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

May 29, 2013

Mr. Mano Nazar
Executive Vice President and Chief Nuclear Officer
NextEra Energy
P. O. Box 14000
Juno Beach, FL 33408-0420

SUBJECT: TURKEY POINT NUCLEAR GENERATING UNITS 3 AND 4 – REVIEW OF LICENSE RENEWAL COMMITMENT FOR PRESSURIZER SURGE LINE WELDS INSPECTION PROGRAM (TAC NOS. ME8717 AND ME8718)

Dear Mr. Nazar:

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated May 16, 2012, as supplemented by letters dated December 19, 2012, April 8, 2013, and May 20, 2013, Florida Power & Light Company (the licensee) requested NRC staff review and approval of an inspection program for managing the effectives of environmentally assisted fatigue of the pressurizer surge line welds at Turkey Point Nuclear Generating Units 3 and 4. The licensee's submittal addresses a commitment described in Section 4.3.2 of NUREG 1759, "Safety Evaluation Report Related to the License Renewal of Turkey Point Nuclear Plant," dated April 2002.

The enclosure to this letter documents the NRC staff's review and assessment of the licensee's request. The NRC staff finds the proposed inspection program acceptable. The NRC staff also finds that the licensee determined an appropriate approach for addressing environmentally assisted fatigue of the pressurizer surge lines and thus fulfilled the aforementioned commitment.

Please contact Audrey Klett at (301) 415-0489 if you have any questions.

Sincerely,

Farideh E. Saba

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-250 and 50-251

Enclosure:
Request for Additional Information

cc w/enclosure: Distribution via Listserv

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REVIEW BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO LICENSE RENEWAL COMMITMENT FOR

PRESSURIZER SURGE LINE WELDS INSPECTION PROGRAM

FLORIDA POWER & LIGHT COMPANY

TURKEY POINT NUCLEAR GENERATING UNITS 3 AND 4

DOCKET NOS. 50-250 AND 50-251

1.0 INTRODUCTION

On June 6, 2002, the U.S. Nuclear Regulatory Commission (NRC) issued renewed facility operating licenses to Florida Power & Light Company (FPL, the licensee) for Turkey Point Nuclear Generating Units 3 and 4 (TPN). The NRC staff's review of FPL's license renewal application (LRA) is documented in NUREG-1759, "Safety Evaluation Report Related to the License Renewal of Turkey Point Nuclear Plant, Units 3 and 4" (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML021280496 and ML021280532), and its supplement (ADAMS Accession No. ML021560094). As discussed in Section 4.3.2 of NUREG-1759, the licensee identified environmentally assisted fatigue as an aging effect requiring management for the pressurizer surge lines. To manage this aging effect, in a letter dated April 19, 2001 (ADAMS Accession No. ML011170195), the licensee stated that it would inspect all of the pressurizer surge line welds in both units during the fourth inservice inspection intervals and prior to entering the period of extended operation (PEO). The licensee committed to use the results of these inspections to address environmentally assisted fatigue of the pressurizer surge lines through any one or a combination of these four options: (1) further refinement of the fatigue analysis to lower the cumulative usage factors to below one, (2) repair of the affected locations, (3) replacement of the affected locations, or (4) management of the effects of fatigue by an NRC-approved inspection program. The NRC staff accepted this approach, and the licensee subsequently captured the commitment in Section 16.3.2.5 of its updated final safety analysis report (UFSAR).

By letter to the NRC dated May 16, 2012 (ADAMS Accession No. ML12152A156), the licensee stated that it had completed the inspections of the pressurizer surge lines and, in accordance with the fourth option described in the April 19, 2001, letter and UFSAR Section 16.3.2.5, the licensee provided a proposed inspection program for NRC review and approval. By letters dated December 13, 2012 (ADAMS Accession No. ML12340A089), and May 6, 2013 (ADAMS Accession No. ML13122A386), the NRC staff issued requests for additional information (RAIs) to complete its review of the licensee's submittal. By letters dated December 19, 2012 (ADAMS

Accession No. ML12361A260), April 8, 2013 (ADAMS Accession No. ML13114A260), and May 20, 2013, the licensee responded to the RAIs and supplemented the submittal.

2.0 REGULATORY EVALUATION

2.1 Background Information

The licensee's submittal proposes an inspection program for managing the effects of environmentally assisted fatigue of the pressurizer surge line piping in both Units 3 and 4. According to Chapter 4 of the TPN UFSAR, the pressurizer surge line is part of each unit's reactor coolant system. The surge line connects the pressurizer to the hot leg of one of the three reactor coolant loops. The pressurizer controls pressure within the reactor coolant system to minimize variations caused by the contraction and expansion of the reactor coolant. Heaters control pressure by forming steam inside the pressurizer, and a spray system controls pressure by condensing steam. The pressurizer also accommodates surges caused by load transients. During a positive surge, which results from a decrease in unit load, the spray system condenses steam in the pressurizer to prevent the pressure from reaching the set point of the relief valves. During a negative surge, which results from an increase in unit load, the flashing of water to steam and the generation of steam by the heaters keep the pressure above the minimum limit. The piping and the welded joints and connections are austenitic stainless steel.

Fatigue is an aging mechanism that can lead to degradation from cracking, and nuclear power plant designs account for this phenomenon. For example, American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Section III, "Rules for Construction of Nuclear Facility Components," requires a fatigue analysis for Class 1 components unless exempted under certain provisions. This analysis must consider transient loads and involves calculation of a cumulative usage factor to estimate the extent of fatigue damage for a given component. An acceptable design has a cumulative usage factor less than or equal to one, which provides assurance that no crack will form based on the assumed number of transient cycles and loads. A component with a cumulative usage factor greater than one indicates that a crack may form. If unmanaged, such a crack could propagate under fatigue loading and eventually lead to failure of the component. Environmentally assisted fatigue refers to the effect that the reactor coolant environment has on the fatigue life of a component. Calculations that supported resolution of Generic Safety Issue 190, "Fatigue Evaluation of Metal Components for 60-Year Plant Life," indicate that the frequency of pipe leaks caused by environmentally assisted fatigue could increase with extended periods of plant operation. As such, the effect of the reactor coolant environment on component fatigue life is an area of review for license renewal.

2.2 Applicable Regulations and Guidance

Inservice inspection requirements for nuclear power plant components are outlined in ASME 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." ASME Code Section XI, Subsubarticle IWA-2430, specifies plant inservice inspection intervals as every ten years beginning from the start of commercial service. The NRC incorporates the requirements of ASME Code Section XI, subject to certain conditions, by reference in 10 CFR 50.55a. The NRC also periodically revises these regulations to endorse newer editions and addenda. Pursuant to 10 CFR 50.55a(g)(4), a nuclear power plant licensee is required to

update its ASME Code Section XI edition and addenda of record to the most recent NRC-endorsed versions referenced in 10 CFR 50.55a. This update is required one year prior to entering each inservice inspection interval. Currently, 10 CFR 50.55a endorses use of the 1970 Edition through the 1976 Winter Addenda and the 1977 Edition through the 2007 Edition with the 2008 Addenda of ASME Code Section XI. The NRC noticed this endorsement on June 21, 2011, at Volume 76, page 36232, of the *Federal Register* (76 FR 36232).

