FPL.

L-2012-444

DEC 19 2012

U.S. Nuclear Regulatory Commission
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Washington, D.C. 20555-0001

Re: Turkey Point Units 3 and 4
Docket No. 50-250 and 50-251
License Renewal Pressurizer Surge Line Welds Inspection Program
Response to Request for Additional Information

References:

1) FPL letter L-2012-214 to the USNRC, dated May 16, 2012, License Renewal Commitment Submittal of Pressurizer Surge Line Welds Inspection Program

2) Email from Tracy J. Orf (NRC) to Olga Hanek (FPL), "RAIs re: Pressurizer Surge Line Welds Inspection Program," dated October 18, 2012

3) NRC Letter, from Tracy J. Orf (NRC) to Mr. Mano Nazar (FPL), "Turkey Point Units 3 and 4 –Request for Additional Information Regarding License Renewal Commitment, Submittal of Pressurizer Surge Line Welds Inspection Program (TAC NOS. ME8717 and ME8718)

On May 16, 2012 Florida Power and Light Company (FPL) submitted letter L-2012-214, (Reference 1), requesting review and approval of the inspection program for managing the effects of environmentally assisted fatigue of the Turkey Point Units 3 and 4 pressurizer surge line welds. By electronic mail from the Nuclear Regulatory Commission (NRC) Project Manager (PM) dated October 18, 2012, (Reference 2), the NRC provided FPL with a request for additional information (RAI) regarding the submittal in FPL letter L-2012-214. On November 9, 2012, FPL and NRC Staff during a teleconference discussed the RAIs to determine need for further clarification. Following the discussion, NRC requested FPL to reply to the RAI questions by December 24, 2012 (Reference 3).

The purpose of this letter is to provide FPL's response to NRC's RAIs (Reference 3) in Enclosure 1. Based on FPL's responses, Enclosure 2, Attachment 1 contains the updated inspection program for NRC review and approval. To facilitate the review, Enclosure 2, Attachment 2 provides the technical basis for the inspection program (unchanged from previous submittal in Reference 1). Additionally, as requested in RAI No. 5, a summary description of the Turkey Point Units 3 and 4, Surge Line Weld Inspection Program to be included in the Updated Final Safety Analysis Report (UFSAR) is provided in Enclosure 2, Attachment 3.

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NRR

Should there be any questions, please contact Mr. Robert J. Tomonto, Licensing Manager at 305 246-7327.

Very truly yours,

Michael Kiley
Vice President
Turkey Point Nuclear Plant

Enclosures
Attachments

cc: Regional Administrator, USNRC Region II
USNRC Senior Resident Inspector – Turkey Point Plant

FPL Letter L-2012-444

ENCLOSURE 1

Florida Power and Light

Turkey Point Nuclear Plant Units 3 and 4

Responses to the NRC Request for Additional Information

NRC Questions and FPL Responses

RAI 1

Background

Section 3.0 of Attachment 1 to the licensee's submittal states that the scope of the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program includes five pressurizer surge line welds in Unit 3 and seven pressurizer surge line welds in Unit 4, as listed in Table 3 of the attachment.

Issue

The commitment addressed by the licensee's submittal is captured in updated final safety analysis report (UFSAR) Section 16.3.2.5. This section states that the licensee will inspect all pressurizer surge line welds on both units during the fourth inservice inspection interval and prior to entering the period of extended operation and the results of these inspections will be used to assess environmentally assisted fatigue of the pressurizer surge lines, to include management of the effects of this aging mechanism through an inspection program.

By letter dated March 11, 2004 (ML040860092), the licensee transmitted its inservice inspection program for the fourth inservice inspection interval. Enclosure 3 (ML041040234) of this letter provides the inservice inspection plan and schedule specific to Unit 3. The staff found that Page 75 lists six pressurizer surge line welds in Unit 3 whereas the licensee's submittal only describes five pressurizer surge line welds. The apparent discrepancy concerns a pipe-to-pipe weld, "12"-RC-1301-7."

The commitment concerns environmentally assisted fatigue of all the pressurizer surge line welds. However, since this particular weld is not addressed in the submittal, the staff could not determine whether the scope of the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program is consistent with the scope of the commitment. The commitment also states that all the welds will be inspected and the results will be considered in the approach for managing the effects of environmentally assisted fatigue. The licensee's submittal does not describe the inspection results for this particular weld; therefore, the staff could not determine whether the licensee assessed these results, consistent with the commitment, in order to demonstrate that the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program will adequately manage the effects of environmentally assisted fatigue.

Request

a. For Unit 3, clarify whether the "12"-RC-1301-7" weld is part of the pressurizer surge line. If it is part of the pressurizer surge line, include it within the scope of the program and provide information on it consistent with that in Table 3 of Attachment 1 to the submittal (i.e., the last examination date and results, allowable operating period, inspection type, and inspection frequency). Otherwise, justify why this weld is not within the scope of the program.

b. For both Units 3 and 4, indicate whether there are any additional pressurizer surge line welds that are not listed in Table 3 of Attachment 1 to the submittal. If there are any additional welds, include them within the scope of the program and provide information on them consistent with that in Table 3 of Attachment 1 to the submittal (i.e., the last examination date and results, allowable operating period, inspection type, and inspection frequency). Otherwise, justify why these additional welds are not within the scope of the program.

Response to RAI # 1(a)

In Unit 3, there is no weld at location 12-RC-1301-7.

In 2001, Turkey Point isometric drawing 5613-P-766-S, identified weld #12-RC-1301-7 as located on the pressurizer surge line between analysis node points 3 and 4. Prior to November 30, 2000 this weld was included in the ISI Program for examinations. Based on the walkdown performed during U3C19 (Fall 2001 refueling outage), it was determined that there is no weld at location 12-RC-1301-7.

Response to RAI # 1(b)

There are no additional welds that are not listed in Table 3 of Attachment 1 to the submittal. All welds on the surge line have been accounted for in the submittal and the examinations of these welds were completed for both Unit 3 and Unit 4 during the fourth 10-Year ISI Interval.

RAI 2

Background

Attachment 2 to the submittal describes the flaw tolerance evaluation performed in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Division 1, "Rules for Inspection and Testing of Components of Light Water Cooled Plants" (Section XI), Appendix L, which was used to determine the successive examination interval for the pressurizer surge line welds. Section 3.3 of this attachment states that crack growth in the Type 316 and Type 304 stainless steel welds was calculated using the formulation in W. J. Mills, "'Critical Review of Fatigue Crack Growth Rates for Stainless Steel in Deaerated Water – Parts 1 and 2,' EPRI MRP-2010 Conference and Exhibition: Materials Reliability in PWR Nuclear Power Plants, Colorado Springs, CO, June 28 – July 01, 2010."

Issue

Section XI, Paragraph L-3331, states that the evaluation procedures in Section XI, Appendix C, shall be used. Section XI, Subsubarticle C-8410, describes the parameters for the fatigue crack growth behavior of austenitic stainless steels and states that the crack growth behavior is affected by temperature, the ratio of the minimum stress intensity factor to the maximum stress intensity factor associated with the transient stress range, and the environment. This subsubarticle does not provide reference fatigue crack growth rates for austenitic stainless steels exposed to pressurized water reactor environments. The licensee referenced a formulation based on the W. J. Mills publication to calculate the fatigue crack growth rate; however, the licensee did not provide a technical basis to justify application of this method to the flaw tolerance evaluation for the pressurizer surge line welds.

Request

Provide a technical basis to justify that use of the referenced formulation is conservative with respect to the calculation of the fatigue crack growth rate in a pressurized water reactor environment. Describe how this formulation takes into account the parameters discussed in Section XI, Subarticle C-8410, including temperature, ratio of the minimum stress intensity factor to the maximum stress intensity factor associated with the transient stress range, and the environment.

Response to RAI # 2:

The crack growth formulation used in the evaluation is based on the publication by W. J. Mills (Reference 1). The work in Reference 1 publication was used to derive reference fatigue crack growth curves for austenitic stainless steels in pressurized water reactor environment. The crack growth formulation is presented in Section 3.3 of the Attachment 2 report of the submittal with the following expression:

$da/dN = C_0(\Delta K)^n$, units of in/cycle,

Where:

C_0	$= C\ S_R\ S_T\ S_{ENV}$
C	$= 3.54\text{x}10^{-7}$ for Type 316 (hot leg surge nozzle weld)
	$= 4.43\text{x}10^{-7}$ for Type 304 (pressurizer surge nozzle weld)
n	$= 2.25$
S_R	$= 1+e^{8.02(R-0.748)}$
	= parameter defining the effect of *R* ratio on crack growth rate,
S_T	$= e^{-2516/T_K}$ $300\ °F \le T \le 650\ °F$
S_T	$= 3.39\ \text{x}\ 10^5 e^{(-2516/T_K - 0.0301T_K)}$ $70\ °F \le T \le 300\ °F$
	= parameter defining the effect of temperature on crack growth rate,
S_{ENV}	$= T_R^{0.3}$
	= parameter defining the environmental effects on crack growth rate
da/dN	= growth rate
ΔK	= stress intensity factor range, ksi-in$^{1/2}$

R $= \text{R-ratio} = K_{min}/K_{max}$

T_K $= [(T-32)/1.8+273.15]$, °K

T = metal temperature, °F

T_R = rise time, sec

ΔK_{th} = 1.0 ksi in^{½} = threshold ΔK for crack growth

The equations above show that the formulation takes into account the parameters discussed in Section XI, Subsubarticle C-8410, including temperature, ratio of the minimum stress intensity factor to the maximum stress intensity factor associated with the transient stress range, and the environment.

