO. MB5698)

Dear Mr. Stall:

By letter dated July 23, 2002, as supplemented by letters dated January 16, 2003, and March 26, 2003, Florida Power & Light Company (FPL) submitted Relief Request 29, "Risk-informed Inservice Inspection Program" for implementation during the third inspection period of the second 10-year inspection interval of St. Lucie, Unit 2.

The proposed Risk-Informed Inservice Inspection (RI-ISI) program, developed in accordance with Westinghouse Owners Group Topical Report WCAP-14572, Revision 1-NP-A, is an alternative to the current American Society of Mechanical Engineers (ASME) Section XI inservice inspection program and is applicable to Class 1 piping at St. Lucie, Unit 2.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the relief request. Based on the information provided by FPL, the NRC staff concludes that the licensee's proposed RI-ISI program is an acceptable alternative to the requirements of the ASME Code, Section XI for inservice inspection of Code Class 1 piping, Categories B-F and B-J welds. Therefore, FPL's request for relief is authorized for the second 10-year inspection interval pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.55a(a)(3)(i) on the basis that the proposed alternative provides an acceptable level of quality and safety. The enclosure contains the staff's evaluation.

Sincerely,

/RA by BMozafari for/

Allen G. Howe, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-389

Enclosure: As stated

cc: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION PROGRAM

RELIEF REQUEST NO. 29

FLORIDA POWER AND LIGHT

SAINT LUCIE NUCLEAR PLANT, UNIT 2

DOCKET NO. 50-389

1.0 INTRODUCTION

In a submittal dated July 23, 2002 (Reference 1), as supplemented January 16, 2003 (Reference 2) and March 26, 2003 (Reference 3), Florida Power and Light Company (FPL, the licensee), proposed a new program entitled "Relief Request 29 Risk-Informed Inservice Inspection (RI-ISI) Program." Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i), the licensee has proposed to implement an RI-ISI program for Class 1 piping in accordance with the provisions of Westinghouse Owners Group (WOG) Topical Report WCAP-14572, Revision 1-NP-A (the WCAP), as an alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (the Code) examination requirements for Class 1 piping system for Saint Lucie, Unit 2 (STL2).

The licensee submitted the application as a RI-ISI "template" application. The licensee requested approval of this alternative for implementation during the spring 2003, Unit 2 refueling outage. The licensee's submittal was reviewed with respect to the methodology and criteria contained in the WCAP.

2.0 REGULATORY EVALUATION

Enclosure

2.1 Applicable Requirements

Section 50.55a(g) of 10 CFR requires that inservice inspection (ISI) of the ASME Code Class 1 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). Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1 components (including supports) shall meet the 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 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.

Section 50.55a(a)(3) of 10 CFR states, in part, that alternatives to the requirements of paragraph (g) may be used, when authorized by the U.S. Nuclear Regulatory Commission (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 staff reviewed the licensee’s submittal with respect to the methodology and criteria contained in the NRC-approved WCAP. Further guidance in defining acceptable methods for implementing an RI-ISI program is also provided in Regulatory Guide (RG) 1.174, RG 1.178, and Standard Review Plan (SRP) Chapter 3.9.8.

RG 1.174 defines the following safety principles that should be met in an acceptable RI-ISI program: (1) the proposed change meets current regulations unless it is explicitly related to a requested exemption, (2) the proposed change is consistent with the defense-in-depth philosophy, (3) the proposed change maintains sufficient safety margins, (4) when proposed 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, and (5) the impact of the proposed changes should be monitored using performance measurement strategies.

In accordance with the guidance provided in RGs 1.174 and 1.178, an engineering analysis of the proposed changes is required using a combination of traditional engineering analysis and supporting insights from the probabilistic risk assessment (PRA). The WCAP provides a discussion on how the results of the engineering analysis demonstrate that the proposed changes are consistent with the principles of defense-in-depth. This is accomplished by performing an evaluation to determine susceptibility of components (i.e., a weld on a pipe) to a particular degradation mechanism that may be a precursor to a leak or rupture, and then performing an independent assessment of the consequence of a failure at that location.

Saint Lucie, Unit 2, is currently in the second 10-year inspection interval that started on August 8, 1993, and ends on August 7, 2003.

3.0 TECHNICAL EVALUATION

3.1.1 Component Identification

Saint Lucie, Unit 2, ASME Code, Section XI, requirements for Code Class 1, Categories B-F and B-J welds.

