Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

August 29, 2006

L-2006-196
10 CFR 50.4
10 CFR 50.55a

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Re: St. Lucie Unit 1
Docket No. 50-335
In-Service Inspection Plans
Alternative Ultrasonic Examination of the Reactor Pressure Vessel
Flange-to-Upper Shell Weld using PDI Demonstrated Techniques
Third Ten-Year Interval Unit 1 Relief Request 27

Pursuant to 10 CFR 50.55a (a)(3)(ii), Florida Power & Light Company (FPL) requests relief from reactor pressure vessel flange-to-upper shell weld examination techniques via the attached proposed alternative. FPL determined pursuant to 10 CFR 50.55a (a)(3)(i) that the alternative provides an acceptable level of quality and safety.

Approval of the attached revision to the relief request for the remainder of the inspection interval is requested to support the upcoming St. Lucie Unit 1 refueling outage (SL1-22 is currently scheduled to begin in October, 2008). Please contact Ken Frehafer at 772-467-7748 if there are any questions about this submittal.

Very truly yours,

Gordon L. Johnston
Site Vice President
St. Lucie Plant

Attachment

GLJ/KWF

A047

Proposed Alternative
In Accordance with 10 CFR 50.55a (a)(3)(i)

--Alternative Provides Acceptable Level of Quality and Safety--

"Alternative Ultrasonic Examination of the Reactor Pressure Vessel Flange-to-Upper Shell Weld using PDI Demonstrated Techniques"

1. **ASME Code Component(s) Affected**

Class 1 Reactor Pressure Vessel (RPV) Flange-to-Upper Shell Weld (Weld Number 7-203) subject to Ultrasonic (UT) examination.

2. **Applicable Code Edition and Addenda**

The code of record for the St. Lucie Unit 1 third 10-year inservice inspection interval is the 1989 Edition, No Addenda, of the American Society of Mechanical Engineers (ASME) Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."

3. **Applicable Code Requirement**

Pursuant to 10CFR 50.55a (a)(3)(i), Florida Power and Light Company (FPL) requests approval to implement an alternative to the requirements within ASME Section XI, 1989 Edition, No Addenda, Appendix I, Article I-2100. Article I-2100, requires "Ultrasonic examination of vessel welds greater than 2 in. thickness shall be conducted in accordance with Article 4 of Section V, as supplemented by this Appendix. Supplements identified in Table I-2000-1 shall be applied."

Exam Cat.	Item No.	Examination Description
B-A	B1.30	Essentially 100% volumetric examination of the reactor vessel-to-flange weld in accordance with Appendix I, Article I-2000

4. **Reason for Request**

FPL is required to perform the UT examination of the reactor vessel-to-flange weld in accordance with the requirements of 10CFR50.55a, plant Technical Specifications, and the 1989 Edition, No Addenda of the ASME Section XI Code. This code edition invokes the examination requirements of Appendix I, Article I-2000 that essentially prescribes 20-year old examination methodology. The examination is performed from the reactor vessel inside surface and the flange surface. This examination methodology is typically "qualified" by calibration on side drilled holes in a calibration block fabricated from similar material.

In the 1989 Addenda of ASME Section XI, a qualification by performance demonstration,

Appendix VIII, approach for UT examinations of reactor vessel welds, excluding the flange to shell weld, was introduced. In September 1999, 10CFR50.55a was issued and required an expedited implementation of the ASME Section XI, 1995 Edition with 1996 Addenda, Appendix VIII supplements in accordance with specific dates. Although the reactor flange-to-upper shell weld is excluded from Appendix VIII requirements, FPL believes that supplementing the ASME Section XI Appendix I examination from the flange surface with the performance of the reactor vessel inside surface examination using procedures, equipment, and personnel qualified by demonstration in accordance with ASME Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 4 (clad-base metal interface) and 6 (vessel welds other than clad-base metal interface) surpasses the quality of the generic examination techniques specified by the referencing code edition and will provide an acceptable level of safety.

5. **Proposed Alternative and Basis for Use**

Proposed Alternative:

FPL requests an alternative to the ASME Section XI, Article I-2100 required examination from the reactor vessel inside surface. FPL proposes supplementing the ASME Section XI, 1989 Edition, No Addenda, Appendix I examination from the flange surface with the examination from the reactor vessel inside surface using procedures, equipment, and personnel qualified by demonstration to perform remote mechanized examination of the reactor vessel flange–to-shell weld from the inside surface in accordance with ASME Code 1995 Edition, 1996 Addenda, Section XI, Appendix VIII, Supplements 4 and 6, in lieu of Section V, Article 4 requirements. The ASME Section XI, 1995 Edition, 1996 Addenda Appendix VIII qualified procedures, 54-ISI-801, "Automated UT of PWR Vessel Shell Welds," have been demonstrated to perform detection, length sizing and through-wall sizing of reactor vessel shell welds, including those of similar thickness and material composition as the flange-to-shell weld. The procedures, equipment, and personnel for the remote mechanized examination from the inside surface have been qualified by demonstration in accordance with the Performance Demonstration Initiative (PDI) Program.