As stated in the issue statement above, ASME Code Section XI Subsubarticle C-8410 does not provide reference fatigue crack growth rates for austenitic stainless steels exposed to pressurized water reactor environments; however, it provides reference fatigue crack growth curves for austenitic stainless steels in air environment. Consequently, the industry practice has been to use the air curve and apply a factor of 2 to account for the pressurized water reactor environment, based on the Section XI Appendix C technical basis documentation (Reference 2). The crack growth law for austenitic steel fatigue in air environment is provided in Subsubarticles C-3210 and C-8410 of ASME Code, Section XI as follows:

$$(da/dN)_{air} = C_0(\Delta K)n \text{, units of in/cycle,}$$

Where:

C_0 $= C \cdot S$

C $= 10^{[-10.009+8.12\times10^{-4}T-1.13\times10^{-6}T^2+1.02\times10^{-9}T^3]}$

S = 1.0 when $R \leq 0$

= 1.0 + 1.8R when $0 < R \leq 0.79$

= -43.35 + 57.97R when $0.79 < R < 1.0$

T = metal temperature, °F (taken as the maximum during the transient)

R = R-ratio = Kmin/Kmax

ΔK = Kmax – Kmin = range of stress intensity factor, ksi-in$^{0.5}$

n = 3.3

Comparisons of the crack growth rate used in the evaluation and 2 times the ASME Code air curve is shown in Figure 1 and Figure 2.

The comparisons use the following constant parameters:

Material = Type 316 stainless steel

Operating temperature = 620°F

R-ratio = 0 or 1 (Figure 1 or Figure 2)

Two different loading rise times are used in the crack growth rate comparison (120 sec and 12000 sec) to show the effect of rise time on the crack growth rate utilized in the evaluation.

For a low rise time of 120 seconds, it can be seen from Figure 1 that, for an R-ratio equal to zero, the formulation used in the evaluation produces more conservative crack growth results than using the ASME Code crack growth curve with a factor of 2 for ΔK values less than 50 ksi-in$^{1/2}$. Similarly, Figure 2 shows that, for a low rise time of 120 seconds and an R-ratio equal to 1, the formulation used in the evaluation produces more conservative crack growth results than using the ASME Code crack growth curve with a factor of 2 for ΔK values less than 30 ksi-in$^{1/2}$.

Both Figures 1 and 2 show that, with a rise time of 12000 seconds, the formulation used in the evaluation is conservative compared to 2 times the ASME Code crack growth rate in air for ΔK values less than 70 ksi-in$^{1/2}$. In the evaluation, a conservatively large rise time of 15732 seconds representing a heatup transient was used for all the cyclic loads and the maximum calculated ΔK was 39.3 ksi-in$^{1/2}$. Therefore, the formulation used in the evaluation is conservative for the calculation of the fatigue crack growth of stainless steel components in a pressurized water reactor environment.

References:

1. W. J. Mills, "Critical Review of Fatigue Crack Growth Rates for Stainless Steel in Deaerated Water – Parts 1 and 2," EPRI MRP-2010 Conference and Exhibition: Materials Reliability in PWR Nuclear Power Plants, Colorado Springs, CO, June 28 – July 01, 2010.

2. Section XI Task Group for Piping Flaw Evaluation, ASME Code, "Evaluation of Flaws in Austenitic Steel Piping," Journal of Pressure Vessel Technology, Vol. 108, August 1986.

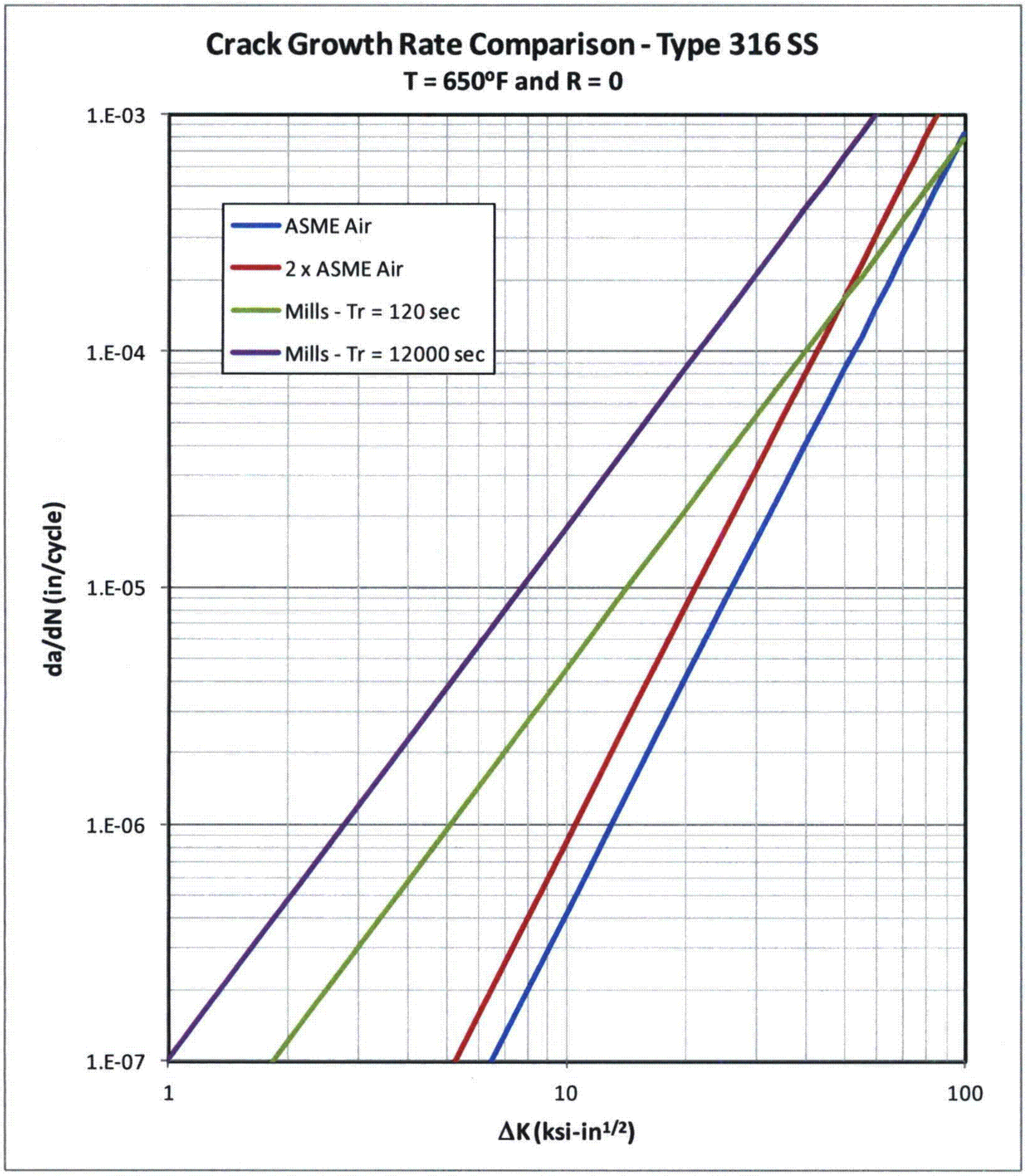

Figure 1, Comparison of Fatigue Crack Growth with R-ratio = 0.