3.1.2 Code Requirements for which Relief is Requested

The current ISI requirements, for Class 1 piping, are contained in the 1989 Edition of Section XI, Division 1 of the ASME Code. The licensee is currently required to perform ISI of ASME Code Category B-F and B-J piping welds during successive 120-month (10-year) intervals. Currently all B-F welds and 25 percent of Category B-J welds are selected for volumetric and/or surface examination based on existing stress analyses and cumulative usage factors. Piping exempted from volumetric and surface examination are excluded from this requirement.

3.1.3 Licensee's Proposed Alternative to Code

The licensee has developed an RI-ISI program in accordance with the WCAP, which was previously reviewed and approved by the NRC staff in a letter dated December 15, 1998. The proposed program is required to maintain the fundamental requirements of the Code, such as the examination technique, examination frequency and acceptance criteria. However, the number of required examination locations is reduced significantly, but remains capable of demonstrating that an acceptable level of quality and safety is maintained. Thus, the proposed alternative approach is based on the conclusion that it provides an acceptable level of quality and safety and, therefore, is in conformance with 10 CFR 50.55a(a)(3)(i).

The licensee proposed to implement the NRC staff approved RI-ISI methodology delineated in WCAP with three deviations. One deviation is that the Westinghouse Structural Reliability and Risk Assessment (SRRA) computer code was not used to calculate the failure rates. The second deviation involves the guidelines used to determine the number of locations to inspect in high safety significant (HSS) segments. The third deviation is that one pipe failure size was used instead of three different failure sizes.

Consistent with the WCAP, the number and locations of inspection based on the ASME guidelines will be replaced by the number and locations of inspection based on the RI-ISI guidelines from the WCAP. As illustrated in Table 5-1 of the submittal, the current Code selects a total of 86 non-destructive examinations while the proposed RI-ISI program selects a total of 23 non-destructive examinations. The surface examinations required by the ASME code will be discontinued while system pressure tests and VT-2 visual examinations shall continue. These results are 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 protection of public health and safety.

The Code guidelines requiring a fixed number of additional examinations after finding an unacceptable flaw will be modified. In the RI-ISI program, an evaluation will be made to determine whether other elements are subject to the same root cause and degradation mechanism. Additional examinations will be performed on these elements up to a number equivalent to the number of elements initially required to be inspected on the segment or segments. If unacceptable flaws or relevant conditions are again found similar to the initial problem, the remaining elements identified as susceptible will be examined. No additional examinations will be performed if there are no additional elements identified as susceptible to the same service-related root cause conditions or degradation mechanism. Sample expansions will be completed within the outage that the flaw or relevant condition was identified.

3.1.4 Licensee's Basis for Relief

In the approved WCAP, piping systems are divided into segments, with the segment boundaries selected according to failure consequences. Section 3 of the submittal stated that the as-operated piping and instrumentation diagrams were used to define the segments. In accordance with the WCAP methodology, the licensee reviewed the failure history of piping systems at STL2 and industry experience to analyze each system for parameters indicative of particular degradation mechanisms.

The consequences of the postulated pipe segment failures considered include both direct effects and indirect effects of each segment's failure. The licensee stated that a review of the St. Lucie Updated Final Safety Analysis Report Amendment No. 13 and the plant Individual Plant Exam (IPE) was performed to determine the potential impact of the indirect effects of pipe leak or rupture inside containment. All Class 1 piping is inside containment. The licensee concluded that the containment structure and the safety-related components inside containment are adequately protected from pipe failures such that the effects of a failure are limited to direct effects.

In the proposed RI-ISI program, estimates of failure potential for piping were determined using the computer code WinPRAISE which utilizes 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 PRA, a safety ranking of piping segments was established for determination of new inspection locations.

3.1.5 Evaluation

3.1.5.1 Method of Staff Review

The 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 core damage frequency (CDF) and large early release frequency (LERF) and to provide an illustrative estimate of the change in risk. Inaccuracies in the models or assumptions large enough to invalidate the analyses developed to support RI-ISI should have been identified in the licensee's or the staff's reviews. 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 NRC staff finds that the licensee systematically evaluated the identified weakness and determined that they did not significantly affect the results and the conclusions of the RI-ISI evaluation and, therefore, the quality of the STL2, PRA is sufficient to support this submittal.