Revision 2 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," (SRP-LR) dated December 2010 (ADAMS Accession No. ML103490036), provides guidance for NRC staff review of aging management programs for license renewal. Section A.1.2.2 of the SRP-LR states that an acceptable aging management program should consist of these ten elements:

(1) scope of program
(2) preventive actions
(3) parameters monitored or inspected
(4) detection of aging effects
(5) monitoring and trending
(6) acceptance criteria
(7) corrective actions
(8) confirmation process
(9) administrative controls
(10) operating experience

3.0 TECHNICAL EVALUATION

Section 3.0 of Attachment 1 to the licensee's submittal describes the Turkey Point Units 3 and 4 Pressurizer Surge Line Welds Inspection Program (surge line inspection program). This program relies on periodic inspections to detect cracks in the pressurizer surge line welds. The program is separate from and augments the inservice inspections specified by ASME Code Section XI. The frequency of the inspections under the surge line inspection program is based on a flaw tolerance evaluation per the procedures of ASME Code Section XI, Appendix L, "Operating Plant Fatigue Assessment," from the 2001 Edition with the 2002 and 2003 Addenda. Attachment 2 to the submittal provides a report which describes the flaw tolerance evaluation. The submittal describes the surge line inspection program in terms of the 10 elements of an aging management program from the SRP-LR.

The NRC staff reviewed the licensee's submittal, as supplemented and amended in response to the NRC staff's RAIs, to determine whether the proposed program will adequately manage cracking caused by environmentally assisted fatigue and therefore fulfill the commitment in Section 16.3.2.5 of the TPN UFSAR. The NRC staff reviewed the program description against the aging management program element criteria in the Section A.1.2.3 of the SRP-LR. The NRC staff reviewed the supporting flaw tolerance evaluation against the requirements of the 2001 Edition with the 2002 and 2003 Addenda of ASME Code Section XI.

3.1 Scope of Program

Section 3.0 of Attachment 1 to the submittal states that the scope of the surge line inspection program includes five pressurizer surge line welds in Unit 3 and seven pressurizer surge line welds in Unit 4. In Unit 3, the specific weld component identification numbers are: 12"-RC-1301-1, 12"-RC-1301-5, 12"-RC-1301-8, 14"-RC-1301-8A, and 14"-RC-1301-9. In Unit 4 the specific weld component identification numbers are: 12"-RC-1401-1, 12"-RC-1401-2, 12"-RC-1401-4, 12"-RC-1401-7, 12"-RC-1401-8, 14"-RC-1401-8A, and 14"-RC-1401-9. The submittal states that all of these welds will be examined under the surge line inspection program to manage cracking caused by environmentally assisted fatigue.

The NRC staff evaluated the "scope of program" element of the surge line inspection program against the criteria in Section A.1.2.3.1 of the SRP-LR. The SRP-LR states that the specific program should be identified and the scope should include the specific structures and components, the aging of which the program manages. The licensee submitted the surge line inspection program to fulfill the commitment in Section 16.3.2.5 of the TPN UFSAR regarding environmentally assisted fatigue of the pressurizer surge lines. As such, the NRC staff finds that the licensee has appropriately identified the specific aging management program. In addition, the scope of the surge line inspection program focuses on the welds in the pressurizer surge lines. The NRC staff notes that in general, welds are more susceptible to fatigue; therefore, the NRC staff determined that the type of component included within the scope of the program is appropriate.

The UFSAR states that the licensee will inspect all of the pressurizer surge line welds on both units during the fourth inservice inspection intervals and use the results to assess the effects of environmentally assisted fatigue. The NRC staff compared the specific welds included within the scope of the surge line inspection program to those included in the licensee's fourth interval inservice inspection program to determine whether the surge line inspection program omits any welds. By letter dated March 11, 2004 (ADAMS Accession No. ML040860092), the licensee transmitted the inservice inspection program for the fourth interval to the NRC. Enclosure 2 (ADAMS Accession No. ML040860137) to that letter provides the inservice inspection plan and schedule for Unit 4; Enclosure 3 (ADAMS Accession No. ML041040234) provides the inservice inspection plan and schedule for Unit 3. The NRC staff reviewed these documents and found that the scope of the surge line inspection program is consistent with the inservice inspection plan for Unit 4; however, the NRC staff found a potential inconsistency for Unit 3. Specifically, the inservice inspection plan for Unit 3 identifies six pressurizer surge line welds; however, the scope of the surge line inspection program only includes five welds. The apparent discrepancy concerns the 12"-RC-1301-7 pipe-to-pipe weld. Because the submittal did not address this particular weld, the NRC staff could not determine whether the scope of the surge line inspection program was consistent with the scope of the commitment. The submittal also did not describe the fourth interval inspection results for this particular weld. Therefore, the licensee's submittal was not clear as to whether the licensee had considered these results, per the commitment, in order to demonstrate that the surge line inspection program will adequately manage the effects of environmentally assisted fatigue.

In RAI 1, the NRC staff requested the licensee to clarify whether the 12"-RC-1301-7 weld is part of the Unit 3 pressurizer surge line. The NRC staff also requested the licensee to indicate whether there are any additional pressurizer surge line welds in Units 3 and 4 not identified in the submittal that are within the scope of the surge line inspection program. In response, the

licensee clarified that there is no 12"-RC-1301-7 weld in Unit 3. The licensee explained that a plant isometric drawing had identified this weld, but a walk-down in 2001 found that there was no actual weld at this location. In addition, the licensee confirmed that the original submittal identifies all of the pressurizer surge line welds in both units and that it had examined all these welds in the fourth inservice inspection interval. The NRC staff reviewed the licensee's response to RAI 1 and determined that the scope of the surge line inspection program includes all pressurizer surge line welds in both units, which is consistent with the scope of the commitment in Section 16.3.2 of the TPN UFSAR. As such, the scope of the program is comprehensive because it includes all pressurizer surge line welds susceptible to the effects of environmentally assisted fatigue. The issue raised by the NRC staff in RAI 1 is therefore resolved.

Based on its review of the licensee's submittal and response to RAI 1, the NRC staff finds that the "scope of the program" element is acceptable because it satisfies the criteria in the Section A.1.2.3.1 of the SRP-LR.

3.2 Preventive Actions

Section 3.0 of Attachment 1 to the submittal states that there are no specific preventive actions as part of the surge line inspection program. The NRC staff evaluated the "preventive actions" element of the surge line inspection program against the criteria in Section A.1.2.3.2 of the SRP-LR. The SRP-LR states that some condition or performance monitoring programs may not rely on preventive actions. Section A.1.1 of the SRP-LR describes the general types of aging management programs and states that condition monitoring programs inspect for the presence and extent of aging effects. Based on this description, the NRC staff determined that the surge line inspection program is of the condition monitoring type because it relies on examinations to detect cracks before they compromise the integrity of the pressurizer surge line welds. Therefore, the NRC staff determined that no preventive actions are necessary as part of this particular program. Based on its review of the licensee's submittal, the NRC staff finds that the criteria in Section A.1.2.3.2 of the SRP-LR regarding "preventive actions" are satisfied.