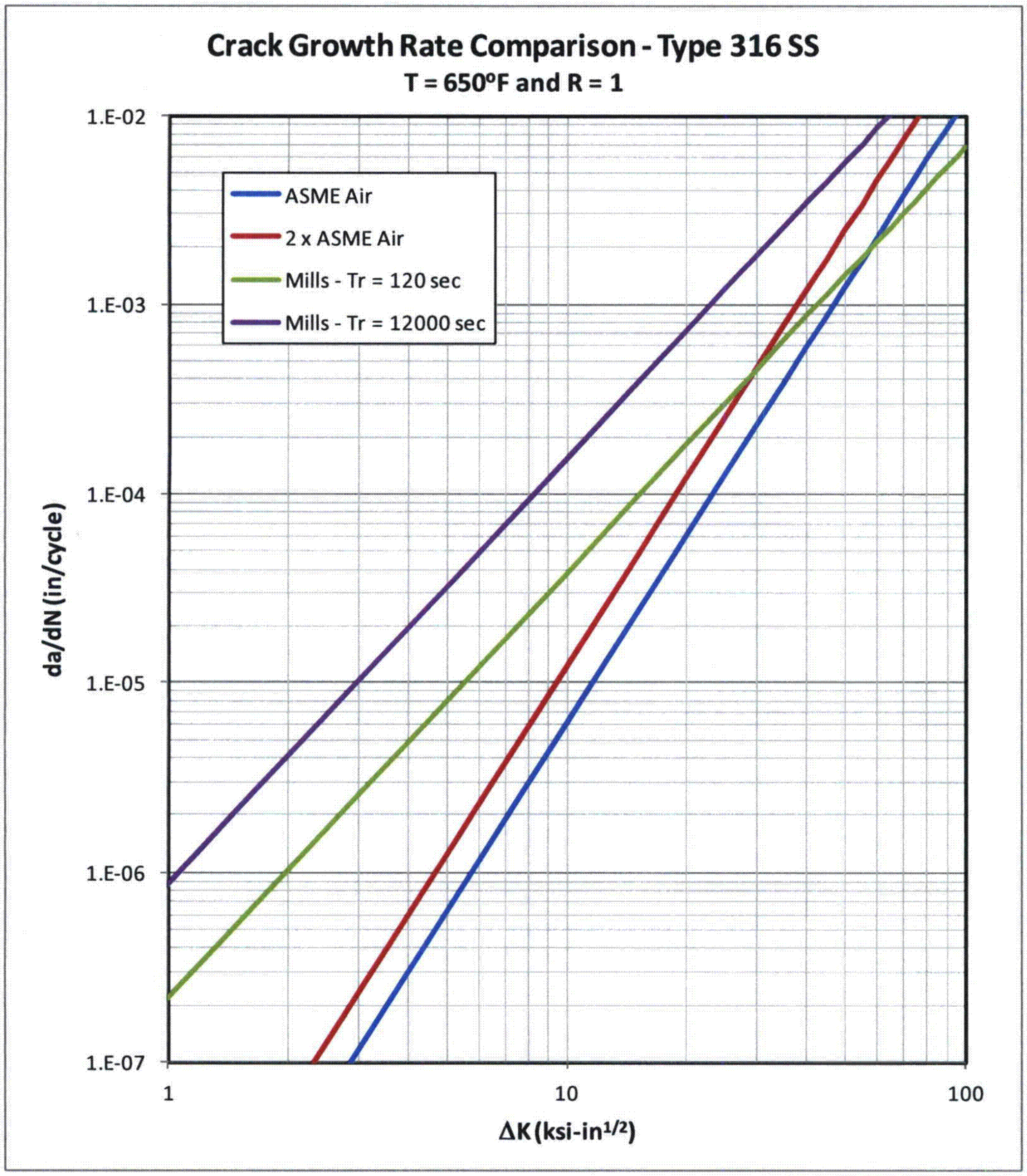

Figure 2, Comparison of Fatigue Crack Growth with R-ratio = 1.

RAI 3

Background

Section 3.3 of Attachment 2 to the submittal indicates that the pressurizer surge line welds are austenitic stainless steel. According to Section 3.2.1.1 of the license renewal application (ML003749654), Class 1 stainless steel piping components in the reactor coolant systems are subject to cracking due to flaw growth as well as stress corrosion cracking. Therefore, stress corrosion cracking is an aging effect requiring management for the period of extended operation.

Issue

As stated in Section 3.2 of Attachment 2 to the submittal, per the recommendations of Section XI, Appendix L, the analytical procedures of Section XI, Appendix C, were used to determine the critical flaw sizes for the postulated axial and circumferential flaws in the pressurizer surge and hot leg surge nozzle welds. Section XI, Subsubarticle C-3230, states that if the service loading, material, and environmental conditions are such that the flaw is subjected to both fatigue and stress corrosion cracking growth, as may occur in austenitic piping components, then the final flaw size depth and length are to be obtained by adding the increments in flaw size due to fatigue and stress corrosion cracking. The license renewal application indicates that the pressurizer surge line piping components are subject to stress corrosion cracking, but the staff could not determine whether stress corrosion cracking was considered in the flaw growth calculation in accordance with Section XI, Subsubarticle C-3230.

Request

Describe how and justify that the flaw growth evaluation accounted for the effects of stress corrosion cracking. Alternatively, provide the basis for not considering the effects of stress corrosion cracking in the evaluation.

Response to RAI #3:

As illustrated in Figure 1, austenitic stainless steels are susceptible to stress corrosion cracking (SCC) in PWR environments in a similar fashion as Alloy 600 (Reference 1). To distinguish the SCC of nickel base alloys in PWR environments, i.e., primary water stress corrosion cracking (PWSCC), a new SCC term, i.e., low potential stress corrosion cracking (LPSCC) is often used to describe the SCC of austenitic stainless steels in PWR environments.

Crack growth rate studies of 20% cold worked Types 304 and 316 stainless steels have revealed the effects of dissolved hydrogen, and furnace sensitization subsequent to cold working and temperature as presented in Figures 2 and 3 (Reference 2). Figure 2 demonstrates that unlike the case for Alloy 600, there appears to be no beneficial effect of increased dissolved hydrogen content in the coolant on crack growth rate of 20% cold worked Types 304 and 316 stainless steels. However, there is a dramatic benefit, i.e., a factor of improvement (FOI) of approximately 100 times in a reduction of the crack growth rate for sensitized material. This test result suggests that the weld sensitized heat affected zone (HAZ) adjacent to stainless steel welds at Turkey Point would be significantly more resistant to crack propagation if LPSCC was initiated. In fact, the measured crack growth rate of approximately 1 x 10^{-9} mm/s (1.24 mpy) is so low that it is equivalent to a 300 year life for a component.

Figure 3 presents the effect of temperature on the crack growth rate of 20% cold worked Type 316 stainless steel (Reference 2). As is the case with Alloy 600, the crack growth rate increases with increasing temperature. However, unlike the case for Alloy 600, the crack growth rate for Type 316 stainless steel hits a maximum as a function of the degree of cold working while the crack growth rate for Alloy 600 monotonically increases with temperature with no inflection point. Again, the non-sensitized stainless steel has a significantly higher crack growth rate.

Finally the stainless steel weld metal itself needs to be addressed. The weld metals high resistance to intergranular attack (IGA) and SCC has been known for over 70 years (Reference 3). Many studies have demonstrated that the resistance of two-phase, austenitic-ferritic stainless steel weld metal and castings is a strong function of the alloy's microstructure. Specifically, in work performed on wrought duplex stainless steels, the resistance to sensitization was shown to be a function of the chemistry of the alloy (e.g., primarily % carbon and secondly % chromium) and the amount and distribution of ferrite (References 3 and 4).

Figure 4 shows a plot of failure and non-failure point on a graph of percent carbon versus percent ferrite for various types of specimens (e.g., full size pipes, constant extension rate, variable-load and constant load) exposed an environment of high purity water (<1 μS/cm) with 6 ± 2 ppm dissolved oxygen at a temperature 288°C (550°F) [4]. This treatment represents the traditional approach of evaluating various casting heats, including as welded austenitic stainless steel materials.

The results of this extensive test program revealed that for welded applications, a control on percent ferrite of 5% recommended. For furnace-sensitized applications, 12% ferrite will assure resistance to SCC. These measurements are recommended following the mill solution heat treatment.

Finally, the U. S. Nuclear Regulatory Commission (NRC) considers weld metal and castings to be resistant to IGSCC (References 5 and 6). More specifically, the NRC states that "Low carbon weld metal, including types 304L, 316L, 309L and similar grades, with a maximum carbon content of 0.035% and a minimum of 7.5% ferrite (or 7.5 FN) as deposited" are considered resistant to SCC. The NRC further states that "welds joining resistant material that meet the ASME Boiler and Pressure Vessel Code requirement of 5% ferrite (or 5 FN), but are below 7.5% ferrite (or 7.5 FN) may be sufficiently resistant, depending on carbon content and other factors. These will be evaluated on an individual case basis." Such a basis is presented in Figure 4.

In summary, the SCC of austenitic stainless steel in PWR environments due to LPSCC is feasible, but the crack growth rate data suggests that the crack growth rates are of little engineering significance for welded, i.e., sensitized, components or for the weld metal itself.

References

1. N. Totsuka, Y. Nishikawa and Y. Kaneshima, "Effect of Strain Rate on Primary Water Stress Corrosion Cracking Fracture Mode and Crack Growth Rate of Nickel Alloy and Austenitic Stainless Steel," Corrosion Vol. 61, No. 3, March 2005, p. 219.

2. K. Arioka, T. Yamada, T. Terachi and T. Miyamoto, "Dependence of Stress Corrosion Cracking for Cold-Worked Stainless Steel on Temperature and Potential, and Role of Diffusion of Vacancies at Crack Tips," Corrosion Vol. 64, No. 9, September 2008, p. 691.

3. H. Menendez, J. S. Chen and T. M. Devine, "The Influence of Microstructure on the Sensitization Behavior of Duplex Stainless Steel Welds," paper 562 presented at Corrosion 89, NACE, New Orleans, Louisiana, April 17-21, 1989.

4. N. R. Hughes, W. L. Clarke and D. E. Delwiche, "Intergranular Stress Corrosion Cracking Resistance of Austenitic Stainless Steel Castings," Stainless Steel Castings. ASTM STP 756, V. G. Behal and A. S. Melilli, Eds. American Society for Testing and Materials, 1982, p. 26.

5. W. S. Hazelton and W. H. Koo, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," NUREG-0313, Rev. 2, US Nuclear Regulatory Commission, January 1988.

