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

FPL

August 25, 2005

L-2005-189
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
Inservice Inspection Plan - Third 10-Year Interval
Request for Additional Information Relief Request 26
Repair of Alloy 600 Small Bore Nozzles Without Flaw Removal

By letter L-2005-099 dated April 29, 2005, Florida Power & Light Company (FPL) requested approval of Unit 1 Relief Request (RR) 26, *Repair of Alloy 600 Small Bore Nozzles without Flaw Removal.* On August 11, 2005, the NRC issued a request for additional information (RAI) to support their review of the subject RR. The RAI topics were discussed on July 19, 2005 and August 8, 2005 with FPL. The response to the NRC RAI is attached.

During prior outage years, FPL, by L-2003-285 dated November 21, 2003, as supplemented by FPL letter L-2004-065 on March 24, 2004, requested extension of Unit 1 Relief Request (RR) 23. This request was made based on the NRC review status of WCAP-15973-P. Unit 1 RR 23 was previously submitted by FPL letter L-2002-247 on January 8, 2003 and supplemented by FPL letter L-2003-108 on April 23, 2003. The NRC approved the RR for one operating cycle by NRC letters dated May 9, 2003 and May 23, 2003.

The NRC staff stated in their May 9, 2003 and May 23, 2003 letters that prior to use of the half nozzle and sleeved full-nozzle replacements on a permanent basis, FPL will be required to submit a separate relief request for NRC approval. The NRC planned to issue the required conditions for implementing the half nozzle and sleeved full-nozzle repairs on a permanent basis in the NRC staff's safety evaluation of the Westinghouse Topical Report WCAP-15973-P, Revision 00, that was under NRC staff review.

By letter L-2004-100 dated April 20, 2004, FPL requested a one cycle extension of the NRC approval of Unit 1 Relief Request 23, Revision 1. On May 18, 2004, the NRC approved the requested one cycle extension. The extension of the Unit 1 RR 23 for one additional cycle was approved to allow time for the NRC staff to complete the topical report review. It also allowed time for FPL to submit and the NRC to review the permanent RRs.

A047

On January 12, 2005, the NRC approved WCAP-15973-P and in February 2005 Westinghouse issued the approved version of the topical report, WCAP-15973-P-A, dated February 2005.

NRC approval of the subject permanent repair Relief Request Number 26 for St. Lucie Unit 1 was requested to support the upcoming fall 2005 refueling outage (SL1-20).

Please contact George Madden at 772-467-7155 if there are any questions about this submittal.

Very truly yours,

William Jefferson, Jr.
Vice President
St. Lucie Plant

WJ/GRM

Attachment

St. Lucie Unit 1
Response to Request for Additional Information
Relief Request No. 26
Repair of Alloy 600 Small Bore Nozzles Without Flaw Removal

NRC Request 1:

The description of American Society of Mechanical Engineers components affected only states that it applies to small bore alloy 600 nozzles welded to the reactor coolant piping hot legs. Also, the referenced drawings were not provided and are not included in the Updated Final Safety Analysis Report for St. Lucie Unit 1. Please provide a detailed list of the affected nozzles with locations and dimensions.

FPL Response:

Please see Tables 1 and 2. Table 1 provides the history of alloy 600 small bore nozzle replacements at St. Lucie Unit 1. Table 2 provides the dimensions of the alloy 600 small bore nozzles that have been or will be replaced at St. Lucie Unit 1 as listed in Table 1.

NRC Request 2:

The requested relief is intended to include previously repaired nozzles. Please provide a listing of previously repaired nozzles, including method of repair and date of repair.

FPL Response:

Please see Table 1, which provides a history of alloy 600 small bore nozzles that have been replaced at St. Lucie Unit1. Table 1 identifies the repair method and date of replacement.

NRC Request 3:

The proposed alternative indicates that it is intended to apply to nozzles that have been or will be repaired using the half nozzle technique. As stated in Florida Power and Light Company letter L-2005-099, the U. S. Nuclear Regulatory Commission (NRC) staff has also previously approved repairs using the sleeved full-nozzle technique. Please clarify the request to indicate that it is not applicable to the sleeved full-nozzle technique, if intended.

FPL Response:

The relief request applies only to replacements done with the half nozzle technique. Table 1 shows that all alloy 600 small bore nozzles replaced at St. Lucie Unit 1 have been done with the half nozzle technique.

NRC Request 4:

The calculations and analysis provided to address Section 4.1 of the NRC Safety Evaluation (SE) dated January 12, 2005, for Westinghouse Topical Report (TR) WCAP-15973-P, do not correctly respond to the concern. Please provide a revised analysis to address the following:

a. Step 1 - Does Section 2.4 of the WCAP-15973-P apply to St. Lucie Unit 1 in determining the maximum allowable hole size relative to (1) reduction in the effective weld shear area, and (2) the required area of reinforcement for the nozzle bore holes? If yes, provide the basis for the determination. If not, provide a plant specific analysis concerning the above.