3.3 Parameters Monitored or Inspected

Section 3.0 of Attachment 1 to the submittal states that the examinations of the pressurizer surge line welds will be volumetric. This section also states that the aging effect managed by the program is cracking caused by environmentally assisted fatigue.

The NRC staff evaluated the "parameters monitored or inspected" element of the surge line inspection program against the criteria in Section A.1.2.3.3 of the SRP-LR. The SRP-LR states that the aging effects managed by the program should be identified and a link should be provided between the parameters that will be monitored and how the monitoring of these parameters will ensure adequate aging management. For condition monitoring programs, the SRP-LR further states that the parameters monitored or inspected should be capable of detecting the presence and extent of aging effects. The proposed surge line inspection program relies on volumetric examinations to detect cracks that may be formed because of environmentally assisted fatigue. The NRC staff determined that the use of volumetric examinations, such as ultrasonic and radiographic tests, is acceptable because, when performed in accordance with ASME Code Section XI, these examinations are capable of detecting discontinuities, such as cracks, that initiate from the inside diameter of welds in piping.

The inside diameters of the pressurizer surge line welds are exposed to reactor coolant, which contributes to environmentally assisted fatigue. Therefore, the NRC staff determined that there is a direct link between the parameters monitored or inspected by the program and the aging effects it manages.

Based on its review of the licensee's submittal, the NRC staff finds that the "parameters monitored or inspected" element of the surge line inspection program is acceptable because it satisfies the criteria in Section A.1.2.3.3 of the SRP-LR.

3.4 Detection of Aging Effects

Section 3.0 of Attachment 1 to the submittal states that the surge line inspection program will detect degradation of the pressurizer surge line welds by volumetric examinations performed in accordance with the plant inservice inspection program. The submittal states that the inspection schedule will be every ten years, as determined by a flaw tolerance evaluation per the guidelines of ASME Code Section XI, Appendix L. Attachment 2 to the submittal contains a report that summarizes the flaw tolerance evaluation.

The NRC staff evaluated the "detection of aging effects" element of the surge line inspection program against the criteria in Section A.1.2.3.4 of the SRP-LR. The SRP-LR states that the detection of aging effects should occur before there is a loss of the structure-intended and component-intended functions. For condition monitoring programs, the SRP-LR states that justification should be provided for the inspection technique and frequency. The SRP-LR also states that a basis should be provided for the inspection population and sample size when sampling is used to represent a larger population of components. The NRC staff based its evaluation of the "detection of aging effects" element on the SRP-LR criteria for inspection frequency, inspection technique, and sampling basis as follows.

3.4.1 Inspection Frequency

For condition monitoring programs such as the surge line inspection program, the SRP-LR states that justification should be provided, including references to codes and standards, that the inspection frequency is adequate to detect the aging effects before a loss of intended function. The inspection frequency of the surge line inspection program is based on a flaw tolerance evaluation per the procedures in ASME Code Section XI, Appendix L. As described in Attachment 2 to the submittal, the licensee used the procedures from the 2001 Edition with the 2002 and 2003 Addenda of ASME Code Section XI. According to its letter dated March 11, 2004, the licensee currently uses the 1998 Edition with the 1999 and 2000 Addenda of ASME Code Section XI. The NRC staff compared this version against the version used in the licensee's flaw tolerance evaluation and found no differences with respect to the content of ASME Code Section XI, Appendix L. Furthermore, on October 1, 2004, at 69 FR 58804, the NRC amended the requirements of 10 CFR 50.55a(b)(2) to incorporate by reference the 2001 Edition and the 2002 and 2003 Addenda of ASME Code Section XI. This rulemaking places no modifications or limitations on ASME Code Section XI, Appendix L; therefore, the NRC staff determined that the licensee's use of this specific edition and addenda for the flaw tolerance evaluation is acceptable.

ASME Code Section XI, Subsubarticle L-3110, outlines the general procedures for a flaw tolerance evaluation. The NRC staff reviewed the report documenting the flaw tolerance

evaluation to determine if the licensee completed the evaluation in accordance with the procedures in ASME Code Section XI, Appendix L. Based on its review, the NRC staff determined that the licensee completed the flaw tolerance evaluation accordingly; however, the NRC staff needed additional information from the licensee to justify certain parts of its approach for the evaluation.

Per ASME Code Section XI, Subparagraph L-3110(c), part of the flaw tolerance evaluation is to determine the stresses at the locations of the postulated flaws under normal operating (including upset and test), emergency, and faulted conditions. In accordance with ASME Code Section XI, Subarticle L-3300, the evaluation shall use the loadings in the design specification and plant-specific loading cycles consistent with the plant design and operating practices. Section 3.1 of Attachment 2 to the submittal states that the licensee created finite element models to determine the stresses at two critical weld locations: (1) the pressurizer surge line nozzle-to-safe-end weld, and (2) the hot leg surge line nozzle-to-pipe weld. Section 1.0 of Attachment 2 to the submittal states that these locations are critical because the calculated cumulative usage factors exceed the allowable values when environmentally assisted fatigue is considered. The submittal states that the evaluations at these locations bound the other weld locations on the pressurizer surge lines. As such, the inspection frequency for all of the pressurizer surge line welds is based on the flaw tolerance evaluations for the two critical weld locations. However, the NRC staff determined that the licensee did not fully justify why these two weld locations bound locations for all of the other pressurizer surge line welds. In addition, the licensee did not separately analyze the critical weld locations for each unit. Therefore, the licensee's submittal was not clear as to why the analyses for the two critical weld locations represent all other locations in each unit. In RAI 7, the NRC staff requested the licensee to justify that the flaw tolerance evaluations for the critical weld locations bound all other welds in the pressurizer surge lines. The NRC staff also requested the licensee to justify why the analyses are representative of each unit.

In response to RAI 7, the licensee stated that it used plant-specific calculations to determine the piping interface loads, such as deadweight, thermal, operating basis earthquake, safe shutdown earthquake, and stratification. The licensee also stated that these loads apply to both units and bound the loads for the welds in proximity to the critical weld locations. In addition, the licensee stated that the analyses of the critical weld locations are representative of those locations in each unit because the same in-surge and out-surge events apply to all of the pressurizer surge line welds. The licensee explained that, during an in-surge, the temperature at the pressurizer surge line nozzle-to-safe-end weld ramps down to the hot leg temperature, and during an out-surge, the temperature at the hot leg surge line nozzle-to-pipe weld ramps up to the pressurizer temperature. The NRC staff reviewed the response and finds it acceptable because the licensee determined the critical locations through actual plant-specific calculations. In addition, the NRC staff agrees that the transient loads at the critical locations are representative of loads at other locations because the critical locations are at separate ends of the pressurizer surge line and thus subject to the temperature change extremes during in-surge and out-surge transients. As such, the NRC staff determined that the licensee's approach for establishing the inspection interval based on analysis of welds at the critical locations is appropriate because they are more susceptible to cracking from environmentally assisted fatigue. The issue identified by the NRC staff in RAI 7 is therefore resolved.

The NRC staff also reviewed the transients included in the licensee's stress analysis. Tables 1, 2, and 3 of Attachment 2 to the submittal list the specific transients that were considered.