6. US NRC Generic Letter 88-01, "NRC Position on IGSCC in BWR Austenitic Stainless Steel," January 25, 1988.

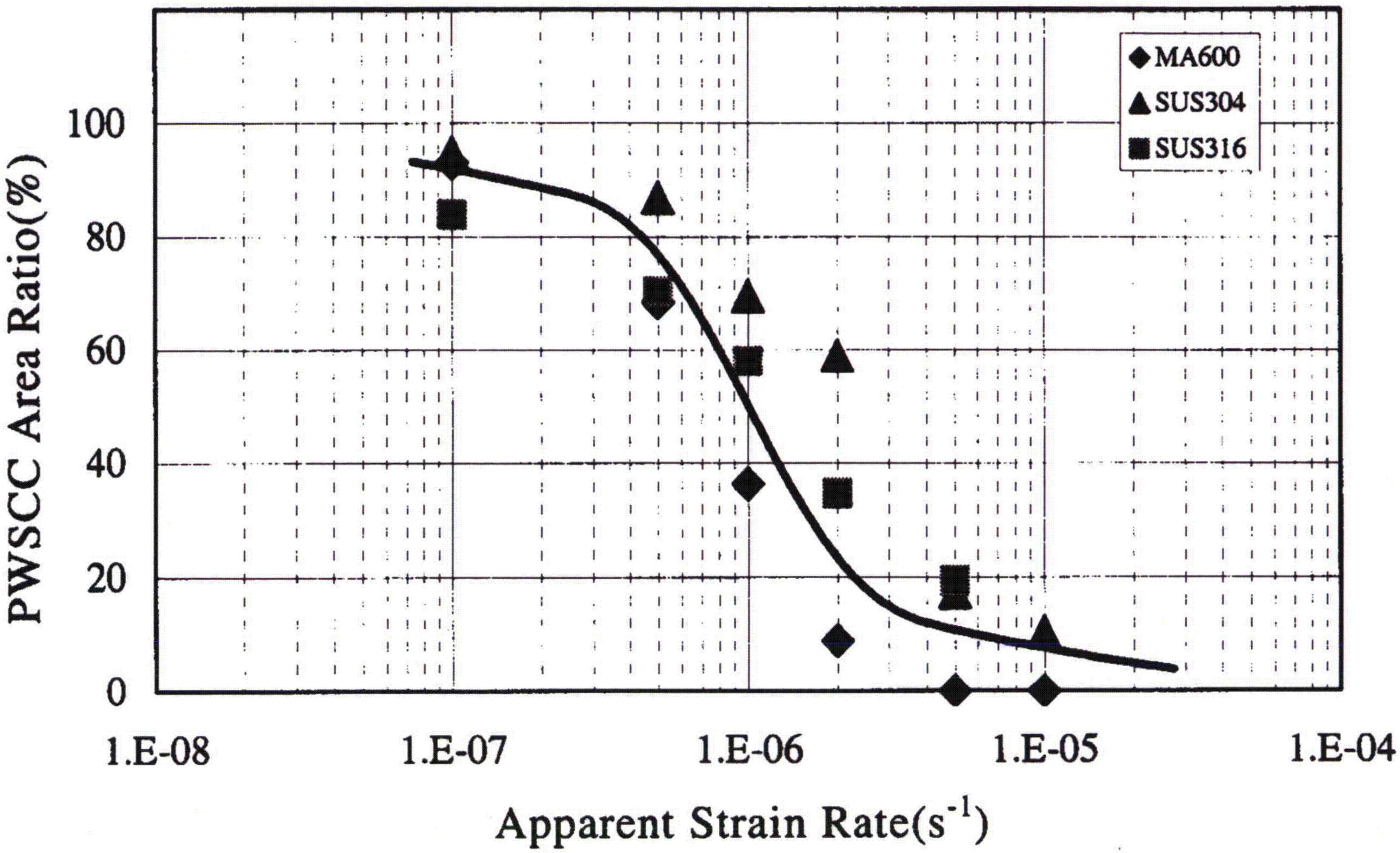

Figure 1. Effect of Strain Rate on SCC of Alloy 600 and Types 304 and 316 Austenitic Stainless Steels (SS) (Ref 1)

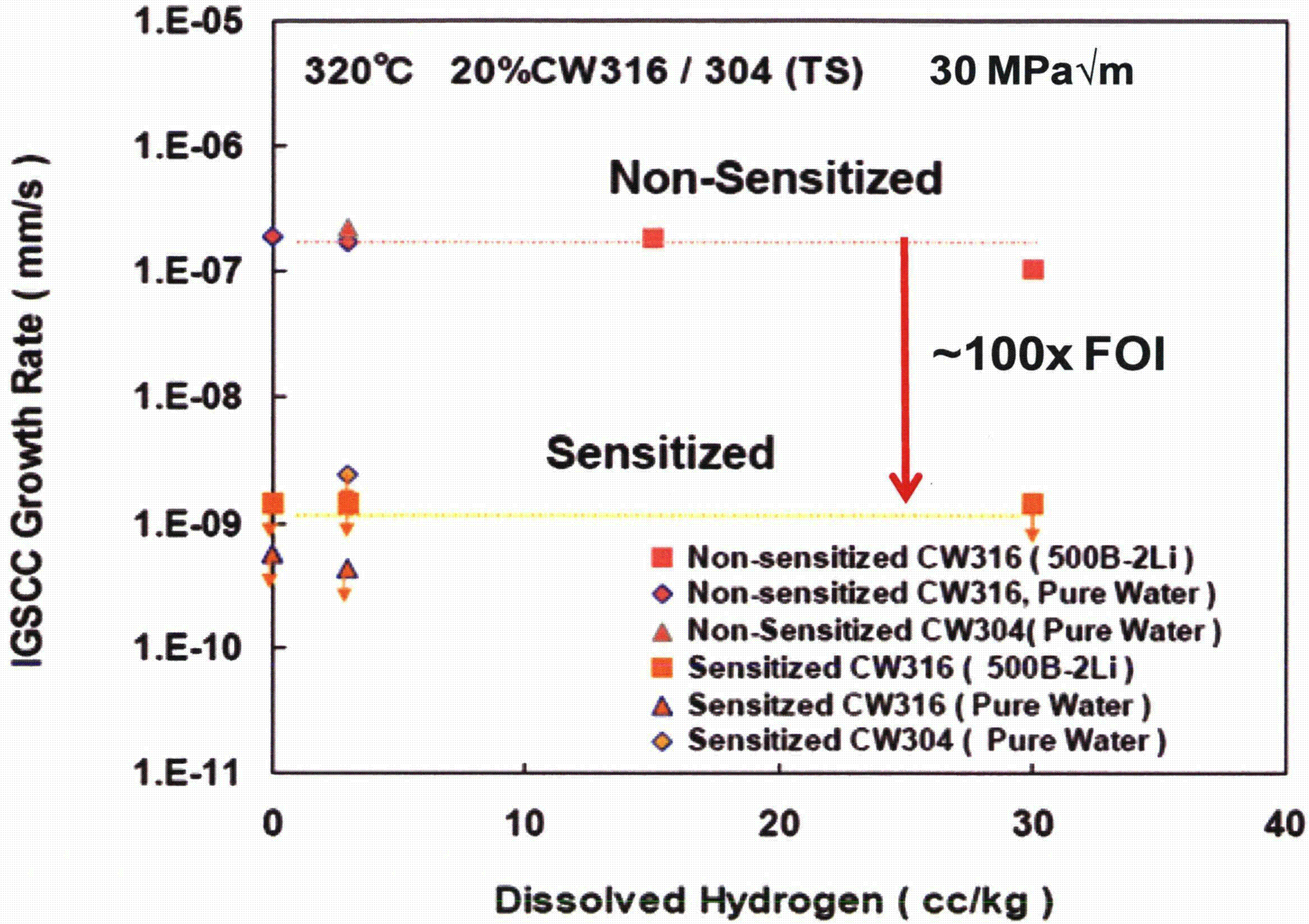

Figure 2, Effect of Dissolved Hydrogen on the Crack Growth Rates of 20% Cold Worked Types 304 and 316 Stainless Steel at 320°C

