August 23, 2007

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

SUBJECT: ST. LUCIE NUCLEAR PLANT, UNIT 2 - REQUEST FOR ADDITIONAL INFORMATION FOR RELIEF REQUEST NO. 10, ALTERNATIVE TO ASME CODE REQUIREMENTS (TAC NO. MD5114)

Dear Mr. Stall:

By letter dated March 29, 2007, Florida Power and Light Company submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for relief from certain requirements of the American Society of Mechanical Engineers (ASME) Code for St. Lucie, Unit 2. Specifically, in Relief Request No. 10 you requested approval to use structural weld overlays as an alternative repair method pursuant to Title 10, Code of Federal Regulations, Section 50.55a(a)(3)(i).

Currently, the NRC staff has approved the use of ASME Code Cases N-504-2, "Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping Section XI, Division 1," and N-638-1, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW [gas tungsten arc welding] Temper Bead Technique Section XI, Division 1." However, currently we have not approved the use of Code Case N-740-1 because it has not yet been approved and published by ASME. Therefore, we request that you revise Relief Request No. 10 such that it be based on Code Cases N-504-2 and N-638-1 or N-740 with modifications. This request was discussed with members of your staff on August 20, 2007. On August 21, 2007, Mr. Ken Frehafer of your staff indicated that a response, in the form of a resubmitted relief request addressing the questions enclosed, would be provided by October 5, 2007.

If you have any questions, please contact me at (301) 415-2020.

Sincerely,

/RA BrendanT. Moroney for/

Brenda L. Mozafari, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-389

Enclosure: Request for Additional Information

cc w/encl: See next page

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Senior Vice President, Nuclear and
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Currently, the NRC staff has approved the use of ASME Code Cases N-504-2, "Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping Section XI, Division 1," and N-638-1, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW [gas tungsten arc welding] Temper Bead Technique Section XI, Division 1." However, currently we have not approved the use of Code Case N-740-1 because it has not yet been approved and published by ASME. Therefore, we request that you revise Relief Request No. 10 such that it be based on Code Cases N-504-2 and N-638-1 or N-740 with modifications. This request was discussed with members of your staff on August 20, 2007. On August 21, 2007, Mr. Ken Frehafer of your staff indicated that a response, in the form of a resubmitted relief request addressing the questions enclosed, would be provided by October 5, 2007.

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REQUEST FOR ADDITIONAL INFORMATION

FLORIDA POWER AND LIGHT COMPANY

ST. LUCIE NUCLEAR POWER PLANT, UNIT 2

DOCKET NUMBER 50-389

Currently, the staff has approved the use of Code Cases N-504-2, "Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping Section XI, Division 1," and N-638-1, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW [gas tungsten arc welding] Temper Bead Technique Section XI, Division 1." The U. S. Nuclear Regulatory Commission (NRC) staff has not approved the use of Code Case N-740-1 as Code Case N-740-1 has not yet been approved and published by American Society of Mechanical Engineers (ASME). Therefore, the NRC staff requests that you revise Relief Request (RR) No. 10 such that it is based on Code Cases N-504-2 and N-638-1 or on N-740 with modifications.

The NRC staff used the requirements of Code Cases N-504-2 and N-638-1 to aid in evaluation of the St. Lucie Unit 2, Attachment 2 (Code Case N-740-1) to RR No. 10 as NRC-approved criteria associated with similar full structural weld overlay (SWOL) applications. Attachment 2 of RR No. 10 is based on Code Case N-740-1 "Dissimilar Metal Weld Overlay for Repair of Class 1, 2, and 3 Items Section XI, Division 1." Code Case N-740-1 was developed as the result of industry's need to repair (reduce or mitigate) flaws (suspected or confirmed) generated from primary water stress corrosion cracking (PWSCC) via application of SWOL. Also, the code case offers relief from post weld heat treatment by allowing the use of a temper-bead weld process.

Code Case N-740-1 is, to a large extent, a combination of Code Cases N-504-2 and N-638-1. However, the intent of the following questions is to support an NRC staff assessment by attempting to scrutinize any disparity between Attachment 2 (Code Case N-740-1) to RR No. 10 and NRC approved Code Cases, and to identify areas that need to be included in your revised submittal.