3.1.5.2 Number of Examinations

The implementation of an RI-ISI program for piping would ideally be initiated at the start of a plant's 10-year ISI interval consistent with the requirements of the Code in accordance with 10 CFR 50.55a. However, the implementation may begin at any point in an existing interval as long as the examinations are scheduled and distributed to be consistent with the Code requirements (e.g., the minimum percentage of examinations completed at the end of each of the three inspection periods under the Code Program B should be 16 percent, 50 percent, and 100 percent, respectively, and the maximum examinations credited at the end of the respective periods should be 34 percent, 67 percent, and 100 percent). In the submittal, the licensee stated that the ASME Code minimum and maximum inspection requirements would be met. In Reference 3, the licensee stated that 68 percent of the examinations under the Code had been performed by the end of the second inspection period and it is further stated in the submittal that 34 percent of the welds would be credited during the third inspection period from the risk-informed population of B-F and B-J categories. The NRC staff finds that the STL2, RI-ISI program meets the Code requirements in regard to the percentages of minimum and maximum examinations during inspection periods and for the interval.

3.1.5.2 Probabilistic Risk Assessment

The licensee used the February 1999 version of its Level 1 PRA model and the May 2001 version of its Level 2 PRA to support this RI-ISI submittal. The base CDF from its February 1999 PRA is 1.25E-5 per year (/yr) and the base LERF from its May 2001 PRA is 6.00E-6/yr.

The licensee stated in Reference 3 that the PRA used to develop its RI-ISI program was based on the St. Lucie, Unit 1 and 2, IPE, dated December 9, 1993. The St. Lucie IPE reported an estimated CDF of 2.6E-5/yr for Unit 2. The staff evaluation report on the IPE, issued in July 1997, stated that “the staff identified weaknesses in the front-end, human reliability analysis (HRA) and back-end portions of the IPE which, we believe, limit its future usefulness.” The weaknesses identified by the staff included use of some relatively low initiating event frequencies, use of some generic initiating event frequencies in lieu of plant-specific frequencies, lack of clarity as to whether time was considered in certain postinitiator human actions, use of generic values for quantifying time-dependent human actions, lack of detail in the analysis of preinitiator human actions, and use of a very high probability of in-vessel recovery due to ex-vessel cooling.

The Combustion Engineering Owners Group peer review of the St. Lucie PRA was conducted the week of May 20, 2002, although the report had not been finalized by the Reference 2 response dated January 16, 2003. The licensee stated that the preliminary results included a number of facts and observations that related only to documentation or to scenarios that are not relevant to the RI-ISI submittal. The facts and observations relevant to the RI-ISI submittal are similar to the weaknesses identified in the NRC staffs review. All the issues are addressed in Reference 2 as discussed below.

In Reference 2, the licensee stated that they requantified the loss-of-coolant accident (LOCA) initiating event frequencies, developed initiating event fault trees for loss of component cooling water, loss of intake cooling water, loss of turbine cooling water, loss of DC bus, and loss of instrument air, and used plant specific data for other initiating events where available. The licensee further stated that potentially significant time-dependent human actions were requantified in a sensitivity study to include the time dependence and plant specific factors. The revised initiating event frequencies and requantified human error probabilities were used to requantify the change in CDF and conditional core damage probability (CCDP) values used to derive the relative risk of each segment. The licensee stated that there is no significant difference between the change in CDF and CCDP sensitivity study values compared to the change in CDF and CCDP values used to develop its RI-ISI program. The licensee also stated that the revised Level 2 analysis indicates that the conditional containment failure probability leading to a large early release for sequences caused by Class 1 piping failures is less than 1 percent. Therefore, the LERF estimate is always a factor of 100 smaller than the CDF. As presented in Criterion 3 on page 213 of the WCAP, the LERF guideline is a factor of 10 smaller than the CDF guideline. Thus, the CDF guideline will be more limiting and the licensee’s sensitivity study did not need to extend to large early release.

The licensee stated that the dominant preinitiator actions involved in the scenarios used to support the RI-ISI submittal were identified. The licensee reports that the effect of changing the preinitiator values on these scenarios would be minor and, thus, the use of unrefined preinitiator values does not have a significant impact on the RI-ISI application. The licensee also stated that, for Class 1 piping failures, the conservatism in the early failure containment failure mechanisms (direct containment heating, steam explosion, and vessel ejection) outweighs the risk impact of variations in the probability used for in-vessel recovery.