UFSAR Table 4.1-8 also lists the plant design and thermal loading cycles, which are valid through the period of extended operation. The NRC staff compared the cycles from the UFSAR with the cycles included in the stress analysis to determine if the analysis is consistent with the licensing bases for the units. Table 1 of Attachment 2 to the submittal lists 600 cycles for both the plant heat-up transient and the plant cool-down transient for the pressurizer surge line nozzle-to-safe-end weld. However, the NRC staff found that, for these same transients, UFSAR Table 4.1-8 only identifies 200 cycles, which equates to a 400-cycle difference between the licensing basis and licensee's analysis. Therefore, in RAI 8 the NRC staff requested the licensee to provide a justification for the difference.

In response to RAI 8, the licensee stated that the 200 cycles from the UFSAR are for the pressurizer and do not include cycles at the pressurizer surge line nozzle-to-safe-end weld for in-surge and out-surge events associated with plant heat-ups and cool-downs. The licensee stated that its modified operating procedures specify 1163 cycles for these events based on vendor reports. The licensee stated that it conservatively assumed a total of 1200 cycles (600 for heat-up and 600 for cool-down) for the finite element analysis. The NRC staff reviewed the licensee's response and finds it acceptable because the transient cycles used in the stress analysis are consistent with the UFSAR and also include additional cycles from in-surge and out-surge events that, per plant procedures, specifically apply to the pressurizer surge line nozzle-to-safe-end weld. The issue identified by the NRC staff in RAI 8 is therefore resolved.

Additionally, per ASME Code Section XI, Subparagraph L-3110(d), part of the flaw tolerance evaluation is to determine the postulated end-of-evaluation-period flaw sizes and critical flaw sizes using analytical procedures. Specifically, for austenitic stainless steel piping, ASME Code Section XI, Paragraph L-3331, states that the evaluation procedures in ASME Code Section XI, Appendix C, are to be used. Section 3.2 of Attachment 2 to the submittal states that the licensee used these procedures to determine the critical flaw sizes for the postulated axial and circumferential flaws for the critical weld locations and then determined the allowable surface flaws based on the critical flaw sizes with consideration of structural margins for different plant operating conditions. The submittal also states that the licensee calculated the crack growth in these Type 316 and Type 304 stainless steel welds using a formulation in a publication by W. J. Mills, ("Critical Review of Fatigue Crack Growth Rates for Stainless Steel in Deaerated Water - Parts 1 and 2," Electric Power Research Institute MRP-2010 Conference and Exhibition: Materials Reliability in PWR Nuclear Power Plants, Colorado Springs, CO, June 28 – July 1, 2010).

ASME Code Section XI, Subsubarticle C-8410, describes the parameters for the fatigue crack growth behavior of austenitic stainless steel 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. However, the NRC staff determined that 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. Therefore, in RAI 2, the NRC staff requested the licensee to provide a technical basis to justify that use of the referenced formulation is conservative with respect to calculation of the fatigue crack growth rate in a pressurized water reactor environment.

In response to RAI 2, the licensee stated that the referenced W. J. Mills formulation is based on work used to derive reference fatigue crack growth curves for austenitic stainless steels in pressurized water reactor environments. The licensee also compared the W. J. Mills formulation with another formulation for fatigue crack growth rates (Journal of Pressure Vessel Technology, Volume 108, Number 3, dated August 1986, article entitled, "Evaluation of Flaws in Austenitic Piping"). For a pressurized water reactor environment, this article recommends use of a fatigue crack growth rate that is twice the rate in air. The licensee provided two figures to compare the crack growth rates produced by the different formulations. The figures plot crack growth rate curves against various stress intensity factor ranges (ΔK values) based on the same material and temperature, but different ratios of the minimum stress intensity factor to the maximum stress intensity factor (R-ratios). Using the W. J. Mills formulation, the licensee plotted high and low rise times to show their effect on the crack growth rate. The results provided by the licensee show that the crack growth rate increases with higher rise times. The licensee stated that, for a relatively high rise time of 12,000 seconds and for ΔK values less than 70 ksi-in$^{1/2}$, the W. J. Mills formulation yields more conservative (i.e., faster) crack growth rates than the formulation based on twice the crack growth rate in air. The licensee indicated that the figures bound the flaw tolerance evaluation because the licensee used a conservatively large rise time of 15,732 seconds for all of the cyclic loads and the maximum ΔK was 39.3 ksi-in$^{1/2}$.

The NRC staff reviewed the response to RAI 2. The NRC staff determined that the licensee's comparison is appropriate because it covers the range of possible R-ratio values and demonstrates that, for the rise times and ΔK values used in the evaluation for the critical pressurizer surge line welds, the resulting fatigue crack growth rates from the W. J. Mills formulation are more conservative than the crack growth rates from the formulation based on twice the crack growth rate in air. The NRC staff also determined that the pressurized water reactor environment fatigue crack growth rate based on twice the crack growth rate in air is a reasonable basis for comparison because it has been used by the industry to account for the effects of the reactor coolant environment on crack growth rates. Furthermore, the shortest allowable operating periods determined from the fatigue crack growth analysis are greater than the program's inspection frequency. Specifically, for the pressurizer surge line nozzle-to-safe-end weld, the postulated axial flaw length will reach the maximum allowable length in 27 years; for the hot leg surge line nozzle-to-pipe weld, the postulated axial flaw length will reach the maximum allowable length in 52 years. The submittal states that the licensee determined a 10-year successive inspection schedule based on these calculated allowable operating periods in accordance with ASME Code Section XI, Subsubarticle L-3420. The margin between the proposed inspection interval and growth of the potential limiting flaws provides additional conservatism. Overall, the NRC staff determined that the licensee's approach is conservative and, as such, use of the crack growth rates from the W. J. Mills formulation is reasonable for this plant-specific application to the pressurizer surge line welds. The issue identified by the NRC staff in RAI 2 is therefore resolved.

In addition, ASME Code 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 caused by fatigue and stress corrosion cracking. According to LRA Section 3.2.1.1, Class 1 stainless steel piping components in the reactor coolant system, which includes the pressurizer, are subject to cracking caused by fatigue flaw growth as well as stress corrosion cracking. As such, the pressurizer surge line piping components could be subject to stress corrosion cracking, but the

licensee's submittal was not clear as to whether the licensee considered stress corrosion cracking in the flaw growth calculation consistent with ASME Code Section XI, Subsubarticle C-3230. In RAI 3, the NRC staff requested the licensee to describe how, and justify that, the flaw growth evaluation accounted for the effects of stress corrosion cracking. Alternatively, the NRC staff requested the licensee to provide a technical basis for not considering the effects of stress corrosion cracking in the flaw growth evaluation for the pressurizer surge line welds.