1. Please provide material specification for the stainless steel (SS) similar metal welds designated to be incorporated as part of the preemptive full SWOL planned at St. Lucie Unit 2.

2. In RR No. 10, it is not evident to the NRC staff whether you will perform an ultrasonic (UT) examination on the dissimilar metal (DM) and similar metal (SM) welds prior to SWOL installation. Without conducting a UT examination of the DM and SM welds prior to SWOL installation, the condition of the original welds may not be known following the SWOL installation. This is based on the following concerns. If a flaw existed in the original weld and the weld is not examined prior to SWOL, the flaw would not be adequately modeled in the crack growth calculation because the initial flaw size would not be known. The flaw may be compacted tightly by the compressive stresses produced by the SWOL and may not be detected by the UT examination following installation. The UT examination performed following SWOL installation is qualified to

interrogate only the outer 25 percent of the original weld thickness. The condition of the remaining 75 percent of the original weld thickness region would not be known. In light of these concerns, discuss the flaw size assumed in your crack growth calculation for the DM and SM welds.

3. Most recent industry experience involves the hot cracking of nickel Alloy 52M SWOL deposits on SS base materials with higher levels of sulfur in the austenitic SS base metal. A method utilized to avoid this phenomenon is the application of a low sulfur SS barrier layer applied over the austenitic SS base metal and ending prior to the DM weld (Alloy 82/182).

    (a) Discuss whether you have considered this potential and if you have plans to incorporate the use of a barrier weld layer or similar weld layer prior to welding of the preemptive SWOL.

    (b) As part of your analysis to use a barrier layer please include in your discussion meeting the minimum chromium content required in Attachment 2 (Code Case N-740-1) to RR No. 10, the transition point from barrier layer into DM weld, filler metal to be used for barrier layer, mock-up testing performed and whether the barrier layer will be considered as part of the SWOL.

    (c) If you choose not to utilize a barrier layer, discuss your reasons and provide a basis.

4. Section 2(a) of Code Case N-740-1 states that flaw characterization and evaluation requirements shall be based on the UT examination. However, per RR No. 10, Florida Power and Light Company (FPL) will not perform a UT examination prior to SWOL installation, which implies that the information regarding the as-found flaw will not be available. Under this circumstance, discuss how the flaw characterization and evaluation requirements of Section 2(a) will be satisfied.

5. If Section 2(b)(7) of Attachment 2 (Code Case N-740-1) to RR No. 10 applies to any planar flaw in the SWOL, then any flaw in the SWOL should be evaluated according to IWX-3500 and the flaw dimensions should include the UT tolerance associated with the qualification. As required in Section 2(b)(7), flaws are evaluated in accordance with IWX-3640 and not IWX-3500. Clarify your intent per Section 2(b)(7).

6. Sections g(2) and g(3) of Code Case N-504-2 require evaluations of residual stresses and flaw growth of the repaired weldment. Similar evaluations are required in Section 2 of Attachment 2 (Code Case N-740-1) to RR No. 10. Section 2(b)(8) of Attachment 2 states that the effects of any changes in applied loads, as a result of weld shrinkage from the entire SWOL on other items in the piping system shall be evaluated.

    (a) Confirm that the analysis in Section 2(b) will include results showing that the requirements of Subarticles NB-3200 and NB-3600 of the ASME Code, Section III are satisfied.

(b) Confirm that the analysis includes the crack growth calculations to demonstrate that crack growth in the SWOL or base metal is acceptable. Also, include the residual stress distribution in the SWOL and original weld to demonstrate favorable stress distribution.

7. (a) Define uninspectable volume in the SWOL as described in Section 3(a)(3)(c) of Attachment 2 (Code Case N-740-1) to RR No. 10. Section 3(a)(3)(c) requires that "This assumed planar flaw shall meet the requirements of Table IWB-3514- 2, with nominal wall thickness as defined for planar flaws. Alternatively, the assumed flaw shall be evaluated and meet the requirements of IWB-3640, IWC-3640, and IWD-3640 as applicable." The NRC staff's position is that during preservice examination or acceptance examination, if a flaw is detected in the SWOL and does not satisfy Table IWB-3514-2, the flaw is removed and the SWOL repaired. Analytical evaluations per IWB-3640 to accept unacceptable preservice indications in Section 3(a)(3)(c) are not permitted.