FPL Response 4.a:

Section 2.4 of WCAP-15973-P applies to St. Lucie Unit 1. The base material of the hot leg, SA-516 Gr. 70, the corrosive environment and operating temperatures of St. Lucie Unit 1 are equivalent to the characteristics described in WCAP-15973-P. The hot leg nozzle design of St. Lucie Unit 1 is equivalent to that described in WCAP-15973-P, as shown in Table 2 herein. Additionally, Section 2.4 of WCAP-15973-P states in several locations that it is applicable to all CE designed plants.

b. Step 2 - Discuss in detail how the overall general corrosion rate was determined.

FPL Response 4.b:

The overall general corrosion rate was determined using the calculation methods in the TR and St. Lucie Unit 1 generation data from 1/1/95 to 12/31/04, the most recent ten year period for which data is available. The percentage of total plant time spent at each of the temperature conditions follows:

High temperature conditions	91.1%
Intermediate temperature conditions	2.4%
Low temperature conditions	6.5%

The corrosion rate for each temperature condition is taken from the TR and is shown as follows:

High temperature conditions	0.4 mpy
Intermediate temperature conditions	19 mpy
Low temperature conditions	8.0 mpy

The overall corrosion rate was determined using the above time at temperature data and corrosion rate at temperature data and formula 1 of the TR as follows;

$$CR=0.911 \times 0.4mpy+0.024 \times 19\ mpy+0.065 \times 8mpy$$

Resulting in an overall corrosion rate of 1.34 mpy

c. Step 3 - Using the calculated corrosion rate in Step 2 above, calculate the amount of corrosion during the service life of the half nozzle repair.

FPL Response 4.c:

The first half nozzle repair was made in April 2001. The plant license was renewed and it expires on March 1, 2036. The first half nozzle repair can be expected to see 35 more years of service. Applying the corrosion rate from step 2, 1.34 mils per year, for 35 years results in a material loss of 46.9 mils.

d. Step 4 - Using the amount of corrosion over the specified time period calculated in Step 3 above, calculate the allowable increase in the diameter of the penetration (not the radius) in the carbon/low alloy steel piping. Does this diameter increase of the penetration still meet the allowable increase in diameter specified in WCAP-15739-P, Rev. 01, Section 2.4? Provide the basis for this conclusion.

FPL Response 4.d:

The calculated material loss in step 3 above is 47 mils. Doubling the loss to account for a diametrical change and adding the diameter of 0.997 inches, from Table 2, results in a diameter of 1.091 inches after 35 years of service. A diameter of 1.091 inches is less than the limiting diameter of 1.270 inches identified in Reference 12 of WCAP 15739-P, Rev.01 applicable to St. Lucie Unit 1.

e. Step 5 - The NRC SE requires licensees to track the time at cold shut down (that are planned or that may occur unexpectedly) to determine whether this time does not exceed the assumptions made in the analysis. If these assumptions are exceeded, the licensees shall provide a revised analysis to the

NRC, and provide a discussion on whether volumetric inspection of the area is required. If St. Lucie Unit 1 does not commit to track the time at cold shutdown required by the SE, provide justification why this will not violate the analysis and the criteria in the SE. This justification should also explain how unplanned outages will be accounted for in the corrosion analysis, including statistical analysis of the confidence level that the overall corrosion rate will not violate the criteria established in WCAP-15973-P.

FPL Response 4.e:

The plant operating conditions will be reassessed for the resubmittal of this relief request at the start of the next inspection interval, which begins in March 2008. There is no need to track plant operating conditions during the remainder of the current inspection interval as there is sufficient wall thickness margin to maintain the minimum required wall thickness until this reassessment is made. As shown in WCAP-15973-P-A Rev. 1, the most severe corrosion rate for steady state conditions, i. e. at power or shutdown, would occur during outage or shutdown conditions with a corrosion rate of 8 mpy. Using the calculated corrosion rate of 1.34 mpy, from 2001 for four years, the wall would have experienced a radial loss of 0.005 inches to date. If the plant remained shut down for the remainder of the inspection interval, approximately 27 months, and experienced corrosion of the steel at the rate shown in the TR, approximately 8 mpy, there would be an additional loss of 0.019 inches of wall thickness. The total loss, 0.005 inches plus 0.019 inches, would equal 0.024 inches. Doubling the loss to account for a diametrical change and adding the diameter of 0.997 inches, from Table 2, results in a diameter of 1.045 inches at the start of the next inspection interval. A diameter of 1.045 inches is less than the limiting diameter of 1.270 inches identified in Reference 12 of WCAP-15739-P, Rev. 01.

NRC Request 5:

To enable the staff to evaluate the response to item 1 of Section 4.2 of the SE, please provide the plant-specific dimensions for comparison with those used in the Calculation Report CN-CI-02-71, Rev. 1.

FPL Response:

Please see Table 2 which lists the nozzle dimensions used in Calculation Report CN-CI-02-71, Rev. 1 and shows the comparable actual dimensions encountered at St. Lucie Unit 1. Table 2 demonstrates that the alloy 600 small bore nozzles at St. Lucie Unit 1 are bounded by the nozzles used in Calculation Report CN-CI-02-71, Rev. 1.

NRC Request 6:

Is St. Lucie Unit 1 bounded by the linear elastic fracture mechanics analysis in Calculation Report CN-CI-02-71, Rev. 1? Please provide the basis for this conclusion.