In response to RAI 3, the licensee stated that crack growth rates for stress corrosion cracking of austenitic stainless steels in a pressurized water reactor environment are of little engineering significance for welded components or weld metals. The licensee supported this statement by citing data from several different technical references. Based on data from one reference, the licensee stated that the weld sensitized heat affected zone adjacent to the stainless steel pressurizer surge line welds would have a significantly lower crack growth rate caused by stress corrosion cracking as compared to a non-sensitized stainless steel. The licensee highlighted from this data that the measured crack growth rate for a sensitized stainless steel weld is approximately $1x10^{-9}$ mm/s, which the licensee stated is equivalent to a 300-year component life. In addition, concerning the effects of temperature, the licensee referenced data which shows for Type 316 stainless steel that the crack growth rates increase with increasing temperature, but reach a maximum value after which the crack growth rate decreases significantly. Furthermore, the licensee stated that the stainless weld metals also have a high resistance to stress corrosion cracking, which is a strong function of the weld material microstructure. The licensee referenced a study which shows that resistance is a function of the chemistry of the alloy, primarily the carbon content, and the amount and distribution of ferrite particles. The licensee also presented data from another study which shows failures and non-failures caused by stress corrosion cracking based on carbon and ferrite content. These data show that there are no stress corrosion cracking failures below 0.035 percent carbon and above 5 percent ferrite. The licensee stated that the pressurizer surge line weld materials fall within this range.

The NRC staff reviewed the licensee's response to RAI 3 and determined that it provides a reasonable basis for not including the contribution of stress corrosion cracking to the crack growth rate calculations. The licensee's response, as supported by several technical references, indicates that stress corrosion cracking would have a negligible effect on this plant-specific flaw tolerance evaluation for the pressurizer surge line welds. The issue identified by the NRC staff in RAI 3 is therefore resolved.

Based on its review, the NRC staff determined that the 10-year inspection frequency is adequate for detecting cracking caused by environmentally assisted fatigue of the pressurizer surge line welds before there is a loss of intended function because (1) it is based on a flaw tolerance evaluation performed in accordance with ASME Code Section XI, Appendix L; (2) the fatigue crack growth rates used in the evaluation acceptably account for the effects of the reactor coolant environment; and (3) there is margin between the inspection frequency and the shortest allowable operating period for the most limiting flaw assumed in the evaluation.

3.4.2 Inspection Technique

For condition monitoring programs such as the surge line inspection program, the SRP-LR states that justification should be provided, including references to applicable codes and standards, that the inspection technique is adequate to detect the effects of aging. Under

"detection of aging effects," Section 3.0 of Attachment 1 to the submittal states that the licensee will determine if there is degradation of the pressurizer surge line welds by volumetric examinations performed in accordance with the requirements of its inservice inspection program. In addition, under "scope of the program," the submittal states that the licensee will examine the pressurizer surge line welds in accordance with the risk-informed inservice inspection programs for Class 1 piping welds. The submittal states that the risk-informed inspections are alternatives to the requirements of ASME Code Section XI, and the NRC approved them for the fourth inservice inspection intervals in a safety evaluation dated December 9, 2008 (ADAMS Accession No. ML083250173). The submittal states that, accordingly, the examination method will be volumetric only as per Category R-A, Item R1.1, of the ASME Code Case N-577-1, "Risk-Informed Requirements for Class 1, 2, or 3 Piping, Method A Section XI, Division 1."

The submittal states that ASME Code Case N-577-1 is the basis for the inspection technique; however, as stated in NRC Regulatory Guide 1.193, Revision 3, "ASME Code Cases Not Approved for Use," dated October 2010 (ADAMS Accession No. ML101800540), this particular code case is not approved. In addition, the NRC's December 9, 2008, safety evaluation only approves use of the risk-informed inservice inspection programs for the fourth inservice inspection intervals, which end in 2014. Therefore, the NRC staff determined that the submittal is not clear on the examination methods for the fifth and sixth inservice inspection intervals. Based on this information, the licensee's basis for the inspection techniques could not be determined. In RAI 6, the NRC staff requested the licensee to clarify the examination methods and justify how they will detect the aging effects before there is a loss of intended function. In addition, the NRC staff requested the licensee to provide references to the applicable provisions in ASME Code Section XI if the licensee will perform the examinations in accordance with these provisions.

In its response to RAI 6, the licensee stated that it will perform "surface/volumetric" examinations of all the pressurizer surge line welds in accordance with the provisions of ASME Code Section XI, Subsection IWB, in the fifth and sixth inservice inspection intervals. The licensee also revised the "scope of program" and "detection of aging effects" elements to delete references to the risk-informed inspection program bases and to clarify that the inspections will be in accordance with ASME Code Section XI, Subsection IWB. The NRC staff reviewed the licensee's response to RAI 6 and determined that it is not clear as to whether "surface/volumetric" means a surface inspection, a volumetric inspection, or both. Therefore, in a follow-up RAI sent on May 6, 2013, the NRC staff requested the licensee to specify for each weld within the scope of the program whether the examinations will be surface, volumetric, or both. The NRC staff also requested the licensee to revise the program description, as necessary.

In its May 20, 2013, response to the NRC staff's follow-up RAI, the licensee clarified that the examinations of all the pressurizer surge line welds will be both surface and volumetric in accordance with ASME Code Section XI, Subsection IWB. The licensee also incorporated this clarification in the program description. The NRC staff reviewed the response to the follow-up RAI and finds it acceptable because the examinations will be conducted in accordance with the provisions of ASME Code Section XI, Subsection IWB, and such examinations are adequate to detect cracking of the pressurizer surge line welds. As discussed in its evaluation of the "parameters monitored or inspected" element, the NRC staff determined that volumetric examinations are capable of detecting discontinuities, such as cracks, that initiate from the

inside diameter of welds in piping. The inside diameter of the pressurizer surge line piping is exposed to the reactor coolant; therefore, it is most susceptible to cracking caused by environmentally assisted fatigue, which is the aging effect managed by the surge line inspection program. The NRC staff also determined that the surface examinations will provide additional indications of any cracks from environmentally assisted fatigue that may initiate on the inside diameter of the piping and propagate to the outside diameter. In addition, conducting the surface and volumetric examinations in accordance with ASME Code Section XI, Subarticle IWB, is appropriate because this subsection applies to Class 1 piping and because the NRC endorses ASME Code Section XI in 10 CFR 50.55a. As such, the NRC staff determined that the licensee provided adequate justification that these inspection techniques will detect cracking caused by environmentally assisted fatigue. The issues raised by the NRC staff in RAI 6 and the follow-up RAI sent by letter dated May 6, 2013, are therefore resolved.

3.4.3 Sampling Basis

For condition monitoring programs such as the surge line inspection program, Section A.1.2.3.4 of the SRP-LR states that a basis should be provided for the inspection population and sample size when sampling is used to represent a larger population of components, and the samples should be biased toward the locations most susceptible to the aging effects of concern. Because Section 3.0 of Attachment 1 to the submittal states that the licensee will examine all of the pressurizer surge line welds, the NRC staff determined that the surge line inspection program does not rely on sampling. In addition, as discussed in its evaluation of the "scope of the program" element, the NRC staff determined that the welds are the components in the pressurizer surge line that are most susceptible to environmentally assisted fatigue. As such, the NRC staff determined that the inspections will focus on the pressurizer surge line components that are most susceptible to the aging effect of concern.

3.4.4 Summary for Detection of Aging Effects

Based on its review of the licensee's submittal, responses to RAIs 2, 3, 6, 7, and 8, and the May 20, 2013, response to the May 6, 2013, follow-up RAI, the NRC staff finds that the "detection of aging effects" element of the surge line inspection program is acceptable because it satisfies the criteria in Section A.1.2.3.4 of the SRP-LR.