(b) Clarify the intent of your request per Section 3(a)(3)(c).

8. Section 3(b)(2) of Attachment 2 (Code Case N-740-1) to RR No. 10 requires that cracks in the outer 25 percent of the base metal shall meet the design analysis requirements of Section 2(b).

(a) Provide the specific subsection requirements within Section 2(b) that cracks shall satisfy.

If a flaw is detected in the outer 25 percent of the base metal or original weld during the preservice examination, the actual flaw size would be used for the crack growth evaluation. The NRC staff believes this flaw size is not a conservative assumption for the crack growth calculation considering the licensee has no plans to UT examine the original weld prior to installing the SWOL. The current UT examination is qualified only to detect flaws in the outer 25 percent of the pipe base metal following application of the SWOL. Therefore, the condition in the inner 75 percent of the pipe base metal would remain undetected. A conservative assumption would be to assume the existence of a crack 75 percent through-wall depth in the inner 75 percent pipe base metal which should be added to the depth of the crack found in the outer 25 percent of the pipe base metal. This worst case crack assumption should be used to calculate crack growth.

(b) Discuss why it is acceptable to assume the actual flaw size for the crack growth calculation when the UT examination is only qualified for the outer 25 percent of the pipe metal.

9. Section 3(c)(2) of Attachment 2 (Code Case N-740-1) to RR No. 10 states that "Alternatively, for mitigative weld overlays, in which examinations are performed in accordance with 2(a)(2)(a), 3(a) and 3(b), and no inside surface connected planar flaws are discovered, the overlay may be placed directly into the population to be examined in accordance with 3(c)(5)." FPL makes no reference within the RR whether they will

perform a pre-SWOL UT examination. With no pre-SWOL UT examination performed and the post SWOL UT examination only qualified to detect flaws within the outer 25 percent of pipe base metal, inside surface connected planar flaws cannot be discovered. The NRC staff believes, for an SWOL to be placed into a population of sample inspections without an inspection during the first or second refueling outage following the installation of the SWOL, the SWOL shall have no planar flaws discovered anywhere within the SWOL and the base metal. Based on the above, the NRC staff does not believe Section 3(c)(2) is applicable to St. Lucie Unit 2. Justify why only inner surface connected flaws are examined or revise Section 3(c)(2) accordingly.

10. Section 1.0(a) of Code Case N-638-1 limits the thickness of the SWOL such that it shall not be greater than one-half of the ferritic base metal thickness. Discuss why this requirement is not included in Section 1.0 of Mandatory Appendix I to Attachment 2 (Code Case N-740-1) of RR No. 10.

11. Section 1(b) of Mandatory Appendix I to Attachment 2 (Code Case N-740-1) of RR No. 10 states that the maximum area of an individual SWOL based on the finished surface over the ferritic base material shall be 500 square-inches. Section 1.0(a) of Code Case N-638-1 allows only 100 square-inches. Provide justification for the 500 square-inch surface area.

12. Section 3.0(d) of Mandatory Appendix I to Attachment 2 (Code Case N-740-1) of RR No. 10 states that the interpass temperature limitation of QW-406.3 need not be applied. This condition is not included in Code Case N-638-1. Discuss why this condition is included in Mandatory Appendix I.

13. Section 4.0(c) of Code Case N-638-1 requires that areas from which weld-attached thermocouples have been removed shall be ground and examined using a surface examination method.

    (a) Discuss whether weld attached thermocouples will be used in Mandatory Appendix I to Attachment 2 (Code Case N-740-1) of RR No. 10 and provide a basis for your response.

    (b) Include within your discussion the surface examination method to be used should your method utilize weld attached thermocouples.

14. In Regulatory Guide 1.147, Revision 14 (latest revision), the NRC staff imposed a condition on Code Case N-638-1 regarding UT examination and associated acceptance criteria based on NB-5330 of the ASME Code, Section III. Discuss your plans to observe this condition.

15. In Section 5.3 of RR No. 10, you identify cast SS base material components not currently within the scope of the Performance Demonstration Inspection (PDI) qualified UT examination procedures. In addition, you state qualified representative mockups are not currently available and examination procedures and personnel have not yet been demonstrated for the cast material. In these cases an ASME Appendix III UT examination will be performed, using the existing PDI qualified personnel and procedures as specified in Attachment 1 of the RR.