The licensee stated in the submittal that the changes in risk calculations were performed according to the guidance provided on page 213 of the WCAP. Table 3.10-1 of the submittal presents a comparison of CDF and LERF for the current Code ISI programs and RI-ISI programs. Inspection of Table 3.10-1 of the submittal indicates that, because of a small increase in risk in the Chemical and Volume Control (CH) system, there is a very slight increase in risk when replacing the current RI-ISI program. This appeared to be a deviation from the WCAP's criteria of risk neutral or a risk reduction; however the licensee stated that the estimated risk increase shown in Table 3.10-1 of the submittal was an error. The licensee stated that the single segment that resulted in the risk increase in the CH system was comprised only of socket welds. Since VT-2 visual examinations are scheduled in accordance with the plant's pressure test program, the proposed examinations in the CH system remain unaffected by the RI-ISI program. The licensee updated Table 3.10-1 of its resubmittal to reflect that there is no change in risk between the current Code program and the RI-ISI program.

Criterion 2 on page 213 of the WCAP, states than any system that contributes greater than 10 percent of the total risk for RI-ISI should be examined when the overall risk has not changed. Table 3.10-1 of the submittal shows that the Reactor Coolant (RC) system contributes greater that 10 percent of the total risk for RI-ISI and the table also shows that the overall risk has not changed. The licensee stated in Reference 2 that during RI-ISI program development, the Expert Panel re-evaluated the RC system and added both of the segments with 1.005>Risk Reduction Worth>1.001 to the initial list of HSS segments. Although addition of these segments did not reduce the estimated risk in the RC system or reduce the estimated overall risk, the addition does satisfy the WCAP criteria that dominant system contributors should be re-evaluated in an attempt to identify additional examination locations. The licensee further stated that selection of additional elements would also not contribute to a reduction in estimate risk.

The STL2 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 confidence 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.

Based on the use of the approved methodology and on the reported results, the staff finds that any change in risk associated with the implementation of the RI-ISI program is small. The small change in risk is consistent with RG 1.178 and the intent of the Commission's Policy Statement. Therefore the NRC finds the risk associated with this alternative acceptable.

3.1.5.3 Integrated Decision Making

As described in the STL2 submittal, an integrated approach is utilized in defining the proposed RI-ISI program by considering in concert the traditional engineering analysis, risk evaluation, and the implementation and performance monitoring of piping under the program. This is consistent with the guidelines of RG 1.178.

The WCAP describes targeted examination volumes (typically associated with welds) and methods of examination based on the type(s) of degradation expected. The NRC staff has reviewed these guidelines and has determined that, if implemented as described, the RI-ISI examinations should result in improved discovery of service-related discontinuities over that currently provided by the Code.

The objective of ISI required by the Code is to identify conditions (i.e., flaw indications) that are precursors to leaks and ruptures in the pressure boundary that may 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 based on inspection for cause, element selection should target specific degradation mechanisms.

Section 4 of the WCAP provides guidelines for the areas and/or volumes to be inspected as well as the examination method, acceptance standard, and evaluation standard for each degradation mechanism. Based on a review of the cited portion of the WCAP, 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 reported no deviations in this area from the WCAP methodology and, therefore, its evaluation is acceptable.

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.

3.1.5.4 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. In accordance with 10 CFR 50.55a(a)(3)(i), the implementation of the RI-ISI program, including inspection scope, examination methods, and methods of evaluation of examination results, must demonstrate an acceptable level of quality and safety.

The licensee considered 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.

The RI-ISI program applies the same performance measurement strategies as existing ASME Code requirements. In Reference 3, the licensee stated that upon approval of the RI-ISI program, procedures that comply with the WCAP guidelines will be prepared to implement and monitor the RI-ISI program. The licensee confirmed that the applicable portions of the Code that are not affected by the change, such as inspection methods, acceptance criteria, corrective measures, documentation requirements, and quality control requirements would be retained. Additionally, 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 the Code.

The licensee stated in Section 4 of Reference 3 that the RI-ISI program is a living program and its implementation will require feedback of new relevant information to ensure appropriate identification of HSS piping locations. Reference 3 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 plant-specific feedback. The licensee stated that the RI-ISI program will be resubmitted to the NRC prior to the end of the 10-year interval if industry experience determines that there is a need for significant revision to the program as described in the original submittal for that interval.