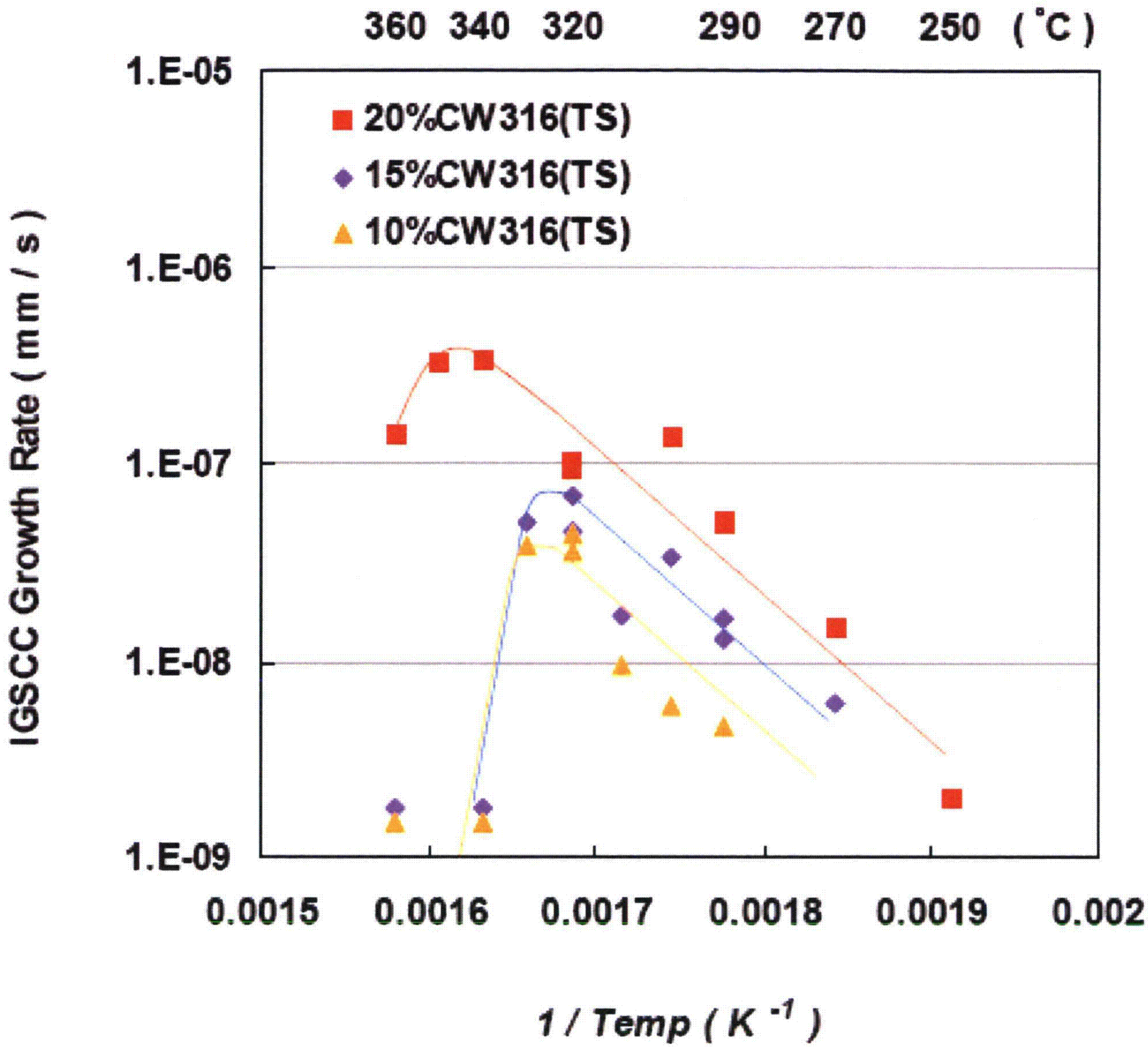

Figure 3, Effect of Temperature on the Crack Growth Rate of Cold Worked Type 316 Stainless Steel (Reference 2)

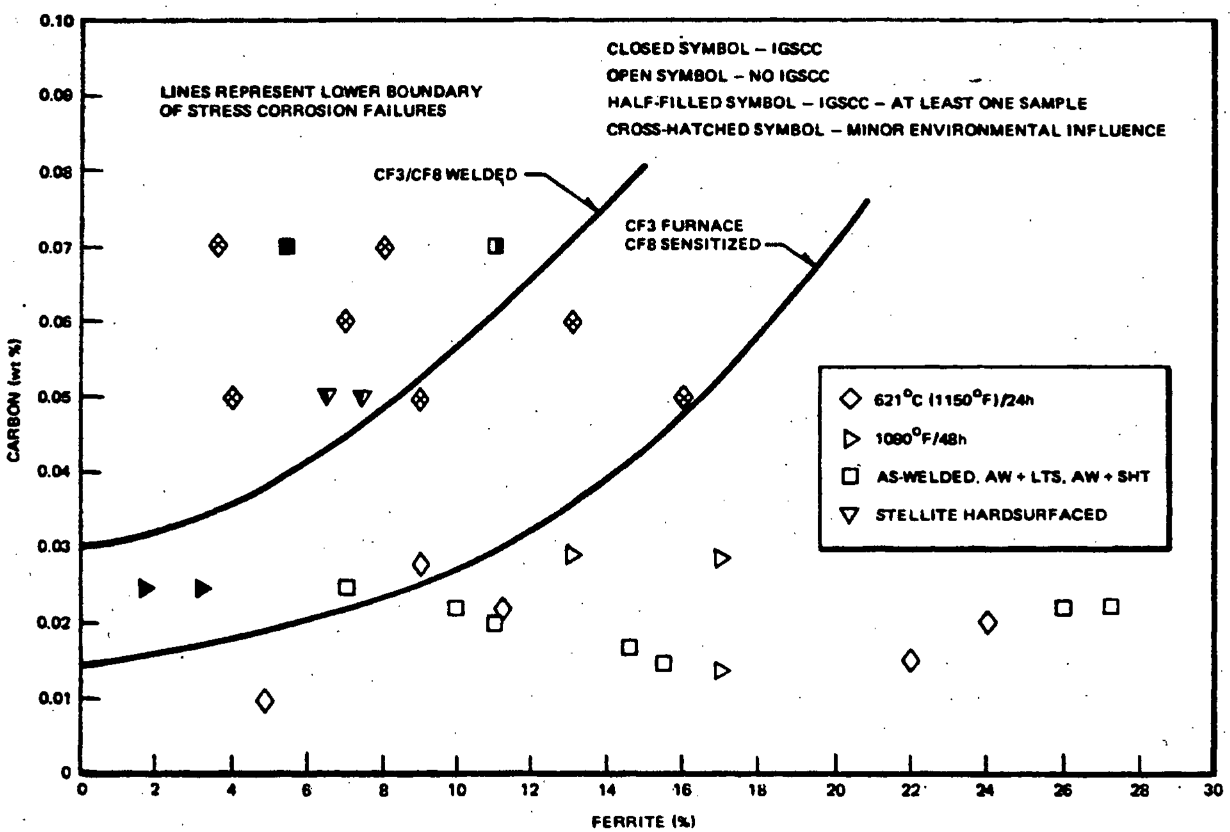

Figure 4, IGSCC Resistance may be predicted by the Combined Influence of Carbon Content and Percent Ferrite (Reference 4)

RAI 4

Background

Section 3.0 of Attachment 1 to the submittal describes the key attributes of the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program. The "operating experience" attribute describes plant-specific operating experience relevant to the program.

Issue

The attributes of the licensee's program align with the 10 elements of an aging management program as described in Section A.1.2.3 of NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated December 2010 (ML103490036). SRP-LR Section A.1.2.3.10 addresses operating experience for aging management programs and was revised in Final License Renewal Interim Staff Guidance (LR-ISG), LR-ISG-2011-05, "Ongoing Review of Operating Experience," dated March 16, 2012 (ML12044A215). SRP-LR Section A.1.2.3.10, as revised, states that consideration of future plant-specific and industry operating experience relating to the aging management program should be discussed because the ongoing review of operating experience may identify areas where the program should be enhanced or new programs developed. Although the licensee discussed currently available operating experience relevant to the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program, it did not describe how future plant-specific and industry operating experience concerning aging management and age-related degradation will be used to ensure that the effects of aging will be adequately managed.

Request

Describe the programmatic activities that will be used to continually identify plant-specific and industry aging issues, evaluate them, and, as necessary, enhance the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program or develop new program(s) in order to manage the effects of aging for the pressurizer surge lines. Indicate whether these activities are consistent with the guidance described in LR-ISG-2011-05, Appendix A, Itemized Change No. 7. Otherwise, provide a basis for the conclusion that the activities will ensure the adequate evaluation of operating experience on an ongoing basis to address age-related degradation and aging management.

Response to RAI #4:

FPL recognizes that Operating Experience (OE) is a crucial element of an effective aging management program. The Operating Experience program procedure PI-AA-102, Operating Experience Program, provides guidance for using, sharing, and evaluating OE information. This procedure provides guidance on the effective and efficient use of OE information to improve safety and reliability.

The systematic review of plant specific and industry operating experience concerning aging management and age-related degradation is intergraded in the programmatic activities of the renewed license program. The FPL corporate procedure PI-AA-102, references the expectations of the NRC Interim Staff Guidance LR-ISG-2011-05, Ongoing Review of Operating Experience to ensure relevant OE is reviewed for impact on aging effects and/or aging management programs. Turkey Point follows the programmatic guidance for using, sharing and evaluating OE information, which incorporates in its scope responsibilities related to license renewal activities. The scope of PI-AA-102 includes the requirement to ensure the effectiveness of license renewal aging management programs through ongoing reviews of relevant OE. Instructions how to consider internal and external OE are also provided in the license renewal procedure LI-AA-207, "Renewed License Process." The requirements of reviewing relevant OE are outlined in LI-AA-107, "Renewed License Program." Accordingly, personnel that are assigned renewed license aging management program responsibility are required to review condition reports and OE entries for age related failures or significant degradation of in-scope SSCs, or failures of aging management programs to prevent aging related failures and degradation and to initiate changes to the site specific aging management programs as appropriate.

FPL is confident that these programmatic activities will ensure the adequate evaluation of operating experience on an ongoing basis to address age-related degradation and aging management for the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program.