(a) Discuss the acceptability of the proposed UT examination for detecting flaws following the SWOL installation. Consider within the discussion that no preinstallation UT examination of the original cast SS components will be performed, and that personnel/procedures that are not qualified to detect flaws in cast SS material with or without the SWOL installed.

(b) Since UT examination is not qualified to detect flaws in cast SS material regardless of the SWOL, discuss how crack growth calculation will be performed in terms of the initial flaw size. A conservative approach would be to assume a 100 percent through-wall flaw existing in the original base metal/weld in the crack growth calculation even if UT examination is performed of the base metal prior to SWOL installation.

16. Under Section 2(a)(2)(c) of Attachment 2 (Code Case N-740-1) to RR No. 10, there may be a region of pipe thickness for which UT examination would not be qualified to detect flaws following SWOL installation. In such a case, the initial flaw size should be the as-found flaw depth plus the postulated worst-case flaw in the unqualified region of the base metal. The postulated worst-case flaw size should be the pipe thickness of the base metal for which UT is not qualified. Clarify or revise the initial flaw size of Section 2(a)(2)(c) accordingly.

17. In Section 2(a)(2)(d) of Attachment 2 (Code Case N-740-1) to RR No. 10 the current UT is not qualified to inspect the inner 75 percent of the base metal once the weld overlay is installed on the pipe. Therefore, UT examination is not capable of detecting indications that are connected to the inside surface of the pipe during preservice inspection. The NRC staff considers the preservice inspection to be the post-SWOL installation inspection and not the pre-SWOL installation inspection. Clarify or revise Section 2(a)(2)(d) accordingly.

18. Section 3(a)(3) of Attachment 2 (Code Case N-740-1) to RR No. 10 states that “for planar indications outside this examination volume, the nominal wall thickness shall be “t2" as shown in Fig 1(c) for volumes A-E-H-D and F-B-C-G.” UT is not qualified to examine inner 75 percent of the base metal following weld overlay installation. Therefore, the “t2" distance cannot be part of the acceptance criteria of IWB-3514-2 since “t2" includes the 75 percent depth of the base metal. Discuss the technical basis of this requirement.

19. In Section 3(c)(4) of Attachment 2 (Code Case N-740-1) to RR No. 10 the NRC staff believes that IWX-3600 cannot be used to accept flaws that are caused by PWSCC because of the aggressive crack growth rate of PWSCC. The NRC staff could accept the criteria of IWB-3600 for a flaw in the weld overlay if flaw growth is caused by thermal fatigue that the NRC staff considers insignificant. However, flaw growth by PWSCC could be significant and the NRC staff would find such growth mechanism unacceptable. Clarify or revise Section 3(c)(4) to include a limitation on the use of IWX-3600 accordingly.

20. Section 2(a) of Code Case N-740 requires that if the flaw is at or near the boundary of two different materials, evaluation of the flaw growth in both materials is required.

Section 2 of Attachment 2 (Code Case N-740-1) to RR No. 10 does not have this requirement. Discuss why or revise Section 2 of Attachment 2 accordingly.

21. As part of the preemptive SWOL of the pressurizer nozzle welds at St. Lucie Unit 2, the NRC staff requests the following information be provided within 60 days following the completion of the UT examination of the SWOL installations: (1) the UT examination results of the SWOL, (2) a discussion and reason for any repairs to the SWOL and/or base metal, and (3) a commitment to perform the subsequent inservice examination in accordance with Subarticle Q-4300 of Appendix Q to the ASME Code, Section XI.

22. In Section 5.3 of RR No. 10, FPL proposed to perform nondestructive examination (NDE) on the temper bead portion of the SWOL no sooner than 48 hours following the completion of the third temper bead layer. Section 3(a)(2) of Attachment 2 (Code Case N-740-1) to RR No. 10 requires that the NDE be performed 48 hours after the completed SWOL has returned to ambient temperature. Clarify or revise the discrepancy between Section 5.3 and Section 3(a)(2) of Attachment 2 accordingly.

cc:
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