3.5 Monitoring and Trending

Section 3.0 of Attachment 1 to the submittal describes the "monitoring and trending" element of the surge line inspection program. The submittal states that the frequency and scope of examinations under the program ensure the detection of cracking caused by environmentally assisted fatigue before it compromises the intended function of the pressurizer surge line welds. The submittal also states that the inspection intervals are based on a postulated flaw tolerance evaluation per the methodology in ASME Code Section XI, Appendix L. In addition, the submittal states that flaws found through the examinations will be evaluated by the licensee to assess the effects of environmentally assisted fatigue and its impact on the flaw tolerance evaluation.

The NRC staff evaluated the "monitoring and trending" element of the surge line inspection program against the criteria in Section A.1.2.3.5 of the SRP-LR. The SRP-LR states that the monitoring and trending activities should predict the extent of degradation and affect timely

corrective or mitigative actions. The SRP-LR also states that the inspection results should be evaluated against the acceptance criteria, and the rate of degradation should be predicted to confirm that the next scheduled inspection will occur before a loss of intended function. The licensee's proposed program will monitor degradation of the pressurizer surge line welds through periodic inspections, and the frequency of these inspections will be every 10 years based on the licensee's flaw tolerance evaluation. As discussed in its evaluation of the "detection of aging effects" program element, the NRC staff determined that this flaw tolerance evaluation per the procedures of ASME Code Section XI, Appendix L, is acceptable to predict the fatigue growth of postulated flaws in the pressurizer surge line welds and to establish an appropriate inspection frequency to detect any actual flaws. In addition, the NRC staff determined that the provision to assess actual flaws for impacts to the flaw tolerance evaluation will ensure that the evaluation will remain a valid basis for scheduling future inspections. These monitoring and trending activities are acceptable because they will ensure that inspections occur in time to detect any actual cracking caused by environmentally assisted fatigue before there is a loss of a pressurizer surge line intended function.

Based on its review of the licensee's submittal, the NRC staff finds that the "monitoring and trending" element of the surge line inspection program is acceptable because it satisfies the criteria in Section A.1.2.3.5 of the SRP-LR.

3.6 Acceptance Criteria

Section 3.0 of Attachment 1 to the submittal describes the "acceptance criteria" element of the surge line inspection program. The submittal states that the acceptance criteria are from ASME Code Section XI, Subarticle IWB-3500, and the licensee will document and evaluate any indications that exceed these criteria in accordance with its corrective action program. The submittal also states that relevant indications found in the pressurizer surge line welds may require further evaluation per ASME Code Section XI, Appendix L. In addition, the submittal states that continued operability of the welds will be assessed based on engineering evaluation, repair, replacement, or analytical evaluation in accordance with ASME Code Section XI, Subarticle IWB-3600.

The NRC staff evaluated the "acceptance criteria" element of the surge line inspection program against the criteria in Section A.1.2.3.6 of the SRP-LR. The SRP-LR states that the acceptance criteria, against which the need for corrective actions are evaluated, should ensure that the structure-intended and component-intended functions are maintained consistent with all current licensing basis design conditions during the PEO. The SRP-LR also states that it is not necessary to justify acceptance criteria established in NRC-accepted or NRC-endorsed methodologies, such as codes and standards, because the NRC has already reviewed and approved these criteria. The acceptance criteria for the surge line inspection program are directly from ASME Code Section XI, Subsection IWB. This subsection applies to Class 1 piping, which is the classification of the pressurizer surge line welds. Therefore, the NRC staff determined that use of the acceptance standards in ASME Code Section XI, Subarticle IWB-3500, and the analytical evaluation criteria in ASME Code Section XI, Subarticle IWB-3600, is acceptable because the NRC has approved and endorses them in 10 CFR 50.55a.

Based on its review of the licensee's submittal, the NRC staff finds that the "acceptance criteria" element of the surge line inspection program is acceptable because it satisfies the criteria in Section A.1.2.3.6 of the SRP-LR.

3.7 Corrective Actions

Section 3.0 of Attachment 1 to the submittal describes the "corrective actions" element of the surge line inspection program. The submittal states that the licensee will generate action requests in accordance with its corrective action program for any relevant indications of degradation found through implementation of the program. Also, as part of the response to RAI 5, the licensee stated that the corrective actions will be in accordance with the site quality assurance program, which implements the requirements of 10 CFR Part 50, Appendix B, and applies to all of the pressurizer surge line welds. Section 3.9 of this safety evaluation discusses RAI 5.

The NRC staff evaluated the "corrective actions" element of the surge line inspection program against the criteria in Section A.1.2.3.7 of the SRP-LR. The SRP-LR states that corrective actions, including root cause determination and prevention of recurrence, should be timely. For safety-related components, the SRP-LR states that the 10 CFR Part 50, Appendix B, quality assurance program is an acceptable means to confirm that the corrective actions are completed in a manner consistent with the aging management program. Per the definitions in 10 CFR 50.2, safety-related systems, structures, and components are those systems, structures, and components that are relied upon to remain functional during and following design basis events to assure the integrity of the reactor coolant pressure boundary. According to Chapter 4 of the TPN UFSAR, the pressurizer surge line is part of the reactor coolant system. As such, the NRC staff determined that the welds are safety-related because they are pressure-retaining components in this system. Therefore, the NRC staff determined that use of the site quality assurance program for addressing the "corrective actions" element of the surge line inspection program is acceptable because all components within the scope of the program are subject to the requirements of 10 CFR Part 50, Appendix B, and corrective actions taken must be consistent with these requirements. This approach is consistent with Section A.1.2.3.7 of the SRP-LR.

Section A.1.2.3.7 of the SRP-LR also states that if corrective actions permit analysis without repair or replacement, then the analysis should ensure that the structure- and component-intended functions are maintained consistent with the current licensing basis. Section 3.0 of Attachment 1 to the submittal states that if the examination results do not meet the acceptance criteria of the program, then they will be subject to acceptance by evaluation in accordance with ASME Code Section XI, Subarticle IWB-3600, which permits analytical evaluation to determine acceptability for continued service when flaws are found to exceed the acceptance standards. The NRC staff determined that use of the provisions in ASME Code Section XI, Subarticle IWB-3600, is acceptable to ensure that the component intended functions are maintained consistent with the current licensing basis because the provisions cover evaluation of flaws in austenitic stainless steel, which is the material of the pressurizer surge line welds. The NRC staff also determined that use of these provisions is acceptable because they are endorsed by 10 CFR 50.55a. Therefore, analysis before repair or replacement under the surge line inspection program is also consistent with Section A.1.2.3.7 of the SRP-LR.

Based on its review of the licensee's submittal and response to RAI 5, the NRC staff finds that the "corrective actions" element of the surge line inspection program is acceptable because it satisfies the criteria in Section A.1.2.3.7 of the SRP-LR.

3.8 Confirmation Process

Section 3.0 of Attachment 1 to the submittal describes the "confirmation process" element of the surge line inspection program. The submittal states that if degradation is identified in a pressurizer surge line weld, then the licensee will complete an engineering evaluation to determine if the weld is acceptable for continued service or if repair or replacement is required. The submittal states that the engineering evaluation will include assessment of the probable cause and extent of degradation, the nature and frequency of additional examinations, and whether repair or replacement is required. The submittal also states that repair or replacement will be in accordance with the requirements of ASME Code Section XI, Articles IWA-4000 and IWA-6000. Additionally, as part of the response to RAI 5, the licensee stated that the confirmation process will be accordance with the site quality assurance program, which implements the requirements of 10 CFR Part 50, Appendix B, and applies to all of the pressurizer surge line welds. Section 3.9 of this safety evaluation discusses RAI 5.