The submittal stated that the RI-ISI program for piping would be updated and resubmitted in conjunction with the update to existing ISI program at the expiration of the current 10-year interval and during periodic 10-year updates. Reference 3 further stated the following circumstances that would require revision of the program and obtaining NRC approval:

- Changing from one methodology to another,
- Changing scope of application,
- Plant-specific impact of revised methodology or safety evaluations,
- ASME Section XI 10-year update,
- Changes that impact the basis for NRC approval in FPL STL2, specific Safety Evaluation, and
- Industry experience determines that there is a need for significant revision to the program as described in the original submittal for that interval.

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 is acceptable. The proposed periodic reporting requirements meet existing ASME Code requirements and applicable regulations and, therefore, are considered acceptable.

3.1.5.5 Deviations from the WCAP Methodology

The licensee noted that its submittal deviated from the approved WCAP methodology in the determination of failure probabilities for the pipe segments. The WCAP methodology uses the Westinghouse SRRA computer code to calculate failure rates. The first deviation is that FPL uses the computer code WinPRAISE to calculate failure rates instead of the SRRA code. The original version of this code (pc-PRAISE), a probabilistic fracture mechanics computer code for piping reliability analysis, was developed for the NRC. WinPRAISE is a Windows version of pc-PRAISE. In the Safety Evaluation on the RI-ISI program for Browns Ferry Nuclear Plant, Unit 3 (Reference 8), the staff and its consultant reviewed the documentation and calculations related to the determination of failure frequencies for piping segments using the WinPRAISE code. The NRC staff found that, on the whole, the methods used to estimate failure frequencies were consistent with those described in the WOG Topical Report. The WinPRAISE and SRRA codes are based on similar methods and have been shown in past studies to predict similar values of failure probabilities if input parameters are assigned the same values for each code.

Probabilistic fracture mechanics calculations do not give exact values of failure probabilities, but rather are subject to many uncertainties associated with uncertain inputs to the calculations as well as uncertainties in the fracture mechanics models themselves. However, the frequencies developed from the application of the WinPRAISE Code have similar characteristics to those developed from SRRA. As noted in Reference 8, the NRC staff has found that the frequencies developed from SRRA are adequate for use in RI-ISI methodology. The output of the WinPRAISE code is best described as a quantitative estimate illustrating the susceptibility of a pipe segment to failure as determined by the weld material and environmental conditions within the segment. In light of the magnitude of uncertainties, the NRC staff believes that the output of the WinPRAISE code may better be recognized as providing relative values of susceptibility of piping segments to failure. The NRC staff finds that the definition of susceptibility of piping segments to failure is an appropriate characterization of the WinPRAISE output. The estimate of failure probability is a reasonable indication of the relative material and environmental properties of each segment such that, subject to final review and approval of the weld selection process and results by an expert panel, the estimates are acceptable for use to support a RI-ISI change request.

The second deviation involves the guidelines and method to determine the number of inspection locations. In the WCAP methodology, the Structural Element Selection Matrix shown in Figure 3.7-1 of the WCAP guides the method used to determine the number of inspection locations. Piping segments placed in Region 1 and Region 2 are considered high safety significant segments. One hundred percent of elements in Region 1 (A) are selected for inspection, and a statistical evaluation process is used to select elements in Region 1(B) and Region 2. If the statistical evaluation process requires less than one inspection location, the WCAP methodology requires a minimum of one location to be selected. Components placed in Region 3 and Region 4 are considered low safety significant and placed in an owner-defined program. VT-2 visual examinations are scheduled in accordance with the plant's pressure test program and are continued to be required for Region 1, 2, 3, and 4 piping components as part of the current ASME Section XI program. At FPL, 25 percent of the elements in Region 1 and Region 2 of the Structural Element Selection Matrix are selected for inspection. The licensee stated in section 3.8 of Reference 3 that this selection method resulted in the selection of 27.7 percent of the total population of elements in the high safety significant segments for inspection.

The licensee stated that 205 piping segments were evaluated in the RI-ISI program: Region 1(B) contains 9 segments, Region 2 contains 2 segments, Region 3 contains no segments, and Region 4 contains 194 segments. In Reference 3, the licensee stated that no segments were placed into Region 1(A) of the Structural Element Selection Matrix since FPL did not identify any active degradation mechanisms. Placement into this region requires the presence of an active degradation mechanism such as excessive thermal fatigue, corrosion cracking, primary water stress corrosion cracking, intergranular stress corrosion cracking, microbiological influenced corrosion, erosion-cavitation, high vibratory loadings on small diameter piping, and flow-accelerated corrosion, as described in section 3.7.1 of the WCAP. The licensee stated that since none of the segments considered to be HSS were subject to any of the listed mechanisms, no segments were placed in Region 1(A). Consequently, there was no population of welds that required 100 percent inspection.