RAI 5

Background

Section 3.0 of Attachment 1 to the submittal, under "administrative controls," states that the plant inservice inspection program will document the environmentally assisted fatigue inspection requirements for the pressurizer surge line welds. Section 4.0 states that, upon approval of the proposed inspection program, the related aging management program basis and implementing documents and the associated UFSAR sections will be updated accordingly.

Issue

Concerning the "administrative controls" element of an aging management program, SRP-LR Section A.1.2.3.9 states that the administrative controls should provide a formal review and approval process. The applicant did not describe the review and approval process for the inservice inspection program. SRP-LR Section A.1.2.3.9 also states that any informal programs relied on to manage aging for license renewal must be administratively controlled and included in the UFSAR supplement. Since the proposed program is informal (i.e., it is not subject to an existing requirement, for example, under an NRC regulation) it should have a summary description in the UFSAR to provide for administrative control of the program. The submittal does not provide a summary description of the program for the UFSAR; therefore, the staff could not determine whether the administrative controls of the program are adequate.

Request

Describe the review and approval process for the inservice inspection program.

Provide a summary description of the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program to be included in the UFSAR. In this description, include details on the specific components within the scope of the program, the aging effects managed by the program, and the inspection methods and frequencies for detecting these aging effects.

Response to RAI #5:

The Inservice Inspection (ISI) Program is updated by an outside vendor, prepared by the Station's ISI Program owner, reviewed by an independent ISI Program Owner, approved by the ISI Program Supervisor and Manager, and then the final review by the Authorized Nuclear Inservice Inspector (ANII).

The ISI Program Plan implements the FPL commitments to manage the effects of aging for system/structures/components within the scope of license renewal. As described in the proposed AMP, all Turkey Point Units 3 and 4 surge line welds will be inspected in accordance with the requirements of ASME Section XI, Subsection IWB, as an augmented inspection program as part of the Turkey Point ISI Program. Once the AMP is approved, a note will be added to the remarks section for these welds in the ISI Plan denoting these welds as part of the Aging Management Program (AMP). The description of the surge line weld inspection program requirements will be included in the "Augmented and Other Programs" section of the ISI Program and will be defined as License Renewal Aging Management Program. Corrective actions, confirmation process and administrative controls for license renewal are in accordance with the site controlled quality assurance program pursuant to 10 CFR Part 50, Appendix B, and it covers all SSCs subject to an aging management review.

As described in the scope of the proposed AMP, the aging management of the surge line welds will be accomplished by a combination of flaw tolerance analysis and in-service inspection. The surge line welds that are in scope will be inspected in accordance with the requirements of ASME Section XI, Subsection IWB, using the Turkey Point In-service Inspection Program which is subject to the limitations and modifications of 10CFR50.55a(b)(2). The technical justification and inspection frequency are supported by the flaw tolerance analysis based on the methodology noted in ASME Section XI, Non-mandatory Appendix L, "Operating Plant Fatigue Assessment."

The description of the AMP for the Turkey Point Units 3 and 4 Pressurizer Surge Line Welds Inspection program will be summarized in the Updated Final Safety Analysis Report (UFSAR) under the section for new aging management programs.

RAI 6

Background

Section 3.0 of Attachment 1 to the submittal states, under "detection of aging effects," that degradation of the pressurizer surge line welds is determined by volumetric examination in accordance with the requirements of plant inservice inspection program. Under "scope of the program," it states that the welds within the scope of the program will be examined in accordance with the risk-informed in-service inspection programs for Class 1 piping welds, an alternative to the requirements of Section XI that was approved by the NRC for the fourth in-service inspection interval as documented in a safety evaluation dated December 9, 2008 (ML083250173). It also states that the examination method for the Class 1 piping welds is volumetric only, as found in ASME Code Case N-577-1, "Risk-Informed Requirements for Class 1, 2, or 3 Piping, Method A Section XI, Division 1," Category R-A, Item R1.11.

Issue

The staff could not clearly determine the basis for the detection of aging effects. As stated in NRC Regulatory Guide 1.193, Revision 3, "ASME Code Cases Not Approved for Use," dated October 2010 (ML101800540), ASME Code Case N-577-1 is not approved for use. In addition, the NRC safety evaluation dated December 9, 2008, approves use of the risk-informed inservice inspection programs for Units 3 and 4 only for the fourth inservice inspection intervals. These intervals end in 2014 and, as such, it is not clear what the examination methods will be in the fifth and sixth inservice inspection intervals, which cover the periods of extended operation.

Request

Clearly describe the examination methods and justify how they will detect the aging effects before there is a loss of the component intended functions. If the examination methods will be performed in accordance with Section XI, provide references to the applicable provisions in Section XI for these methods.

Response to RAI #6:

The pressurizer surge line welds were previously inspected during the fourth 10-Year Inspection Interval as per the requirements of the approved fourth 10-Year ISI Program for Turkey Point Units 3 and 4. The fourth 10-Year ISI interval will end in February 2014 for Unit 3 and April 2014 for Unit 4. The fifth 10-year ISI program will be submitted to the NRC before February 2014.

All pressurizer surge line welds will be examined in accordance with ASME Section XI, IWB for Class 1 welds. The aging effect managed with these inspections is cracking due to environmentally assisted fatigue. Inservice examinations for the surge line welds will be a surface/volumetric examination as indicated in Table 3, "Turkey Point Units 3 and 4 Pressurizer Surge Line Welds Subject to Environmental Assisted Fatigue Inspection Program." Based on postulated flaw tolerance analysis, and per the guidelines of ASME Code, Section XI, Appendix L, Table L-3420-1, the successive inspection schedule is determined to be ten years. This inspection interval will be used for all surge line piping welds in scope.

Surge Line welds, listed in Table 3 will be included in the scope of the fifth and sixth 10-Year inspection program as an augmented inspections under the section "Augmented and Other Programs" of the PTN ISI Program. In each 10-year ISI interval during the period of extended operation, all surge line welds in scope will be inspected in accordance with the Turkey Point ISI Program under augmented programs.

Enclosure 2, Attachment 1 contains the updated aging management program for the Pressurizer Surge Line Welds Inspection Program which deletes references to Risk-Informed ISI Program and provides the basis for performing surface/volumetric examinations.

RAI 7

Background

Section 1.0 of Attachment 1 to the submittal states that the critical weld locations of concern are the pressurizer surge line nozzle-to-safe-end weld and the hot leg surge line nozzle-to-pipe weld. Section 1.0 of Attachment 2 to the submittal states that, based on a comparison of geometry, material properties, and applicable loads, the results of the detailed evaluation of these critical locations bound the other weld locations on the pressurizer surge lines.

Issue

The inspection interval for all of the pressurizer surge line welds within the scope of the program is based on the flaw tolerance evaluations for the two critical weld locations; however, the licensee did not provided a justification as to why these two weld locations bound locations for all other welds in the pressurizer surge lines. Also, the critical weld locations were not analyzed separately for each unit; therefore, it is not clear why the two critical locations are representative of those locations in each unit

Request

Justify that the flaw tolerance evaluations for the critical weld locations (i.e., the pressurizer surge line nozzle-to-safe-end weld and the hot leg surge line nozzle-to-pipe weld) bound all other welds in the pressurizer surge lines. In addition, justify why the two critical locations are representative of those locations in each unit.

Response to RAI #7:

The ASME Code, Section XI, Appendix L flaw tolerance evaluation was performed by Structural Integrity Associates (SIA) for Turkey Point Units 3 and 4 pressurizer surge line nozzle-to-safe-end and hot leg nozzle welds. The objective of this calculation was to determine the loading conditions that are applied to the nozzles including piping interface loads, pressure and thermal transients for the design number of cycles. The interface loads are forces and moments for Deadweight, Thermal, Operating Basis Earthquake (OBE), Safe Shutdown Earthquake (SSE), and stratification, and are applicable to both Turkey Point Units 3 and 4.

Based on input from the Teledyne Technical Report TR-5322-135, Reference 1, and the PIPESTRESS results generated by SIA, the Turkey Point Units 3 and 4 critical weld locations were determined. The interface loads for the pressurizer surge nozzle-to-safe end weld bound the other weld locations on the surge line that are in the proximity of this nozzle. This has been documented in proprietary SIA Calculation No. 1100756.301, Reference 2.

Similarly, based on Teledyne Technical Report TR-5322-135, Reference 1, and the PIPESTRESS results generated by SIA, the interface loads for the hot leg surge nozzle bound the other weld locations on the surge line that are in the proximity of this nozzle. This has been documented in proprietary SIA Calculation No. 1100756.306, Reference 3.

The two critical locations are representative of those locations in each unit, since the transients developed for the analyses are basically insurge/outsurge transients, which apply to all the welds in the pressurizer surge lines. During insurge, the top temperature in the line ramps down to the hot leg temperature and during outsurge, the bottom temperature in the line ramps up to the pressurizer temperature.