FPL Response:

St. Lucie Unit 1 is bounded by the linear elastic fracture mechanic analysis in Calculation Report CN-CI-02-71, Revision 1, since the estimated Unit 1 hot leg pipe RT_{NDT} is 30 degrees F versus the 60 degree F value used in the TR. The actual RT_{NDT} was not determined for the hot leg piping since this determination was not required at the time of procurement of the piping. However, Charpy V-notch tests were performed on the hot leg piping at +10 degrees F, yielding values of 54, 43, 42 and 55, 44, 52 ft-lb for the two heat numbers involved. Based on Reference 1, Section B.1.1(4), the Charpy V-notch test results can be used to justify an estimated RT_{NDT} of the two heat numbers involved as +30 degrees F.

NRC Request 7:

The responses to address Section 4.3 of the SE provide values of chemistry parameters and contaminant levels and states that they have been maintained at steady state during the past two cycles. Please discuss the scope of the reviews conducted to support the data provided. Also, please identify any water chemistry transients in the last two operating cycles that significantly exceeded the steady state ranges and discuss the impact on stress corrosion crack growth of existing flaws in the crevice area of carbon and low-alloy steel.

FPL Response:

The reactor coolant system water is analyzed for dissolved oxygen and halides three times per week with no interval between analysis to exceed 72 hours. Analysis for dissolved oxygen is not required when the reactor coolant system T_{avg} is less than or equal to 250 degrees F. Analysis for halides is not required when all fuel is removed from the reactor vessel and the reactor coolant system T_{avg} is less than 140 degrees F. The reactor coolant system water is analyzed for sulfate ions at least once per 7 days. The analysis results for the last two cycles were reviewed and no transients were identified.

TABLE 1 St. Lucie Unit 1 Replacement History Alloy 600 Small Bore Nozzles on Hot Leg Piping					
Tag ID	Hot Leg A or B	Replacement Date	Replacement Method	Reason for Replacement	Flaw Left
PDT-1121D	B	2001	1/2 Nozzle Repair	Leakage	Yes
TE-1112HA	A	Planned for 2005	1/2 Nozzle Repair	Preventative	*
TE-1112HB	A	Planned for 2005	1/2 Nozzle Repair	Preventative	*
TE-1112HC	A	Planned for 2005	1/2 Nozzle Repair	Preventative	*
TE-1112HD	A	Planned for 2005	1/2 Nozzle Repair	Preventative	*
TE-1111X	A	Planned for 2005	1/2 Nozzle Repair	Preventative	*
TE-1122HA	B	Planned for 2005	1/2 Nozzle Repair	Preventative	*
TE-1122HB	B	Planned for 2005	1/2 Nozzle Repair	Preventative	*
TE-1122HC	B	Planned for 2005	1/2 Nozzle Repair	Preventative	*
TE-1122HD	B	Planned for 2005	1/2 Nozzle Repair	Preventative	*
TE-1121X	B	Planned for 2005	1/2 Nozzle Repair	Preventative	*
PDT-1111A	A	Planned for 2005	1/2 Nozzle Repair	Preventative	*
PDT-1111B	A	Planned for 2005	1/2 Nozzle Repair	Preventative	*
PDT-1111C	A	Planned for 2005	1/2 Nozzle Repair	Preventative	*
PDT-1111D	A	Planned for 2005	1/2 Nozzle Repair	Preventative	*
PDT-1121A	B	Planned for 2005	1/2 Nozzle Repair	Preventative	*
PDT-1121B	B	Planned for 2005	1/2 Nozzle Repair	Preventative	*
PDT-1121C	B	Planned for 2005	1/2 Nozzle Repair	Preventative	*
RC-143	A	Planned for 2005	1/2 Nozzle Repair	Preventative	*

*No leakage has been identified during previous inspections. Preventative repair is currently scheduled for refueling outage SL1-20.

Table 2
St. Lucie Unit 1
Comparison of Nozzle Dimensions Used in Calculation and Actual Nozzles

Dimension	Value from CN-CI-02-71 (in.)	Value at PSL1 (in.)	Comparison to Value from CN-CI-02-71
Hot Leg Piping Base Metal Thickness	3.75	3.75	Equivalent
Hot Leg Piping Inside Radius	21	21	Equivalent
Cladding Thickness	0.25	0.25	Equivalent
Nozzle Bore Diameter	0.997	0.997	Equivalent
Initial Depth of Weld Prep Radial Direction*	0.938	0.938 Flow nozzle 0.875 RTD nozzle	Equivalent Less
Initial Length of Weld Prep Circumferentially*	0.762	0.760 Flow Nozzle 0.743 RTD Nozzle	Less Less

*Postulated crack dimensions based on initial weld joint dimensions.

REFERENCES

1) BRANCH TECHNICAL POSITION - EMCB 5-2 (Formerly MTEB 5-2)FRACTURE TOUGHNESS REQUIREMENTS contained in the Standard Review Plan Section 5.3.2, Pressure-Temperature Limits and Pressurized Thermal Shock, Draft Revision 2, April 1996