The statistical sampling method is used to determine the number of inspection locations where no active or potential degradation mechanisms are postulated. These locations tend to have low failure frequencies and, in general, very few or no locations need be inspected to meet the statistical criteria. If the results of the statistical sample method require the selection of no locations, the WCAP methodology requires that at least one location be selected. Experience from previous RI-ISI submittals indicates that, almost always, no inspections are required using the statistical sample method and, therefore, one inspection is assigned according to the WCAP methodology. Because there are no locations requiring 100 percent inspection at STL2, and the statistical sampling almost always requires one inspection, the use of the 25 percent sampling criteria is expected to require more inspections than applications of the WCAP methodology and is, therefore, conservative and acceptable.

The third deviation involves the use of one pipe failure size instead of three pipe failure sizes. The WCAP methodology requires that a range of piping failure modes be used (i.e., small leaks, disabling leak, or rupture). The WCAP methodology further defines which consequential failure effects can be expected for each failure mode. The STL2, RI-ISI methodology deviates from the WCAP methodology in that it only evaluates one leak size (i.e., large leak). The licensee states that WinPRAISE requires the input of a specific leak rate to calculate the frequency of a break large enough to result in that leak rate. For those segments where failure would result in a LOCA, a leak rate equal to the Technical Specification limit for leakage inside containment was used as the input leak rate. For loss of a mitigating system, a leak rate equal to 10 percent of required system flow was used as the input leak rate. The consequences of pipe rupture are conservatively used together with the frequency of smaller pipe failures which are more likely than a full rupture. The NRC staff believes that the current state-of-the-art in both pipe failure modeling and in consequential failure effects determination, while sufficient to support RI-ISI applications, is not precise enough to clearly require a more detailed failure mode evaluation. The NRC staff recognized this lack of precision when it developed RG 1.178 and SRP 3.9.8, which allow for the use of a single pipe break size. The STL2, evaluation is consistent with RG 1.178 and SRP 3.9.8 and is an acceptable deviation from the WCAP methodology.

The licensee proposed to implement the staff approved RI-ISI methodology delineated in the WCAP with three deviations. One deviation is that the SRRA code was not used to calculate the failure rates. The second deviation involves the guidelines used to determine the number of locations to inspect in HSS segments. The third deviation is that one pipe failure size was used instead of three different failure sizes. Based on the above the NRC staff finds the three deviations from the WCAP acceptable. The NRC staff concludes that the licensee's proposed RI-ISI program, as described in the submittal, will provide an acceptable level of quality and safety with regard to the number of inspections, locations of inspections, and methods of inspection.

4.0 CONCLUSIONS

Based on the information provided in the licensee's submittals, the NRC staff has determined that the proposed alternative in Relief Request 29, as described above, provides an acceptable level of quality and safety, and, therefore, it is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the remainder of the second 10-year ISI interval at STL2, which began August 8, 1993, and ends August 7, 2003. 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.

5.0 REFERENCES

1. Letter, dated July 23, 2002, Donald E. Jernigan (Vice President, St. Lucie Plant), to U.S. Nuclear Regulatory Commission, containing St. Lucie - Unit 2 - Relief Request 29 Risk-Informed Inservice Inspection Program.

2. Letter, dated January 16, 2003, Donald E. Jernigan (Vice President, St. Lucie Plant), to U.S. Nuclear Regulatory Commission, containing St. Lucie - Unit 2 - Relief Request 29 Request for Additional Information Response.

3. Letter, dated March 26, 2003, Donald E. Jernigan (Vice President, St. Lucie Plant), to U.S. Nuclear Regulatory Commission, containing St. Lucie - Unit 2 - Relief Request 29 Request for Additional Information Response.

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

5. U.S. Nuclear Regulatory Commission, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Regulatory Guide 1.174, July 1998.

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

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

8. Letter, dated February 11, 2000, Richard P. Correia (U.S. Nuclear Regulatory Commission) to J. A. Scalice (TVA Chief Nuclear Officer and Executive Vice President) containing Safety Evaluation by NRR on the Risk Informed Inservice Inspection (RI-ISI) Program for the TVA Browns Ferry Nuclear Plant, Unit 3.

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