References:

1. Teledyne Engineering Services, Technical Report TR-5322-135, Rev. 1, "USNRC I&E Bulletin 79-14 Analysis, Turkey Point Unit 3 & 4 Nuclear Power Plant, Pressurizer Surge Line (Inside Containment) Stress Problem 041." SI File No. 100756.203
2. SIA Calculation 1100756.301, Pressurizer Surge Nozzle Design Loads Calculation, 4/17/2012 (SIA Proprietary Document)
3. SIA Calculation 1100756.306, Hot Leg Surge Nozzle Design Loads Calculation, 4/17/2012 (SIA Proprietary Document)

RAI 8

Background

Table 1.0 of Attachment 2 to the submittal lists the bounding thermal transients included in the finite element analysis of the pressurizer surge nozzle weld. It identifies 600 cycles for both the plant heat-up transient and the plant cool-down transient.

Issue

UFSAR Table 4.1-8 lists the 60-year transient design conditions and associated design cycles. It identifies 200 cycles for both the plant heat-up transient and the plant cool-down transient, which equates to a 400-cycle difference between the licensing basis for the plants and the finite element analysis used as the basis for the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program. The licensee did not provide a justification for this difference.

Request

Provide the basis for including 600 cycles of plant heat-up and cool-down transients in the finite element analysis of the pressurizer surge nozzle weld.

Response to RAI #8:

The 200 cycles are for the pressurizer; however, for the pressurizer surge nozzle, the number of cycles during insurge/outsurge events for each plant heatup and cooldown must be considered. The number of cycles for the Plant Heatup and Cooldown insurge/outsurge (I/O) events is conservatively assumed to be 1200 total. This is greater than the 1163 cycles for I/O transients during pre-Modified Operating Procedure (MOP) and Post-MOP operation. The number of cycles of 1163 was obtained from Westinghouse reports WCAP-12959 and WCAP-14950. Therefore, 600 cycles are assigned each to the heat-up or cooldown events in the finite element analysis of the pressurizer surge nozzle weld.

FPL Letter L-2012-444

ENCLOSURE 2

ATTACHMENT 1

Updated

Florida Power and Light

Turkey Point Nuclear Plant Units 3 and 4

Description of the Proposed Aging Management Program

For Pressurizer Surge Line Welds

Inspection Program

1. Background

Florida Power & Light Company has a license renewal commitment for Turkey Point Units 3 and 4, to address the effects of environmentally assisted fatigue for the pressurizer surge line welds during the period of extended operation using one or more of the following approaches:

1. Further refinement of the fatigue analysis to lower the cumulative usage factor (CUF) to below 1.0, or
2. Repair of the affected locations, or
3. Replacement of the affected locations, or
4. Management of the effects of fatigue by an inspection program that has been reviewed and approved by the NRC.

At Turkey Point Units 3 and 4, there are twelve pressurizer surge line weld locations subject to the effects of environmentally assisted fatigue (i.e., five welds in Unit 3, and seven welds in Unit 4). The critical weld locations of concern are the pressurizer surge nozzle-to-safe-end weld and the hot leg surge nozzle-to-pipe weld, where the calculated CUF was determined to exceed the ASME Code allowable usage factor of 1.0, when environmentally assisted fatigue (EAF) is considered during the period of extended operation.

By letter L-2001-075, dated April 19, 2001, (Reference 1), FPL committed to provide the NRC with inspection program details prior to entering the period of extended operation, should FPL selected option 4 (i.e., inspection) to manage environmentally assisted fatigue during the period of extended operation.

FPL has selected to age manage the effects of the environmentally assisted fatigue on the pressurizer surge line welds by an inspection program and flaw tolerance evaluation. Accordingly, Sections 2, 3 and 4 of this attachment provide the description of the proposed Aging Management Program for the Turkey Point Units 3 and 4 Pressurizer Surge Line Welds Inspection Program, the Aging Management Program Attributes, and the Implementation of the Inspection Program, respectively, for NRC Staff review and approval.

2. Description of the Proposed Aging Management Program for Turkey Point Units 3 and 4 Pressurizer Surge Line Welds Inspection Program

The proposed Aging Management Program (AMP) for fatigue assessment is based on the approach documented in the ASME Boiler and Pressure Vessel Code, Section XI- Rules for Inservice Inspection of Nuclear Power Plant Components, Non-Mandatory Appendix L Operating Plant Fatigue Assessment.

A flaw tolerance evaluation was performed specifically for Turkey Point Units 3 and 4 in order to assess the operability of the surge line by using ASME Section XI Appendix L methodology and to determine the successive inspection schedule for the surge line welds with a postulated surface flaw. Two bounding weld locations were evaluated in detail. The two bounding weld locations of concern are the pressurizer surge nozzle-to-safe-end weld and the hot leg surge nozzle-to-pipe weld. Based on a comparison of geometry, material properties and applicable loads, the results of the detailed evaluation of the two bounding locations are also applicable to all other in-between pipe weld locations on the surge line. The results of the crack growth for the pressurizer surge nozzle welds and hot leg surge nozzle welds are presented in Tables 1 and 2, respectively. The technical analysis of the postulated flaw tolerance evaluation is provided in Attachment 2 of this enclosure.

Table 1

Pressurizer Surge Nozzle Crack Growth Results

Flaw Type (1) (2)	Max. Flaw Length(3)			Allowable Flaw Depth		Final Flaw Depth	Final Flaw Length (2)	Allowable Operating Period	Successive Inspection Schedule (5)
	$l/\pi D$	(Deg.)	(in.)	a/t	(in.)	(in.)	(in.)	(months)	(years)
Circumferential	0.1	36	3.91	0.75	0.96	0.650	3.900	> 564(4)	10
Axial	NA	NA	2.96	0.70	0.90	0.492	2.952	324(4)	10

Table 2

Hot Leg Surge Nozzle Crack Growth Results

Flaw Type (1) (2)	Max. Flaw Length(3)			Allowable Flaw Depth		Final Flaw Depth	Final Flaw Length (2)	Allowable Operating Period	Successive Inspection Schedule (5)
	$l/\pi D$	(Deg.)	(in.)	a/t	(in.)	(in.)	(in.)	(months)	(years)
Circumferential	0.1	36	3.37	0.42	0.422	0.386	2.316	> 720	10
Axial	NA	NA	1.94	0.75	0.76	0.323	1.938	624(4)	10

Notes for Tables 1 and 2:

1. The postulated initial flaw depth is 20% of the weld thickness (i.e., 0.201 inches) and the initial flaw length is 6 times its depth (i.e., 1.206 inches) per Appendix L guidelines.
2. A constant aspect ratio (a/l) of 1/6 is used in the crack growth analysis.
3. Flaw length based on Inner Diameter (ID)
4. Maximum flaw length is reached before the allowable flaw depth.
5. Per Appendix L, if allowable operating period is equal or greater than 10 years, the successive inspection schedule shall be equal to the examination interval listed in the Turkey Point ASME Section XI schedule of Inservice Inspection (ISI) program of the component.

Per the guidelines of Appendix L, Table L-3420-1, for the allowable operating periods listed in Tables 1 and 2, the successive inspection schedule for pressurizer surge line welds is determined to be ten years for either an axial or a circumferential postulated flaw. This inspection interval will be used for all pressurizer surge line welds as noted in Table 3.

3. Aging Management Program Attributes

The key attributes of the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program that are used to describe the aging management program, are discussed below:

1. Scope of the Program
All pressurizer surge line welds listed in Table 3 will be examined in accordance with ASME Section XI, IWB for Class 1 welds. The aging effect managed with these inspections is cracking due to environmentally assisted fatigue. In each 10-year ISI interval during the period of extended operation, all surge line welds in scope will be inspected in accordance with the Turkey Point ISI Program under augmented programs.

   Based on postulated flaw tolerance analysis, and per the guidelines of ASME Code, Section XI, Appendix L, Table L-3420-1, the successive inspection schedule is determined to be ten years. This inspection interval will be used for all surge line piping welds in scope. Examination results are evaluated by qualified individuals in accordance with ASME Section XI acceptance criteria. Components with indications that do not exceed the acceptance criteria are considered acceptable for continued service.

2. Preventive Actions
There are no specific preventive actions under this program to prevent the effects of aging.

3. Parameter(s) Monitored or Inspected
Inservice examinations for the surge line welds will be a surface/volumetric examination as indicated in Table 3, "Turkey Point Units 3 and 4 Pressurizer Surge Line Welds Subject to Environmental Assisted Fatigue Inspection Program."

4. Detection of Aging Effects

   The degradation of surge line welds is determined by volumetric/surface examination in accordance with the requirements of Turkey Point ISI Program. The frequency and scope of examination are sufficient to ensure that the aging effects are detected before the integrity of the surge line welds would be compromised.

5. Monitoring and Trending

   The frequency and scope of the examinations are sufficient to ensure that the environmentally assisted fatigue aging effect is detected before the intended function of these welds would be compromised. Examinations will be performed in accordance with the inspection intervals based on the results of the postulated flaw evaluation performed in accordance to the ASME Code Section XI, Appendix L methodology.

If flaws are identified in the pressurizer surge line welds, they will be evaluated by engineering to assess the effect of environmentally assisted fatigue (EAF), and to determine its impact on the EAF analysis (Attachment 2). Records of the examination procedures, results of activities, examination datasheets, and corrective actions taken or recommended will be maintained in accordance with the requirements of Turkey Point Units 3 and 4 ISI Program for ASME Section XI requirements.