The NRC staff evaluated the "confirmation process" element of the surge line inspection program against the criteria in Section A.1.2.3.8 of the SRP-LR. The SRP-LR states that the confirmation process should ensure that appropriate corrective actions have been completed and are effective. The SRP-LR also states that when corrective actions are necessary, there should be follow-up activities to confirm completion of the corrective actions, determine the root cause, and prevent recurrence. As discussed in its evaluation of the "corrective actions" element, the NRC staff determined that the pressurizer surge line welds are safety-related components and therefore subject to the requirements of 10 CFR Part 50, Appendix B. Section A.2 of the SRP-LR states the NRC staff's position that for safety-related components, the requirements of 10 CFR Part 50, Appendix B, are adequate to address all quality-related aspects of an aging management program, which includes the confirmation process. Therefore, the NRC staff determined that the licensee's use of the site quality assurance program for addressing the "confirmation process" element of the surge line inspection program is acceptable because the confirmation process must be in accordance with the requirements of 10 CFR Part 50, Appendix B, which is consistent with Section A.2 of the SRP-LR.

Based on its review of the licensee's submittal and response to RAI 5, the NRC staff finds that the "confirmation process" element of the surge line inspection program is acceptable because it satisfies the criteria in Section A.1.2.3.8 of the SRP-LR.

3.9 Administrative Controls

Section 3.0 of Attachment 1 to the submittal describes the "administrative controls" element of the surge line inspection program. It states that the plant inservice inspection program will document the inspection requirements for managing environmentally assisted fatigue of the pressurizer surge line welds. In addition, Section 4.0 of Attachment 1 to the submittal states that upon NRC approval, the licensee will update the related aging management program basis and implementing documents and associated UFSAR sections.

The NRC staff evaluated the "administrative controls" element of the surge line inspection program against the criteria in Section A.1.2.3.9 of the SRP-LR. The SRP-LR states that the administrative controls of the program should provide for a formal review and approval process. However, based on its review, the NRC staff determined that the licensee did not describe the review and approval process for the inservice inspection program. As such, in RAI 5, the NRC staff requested the licensee to describe this process.

In its response to RAI 5, the licensee stated that the pressurizer surge line weld inspection requirements will be included as an augmentation to the plant inservice inspection program and the inservice inspection plan will indicate that the inspections of the pressurizer surge line welds are conducted as part of implementing the surge line inspection program. The licensee also stated that the inservice inspection program is updated by an outside vendor, prepared by the plant inservice inspection program owner, reviewed by an independent program owner, approved by the inservice inspection program supervisor and manager, and it receives a final review by the authorized nuclear inservice inspector. The licensee further stated that administrative controls for the program are in accordance with the site quality assurance program, which implements the requirements of 10 CFR Part 50, Appendix B, and applies to all of the pressurizer surge line welds.

The NRC staff reviewed the licensee's response to RAI 5 and determined that it adequately describes the review and approval process for the surge line inspection program. The NRC staff determined that the licensee's multiple approvals and reviews will ensure that any changes to the surge line inspection program procedures receive appropriate review and approval. In addition, the licensee will also implement the administrative controls as part of the quality assurance program. The NRC staff finds this approach acceptable because it is consistent with the NRC staff's position in Section A.2 of the SRP-LR, which states that the requirements of 10 CFR Part 50, Appendix B, are adequate to address the quality-related aspects of an aging management program, which include the administrative controls. The NRC staff's concern in RAI 5 regarding the review and approval process for the program is therefore resolved.

Section A.1.2.3.9 of the SRP-LR also states that informal aging management programs must be subject to regulatory controls and therefore described in the final safety analysis report supplement. Based on its review of the submittal, the NRC staff determined that the surge line inspection program is informal because it is not subject to existing NRC requirements. Therefore, the NRC staff determined that the licensee's UFSAR supplement should contain a summary description of the program. However, the NRC staff found that the submittal does not provide such a summary description because it only contains a commitment to revise the UFSAR. As such, the NRC staff could not determine whether the administrative and regulatory controls of the program will be adequate. As part of RAI 5, the NRC staff requested the licensee to provide a summary description of the surge line inspection program to be included in the UFSAR. The NRC staff requested that the licensee include in this description 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.

As part of its response to RAI 5, the licensee provided a proposed summary description of the surge line inspection program to include in Section 16.1 of the TPN UFSAR. The proposed summary description addresses the inspection methods, as requested by the NRC staff, but indicates that they will be "surface/volumetric." As discussed in its evaluation of the "detection of aging effects" element, the NRC staff determined that "surface/volumetric" is not clear as to

whether it means a surface inspection, a volumetric inspection, or both. As such, in the follow-up RAI sent on May 6, 2013, the NRC staff requested the licensee to clarify the examination techniques and revise the UFSAR summary description, as necessary. In its May 20, 2013, response, the licensee clarified that the examinations will be both surface and volumetric in accordance with ASME Code Section XI, Subsection IWB, and revised the UFSAR summary description accordingly.

Section 3.1.2.5 of the SRP-LR provides acceptance criteria for NRC staff review of final safety analysis report supplement summary descriptions of the programs and activities for managing the effects of aging. The SRP-LR states that the summary description should be sufficiently comprehensive and contain information associated with the bases for determining that the aging effects will be adequately managed for the PEO. The NRC staff reviewed the licensee's summary description of the surge line inspection program, as provided in response to RAI 5 and amended in response to the follow-up RAI sent on May 6, 2013, against the acceptance criteria in Section 3.1.2.5 of the SRP-LR. The NRC staff determined that the content of the proposed summary description is sufficiently comprehensive because it provides adequate details on key aspects of the program, such as the specific components within its scope, the aging effects it manages, and the inspection methods and frequencies for detecting these aging effects. Also, because the summary description states that the technical justification and inspection frequency are supported by a flaw tolerance evaluation based on the methodology of ASME Code Section XI, Appendix L, the NRC staff also determined that the summary description also provides the bases for determining that the aging effects will be adequately managed. The NRC staff's concerns described in RAI 5 and the follow-up RAI sent by letter dated May 6, 2013, are therefore resolved. In addition, the NRC staff notes that changes to the UFSAR must be implemented in the next periodic update to the UFSAR in accordance with 10 CFR 50.71(e).

Based on its review of the licensee's submittal, response to RAI 5, and the response to the follow-up RAI sent by letter dated May 6, 2013, the NRC staff finds that the "administrative controls" element of the surge line inspection program is acceptable because it satisfies the criteria in Section A.1.2.3.9 of the SRP-LR.

3.10 Operating Experience

Section A.1.2.3.10 of the SRP-LR contains criteria for the "operating experience" element of aging management programs. On March 16, 2012, the NRC issued Final License Renewal Interim Staff Guidance (LR-ISG), LR-ISG-2011-05, "Ongoing Review of Operating Experience," (ADAMS Accession No. ML12044A215). The primary purpose of the LR-ISG is to provide a framework to ensure that future operating experience review activities will adequately address operating experience concerning age-related degradation and aging management to ensure the continued effectiveness of the aging management programs and activities. Appendix A to the LR-ISG also identifies changes to the SRP-LR that include revisions to the operating experience criteria in Section A.1.2.3.10 of the SRP-LR.