Basis for Use:

ASME Section XI, Appendix VIII qualified procedures are technically superior to the standard ASME Code, Section V, Article 4 methodologies that are amplitude based. Enhanced performance is possible by (a) increased sensitivity to flaws, (b) demonstrated flaw measurement capability using amplitude independent sizing techniques, and (c) compatibility of the Appendix VIII examination technique with the flange–to-shell weld joint geometry resulting in good ultrasonic beam coverage.

(a) Increased sensitivity to Flaws: An Appendix VIII qualified procedure is more sensitive to flaws because the exam sensitivity level compares to the ASME DAC (distance amplitude correction) level of 10 percent DAC. Previous examinations of the reactor vessel shell welds in accordance with ASME Section V were conducted at the less

sensitive level of 50 percent DAC for flaws located in the outer 80 percent of the material thickness and 20 percent DAC for flaws located from the clad-base metal interface to a depth of about 20 percent thickness (i.e., near surface region).

The Appendix VIII qualified procedures offer an additional level of assurance in the detection of flaws because the procedure requires that all signals interpreted by the analyst as flaws, regardless of amplitude response, shall be measured and assessed in accordance with the applicable criteria. The Appendix VIII procedure recognizes that some flaws can exhibit low amplitude response depending on orientation. This evidence has not been factored into the ASME Section V techniques that have traditionally had a flaw response cut-off point of 20 percent DAC.

(b) Demonstrated Flaw Measurement Capability using Amplitude Independent Sizing Techniques: 54-ISI-801, "Automated UT of PWR Vessel Shell Welds" in accordance with ASME Section XI, Appendix VIII, Supplements 4 and 6 was demonstrated in 2004 to the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI). The reference number for the performance demonstration test is PDQS No. 449.

The Appendix VIII qualified procedure complies with ASME Code, Section XI 1995 Edition with 1996 Addenda as modified by 10CFR50.55a. The procedure was qualified using tip diffraction sizing techniques, which are amplitude independent. The amplitude based flaw bounding criteria specified in ASME Section V procedures have been proven inaccurate because the size of the reflection is measured. This may or may not accurately reflect true flaw sizes.

(c) Compatibility of the Appendix VIII technique to the flange-to-shell weld joint resulting in good ultrasonic beam coverage and synergy with the previous examination: The Appendix VIII, Supplement 4 and 6 qualified examination procedure requires the use of multiple angle beam transducers to examine the weld and heat affected zone. The qualified procedure requires the exam volume to be examined with sound beams in four orthogonal directions, although it has also been successfully demonstrated as a single sided examination technique. The increment size is 0.5 inch for dual side examinations and 0.2 inch for single side examinations. When examination coverage using Appendix VIII techniques are combined with the manual examination performed from the flange seal surface, the maximum coverage will be obtained. It is not anticipated that greater coverage could be obtained scanning along the ID surface by using additional transducers and beam angles due to the fact that the flange taper geometry will partially obstruct the path of all transducers. This is a common limitation for the flange-top-shell weld joint.

The last remote mechanized exam of the flange-to-shell weld was conducted in 1996. At that time 45, 55, and 50/70 degree exam angles were used, and the results were acquired and analyzed using an automated ultrasonic exam system. No indications were found exceeding the allowable limits of Section XI. Scan limitations were reported due to the flange inside surface configuration.

Florida Power & Light will ensure that the flange-to-shell weld is examined from the inside surface with ultrasonic examination techniques qualified by demonstration in lieu of standard amplitude based ultrasonic examination techniques currently specified. The examination will be conducted to the maximum extent practical in four orthogonal directions. When these results are combined with the manual examination performed from the flange seal surface, the coverage is expected to be 68 percent minimum. The examination sensitivity and flaw measurement capability of the proposed alternative are superior to the method prescribed and coverage will be acceptable, considering the difficult geometric presentation.

6. Duration of Proposed Alternative

FPL will implement the proposed alternative Ultrasonic examination of the RPV Flange-to-Upper Shell Weld using PDI Demonstrated Techniques during the St. Lucie Unit 1 third inservice inspection interval.

7. Attachments to Relief Request 27

Illustration of Flange-to-Shell Weld

Illustration of Flange-to-Shell Weld