6. Acceptance Criteria
Acceptance standards for the inservice inspections are identified in Subsection IWB for Class 1 components. Table IWB-2500-1 identifies references to acceptance standards listed in IWB-3500. Relevant indications found in the surge line welds that are revealed by the inservice inspections, may require additional evaluation per the requirements of ASME Section XI, Appendix L.

   Indications that exceed the acceptance criteria are documented and evaluated in accordance with the Turkey Point Corrective Action Program. Operability of the surge line welds will require an IWB-3600 evaluation for acceptance based on engineering evaluation, repair, replacement or analytical evaluation. Repairs or replacements will be performed in accordance with ASME Section XI, Subsection IWA-4000 and IWA-6000, as described by administrative procedure 0-ADM-532, ASME Section XI Repair/Replacement Program.

7. Corrective Actions

   Action Requests (ARs) are generated in accordance with the Turkey Point Corrective Action Program for any relevant indications of degradation. Items with examination results that do not meet the acceptance criteria are subject to acceptance by evaluation and/or acceptance by repair or replacement in accordance with Subsection IWB-3600.

8. Confirmation Process
When degradation is identified in the pressurizer surge line welds, an engineering evaluation is performed to determine if the weld is acceptable for continued service or if repair or replacement is required. The engineering evaluation includes probable cause, the extent of degradation, the nature and frequency of additional examinations, and, whether repair or replacement is required.

   Repair and/or replacement are performed in accordance with the requirements of ASME Section XI, Subsections IWA-4000 and IWA- 6000, and as implemented by the Turkey Point Units 3 and 4 ISI Program and by the associated administrative procedure 0-ADM-532, ASME Section XI Repair/Replacement Program.

9. Administrative Controls
Turkey Point ISI Program will document the EAF inspection requirements for the Turkey Point Units 3 and 4 pressurizer surge line welds under the ISI Program section for Augmented Inspection Programs. In addition, a summary description of this aging management program will be included in the Updated Safety Analysis Report as a new Aging Management Program.

10. Operating Experience
A sample of the surge line welds have been examined and/or ultrasonically during the first three inservice inspection intervals in accordance with the requirements of the ASME Section XI, Subsection IWB. All surge line welds were volumetrically inspected during the fourth ISI interval and prior to entering period of extended operation. To date, no reportable indications have been found in the subject pressurizer surge line welds. The programmatic operating experience (OE) activities described in relevant station procedures ensure the adequate evaluation of operating experience on an ongoing basis to address age-related degradation and aging management for the Turkey Point Units 3 and 4 Pressurizer Surge Line Weld Inspection Program.

The proposed aging management program to examine all pressurizer surge line welds listed in Table 3, every 10 years (every ISI interval), provide reasonable assurance that potential environmental effects of fatigue will be managed such that all the pressurizer surge line welds within the scope of license renewal will continue to perform their intended functions for the extended period of operation.

Corrective actions, confirmation process and administrative controls for license renewal are in accordance with the site controlled quality assurance program pursuant to 10 CFR Part 50, Appendix B, and it covers all SSCs subject to an aging management review.

4. Implementation of Pressurizer Surge Line Welds Inspection Program

Upon approval of the proposed inspection program for the pressurizer surge line welds, related aging management program documents and the associated Updated Final Safety Analysis Report (UFSAR) sections will be updated accordingly.

5. References

1. Florida Power and Light letter to the NRC, L-2001-075, Response to Request for Additional Information for the Review of the Turkey Point Units 3 and 4 License Renewal Application, dated April 19, 2001.

2. Structural Integrity Associates Engineering Report No. 100756.401, Rev. 1, "Flaw Tolerance Evaluation of Turkey Point Surge Line Welds Using ASME Code Section XI, Appendix L" dated May 2012.

3. FPL letter L-2012-214 to the USNRC, dated May 16, 2012, License Renewal Commitment Submittal of Pressurizer Surge Line Welds Inspection Program

4. Florida Power and Light letter to the NRC, L-2012- 438, Response to Request for Additional Information for the Review of the Turkey Point Units 3 and 4 License Renewal Application.

TABLE 3

Turkey Point Units 3 and 4

Pressurizer Surge Line Welds Subject to Environmental Assisted Fatigue Inspection Program

	Unit	Weld Number	Last Examination Performed and Results	Allowable Operating Period per ASME Appendix L Analysis (See Note 1)	Proposed AMP Inspections Type & Frequency
1	**Unit 3**	**12”-RC-1301-1** RCS Hot Leg Nozzle	2004 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year
2		**12”-RC-1301-5** Surge Pipe to pipe weld	2012 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year
3		**12”-RC-1301-8** Pipe to reducer at Pressurizer	2006 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year
4		**14”-RC-1301-8A** Reducer to safe end at pressurizer Surge Nozzle	2006 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year
5		**14”- RC-1301-9** Safe End to Nozzle	2010 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year
1	**Unit 4**	**12”-RC-1401-1** At RCS Hot Leg Nozzle to pipe	2008 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year
2		**12”-RC-1401-2** Surge Pipe to pipe weld	2008 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year
3		**12”-RC-1401-4** Surge Pipe to pipe weld	2008 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10 Year
4		**12”-RC-1401-7** Surge Pipe to pipe weld	2006 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year
5		**12”-RC-1401-8** Pipe to nozzle at Pressurizer	2006 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year
6		**14”-RC-1401-8A** Reducer to safe end at Pressurizer Surge Nozzle	2006 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year
7		**14”- RC-1401-9** Safe End to Nozzle	2009 Satisfactory	Greater than 10 Yrs	Surface/Volumetric Once in 10-Year

Note 1: The inspection frequency as determined by ASME Code Section XI, Appendix L analysis is more than 10 years. In accordance to the requirements of Appendix L Table L-3420-1, the surge line welds will be examined once per 10 years, at the frequency of the Turkey Point ISI program

FPL Letter L-2012-444

ENCLOSURE 2

ATTACHMENT 3

Florida Power and Light

Turkey Point Nuclear Plant Units 3 and 4

Proposed UFSAR Update

Proposed UFSAR Update to Chapter 16.1 on the Aging Management Program (AMP) for PZR Surge Line Welds

The Turkey Point approach to address reactor water environmental effects accomplishes two objectives. First, the TLAA on fatigue design has been resolved by confirming that the original transient design limits remain valid for the 60-year operating period. Confirmation by fatigue monitoring will ensure these transient design limits are not exceeded. Second, reactor water environmental effects on fatigue life are examined using the most recent data from laboratory simulation of the reactor coolant environment.

As a part of the industry effort to address environmental effects for operating nuclear power plants during the current 40-year licensing term, Idaho National Engineering Laboratories (INEL) evaluated, in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," March 1995, fatigue-sensitive component locations at plants designed by all four U. S. Nuclear Steam Supply System (NSSS) vendors. The pressurized water reactor (PWR) calculations, especially the early-vintage Westinghouse PWR calculations, are directly relevant to Turkey Point. The description of the "Older Vintage Westinghouse Plant" evaluated in NUREG/CR-6260 matches Turkey Point with respect to design code. In addition, the transient cycles considered in the evaluation match or bound Turkey Point design.

NUREG/CR-6260 calculated fatigue usage factors for critical fatigue-sensitive component locations for the early-vintage Westinghouse plant utilizing the interim fatigue curves provided in NUREG/CR-5999, "Interim Fatigue Design Curves for Carbon, Low-Alloy, and Austenitic Stainless Steels in LWR Environments," August 1993. The results of NUREG/CR-6260 analyses were then utilized to scale up the Turkey Point plant-specific usage factors for the same locations to account for environmental effects. Generic industry studies performed by EPRI and NEI were also considered in this aspect of the evaluation, as well as environmental data that have been collected and published subsequent to the generic industry studies.

For the pressurizer surge line, FPL has previously inspected all surge line welds on both units during the fourth in-service inspection interval, and prior to entering the extended period of operation. The results of these inspections were utilized to assess fatigue of the surge lines. In addition to these inspections, environmentally assisted fatigue of the surge lines welds is addressed using the following approach:

Florida Power & Light elected to manage the effects of environmentally assisted fatigue of the pressurizer surge line welds by an aging management inspection program approved by the NRC.

The aging management of the surge line will be accomplished by a combination of flaw tolerance analysis and in-service inspection. The aging effect managed with these inspections is cracking due to environmentally assisted fatigue. The technical justification and inspection frequency are supported by the flaw tolerance analysis based on the methodology noted in ASME Section XI, Non-mandatory Appendix L, "Operating Plant Fatigue Assessment". Based on postulated flaw tolerance analysis, and per the guidelines of ASME Code, Section XI, Appendix L, Table L-3420-1, the successive inspection schedule is determined to be ten years.

All pressurizer surge line welds listed in scope of the aging management program will be examined in accordance with ASME Section XI, IWB for Class 1 welds. Inservice examinations for the surge line welds will be a surface/volumetric examination. In each 10-year ISI interval during the period of extended operation, all surge line welds will be inspected in accordance with the Turkey Point ISI Program under augmented programs.

Corrective actions, confirmation process and administrative controls related to license renewal are in accordance with the site controlled quality assurance program pursuant to 10 CFR Part 50, Appendix B, and covers all SSCs subject to an aging management review.