The NRC staff evaluated the "operating experience" element of the surge line inspection program against the criteria in Section A.1.2.3.10 of the SRP-LR, as revised by LR-ISG-2011-05. Because the the surge line inspection program is a new aging management program, two criteria apply: (1) consideration of operating experience for new programs, and (2) consideration of future operating experience. The NRC staff based its evaluation of the "operating experience" element of the program on these two criteria as follows.

3.10.1 Consideration of Operating Experience for New Programs

Section 3.0 of Attachment 1 to the submittal states that the licensee ultrasonically examined a sample of the pressurizer surge line welds during the first three inservice inspection intervals in accordance with the requirements of ASME Code Section XI. The licensee also volumetrically inspected all of the pressurizer surge line welds during the fourth inservice inspection interval and prior to entering the PEO. The submittal states that the licensee found no reportable indications through these inspections.

For new aging management programs, Section A.1.2.3.10 of the SRP-LR, as revised by LR-ISG-2011-05, states that currently available operating experience applicable to the program should be discussed even though the program has not yet been implemented. The SRP-LR also states that the impact of relevant operating experience from implementation of existing aging management programs and from generic industry operating experience should be discussed. Although the proposed program is new, the licensee has periodically inspected components within its scope throughout operation of the units in accordance with the requirements of ASME Code Section XI. These past inspections have included volumetric examinations of the pressurizer surge line welds. Such examinations can detect cracking, which is the aging effect managed by the surge line inspection program. This plant-specific operating experience also applies to the licensee's flaw tolerance evaluation, which is the basis for the program's inspection interval. In accordance with ASME Code Section XI, Subsubarticle L-3110, the first step of the flaw tolerance evaluation procedure is to verify the absence of any flaw exceeding the applicable acceptance standard for the component locations of concern. Based on this information, the NRC staff determined that the licensee has included an appropriate discussion of past plant-specific operating experience applicable to the program. In addition, although the submittal does not include a specific discussion of industry operating experience applicable to the program, the elements of the program are primarily based on the inspection methods, evaluation procedures, and acceptance criteria of ASME Code Section XI. Because the ASME Code is a consensus document that has been widely used throughout the nuclear power industry over a long period, it has been shown to be generally effective in managing aging effects in Class 1 components, such as cracking caused by fatigue. Based on the degree of consistency of the surge line inspection program with the requirements of ASME Code Section XI, and the NRC's endorsement of ASME Code Section XI in 10 CFR 50.55a, the NRC staff determined that the program is based on appropriate industry operating experience. Based on its review, the NRC staff determined that the licensee has appropriately addressed operating experience applicable to the program, and this operating experience demonstrates that the program can adequately manage the effects of cracking caused by environmentally assisted fatigue in the pressurizer surge lines.

3.10.2 Consideration of Future Operating Experience

Section A.1.2.3.10 of the SRP-LR, as revised by LR-ISG-2011-05, states that the 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. The SRP-LR further states that adequate processes should be in-place to monitor and evaluate plant-specific and industry operating experience related to aging management to ensure that the program is effective in managing the aging effects for which it is credited. This ongoing review of operating experience information should provide objective evidence to support the conclusion that the

effects of aging are managed adequately so that the structure- and component-intended function(s) will be maintained during the PEO.

The NRC staff reviewed the submittal and determined that although the licensee discussed currently available operating experience relevant to the surge line inspection program, the licensee did not describe how it will use future plant-specific and industry operating experience concerning aging management and age-related degradation to ensure that the effects of aging will continue to be adequately managed. In RAI 4, the NRC staff requested the licensee to describe the programmatic activities that it will use to continually identify plant-specific and industry aging issues, evaluate them, and, as necessary, enhance the surge line inspection program or develop new programs in order to manage the effects of aging. The NRC staff also requested the licensee to indicate whether its operating experience review activities are consistent with the framework in LR-ISG-2011-05; otherwise, the NRC staff requested the licensee to provide a basis for concluding that the review activities will ensure the adequate evaluation of operating experience on an ongoing basis to address age-related degradation and aging management.

In its response to RAI 4, the licensee stated that it integrates activities for the systematic review of plant-specific and industry operating experience concerning aging management and age-related degradation within its renewed license program. The licensee stated that its procedures include specific requirements to ensure the effectiveness of aging management programs through ongoing reviews of relevant operating experience, and these procedures reference the expectations of LR-ISG-2011-05. The licensee also stated that these procedures include guidance for using, sharing, and evaluating operating experience information to ensure that relevant operating experience is reviewed for impacts to aging effects and aging management programs. In addition, personnel assigned responsibility for aging management programs are required by licensee procedures to review condition reports and operating experience entries for age-related failures, significant degradation of systems, structures, and components within the scope of license renewal, and failures of aging management programs to prevent age-related failures and degradation. The licensee stated that its procedures require personnel to initiate changes to the site aging management programs when determined appropriate from the evaluation of operating experience.

The NRC staff reviewed the response to RAI 4 and determined that the licensee has existing processes and requirements in-place to specifically capture and evaluate plant-specific and industry operating experience to determine its impact to the aging management programs. The licensee also requires changes to its aging management programs when determined necessary by these operating experience evaluations. The NRC staff determined that the licensee's operating experience review activities are acceptable because they include consideration of plant-specific and industry operating experience related to aging management and age-related degradation, and because the licensee will use these activities to ensure that the surge line inspection program will continue to be effective. The NRC staff's concern identified in RAI 4 is therefore resolved.

3.10.3 Summary for Operating Experience

Based on its review of the licensee's submittal and response to RAI 4, the NRC staff finds that the "operating experience" element of the surge line inspection program is acceptable because it satisfies the criteria in Section A.1.2.3.10 of the SRP-LR.

4.0 CONCLUSION

Based on its review of the surge line inspection program, as described in the licensee's submittal and supplemented and revised in response to RAIs 1 through 8 and the May 20, 2013, response to the May 6, 2013, follow-up RAI, the NRC staff finds the program acceptable because it satisfies the ten elements for an acceptable aging management program, as described in Section A.1.2.3 of the SRP-LR, and it will adequately manage cracking caused by environmentally assisted fatigue in the pressurizer surge line welds. The NRC staff also finds that the licensee has determined an appropriate approach for addressing environmentally assisted fatigue of the pressurizer surge lines and thus fulfilled the commitment in Section 16.3.2.5 of the TPN UFSAR. NRC approval of the surge line inspection program does not affect the inservice inspection requirements of ASME Code Section XI, as endorsed by 10 CFR 50.55a.

Principal Contributor: Matthew Homiack

Date: May 29, 2013

Please contact Audrey Klett at (301) 415-0489 if you have any questions.

Sincerely,

/RA/

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-250 and 50-251

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DATE	05/28/13	05/28/13	05/29/13	05/24/13
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NAME	DMorey*	JQuichocho	FSaba	
DATE	5/24/13	05/29/13	05/29/13	

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