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

November 3, 2004

L-2004-252
EA-03-09 IV.F(2)

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

Re: St. Lucie Unit 2
Docket No. 50-389
Order (EA-03-009)
Request for Additional Information Response
Relaxation Request No. 3

On October 12, 2004, the NRC issued a request for additional information (RAI) regarding Relaxation Requests No. 3 for reactor vessel head penetration (RPVH) inspections required by NRC Order EA-03-009. The RAIs were discussed between Florida Power & Light (FPL) and the NRC in a conference call on October 7, 2004. The FPL response to the RAI is attached.

The NRC issued Order (EA-03-009) requiring specific inspections of the reactor pressure vessel (RPV) head and associated penetration nozzles at pressurized water reactors on February 11, 2003. On February 20, 2004, the NRC issued the First Revised Order EA-03-009. Pursuant to the procedure specified in Section IV, paragraph F of the Order, FPL requested relaxation from the requirements specified in Section IV, paragraphs C(1)(a) and C(1)(b)(i) for St. Lucie Unit 2 RPVH penetration inspections. The subject requests were submitted by FPL letter L-2004-095 on May 6, 2004.

FPL requested approval of the subject relaxation requests by November 28, 2004, the originally scheduled start date for St. Lucie Unit 2 refueling outage (SL2-15). SL2-15 is currently scheduled to start on January 5, 2005.

Please contact George Madden at (772) 467-7155 if there are any questions about the relaxation requests.

Very truly yours,

William Jefferson, Jr.
Vice President
St. Lucie Plant

Attachment

A101

**RESPONSE TO NRC REQUESTS FOR ADDITIONAL INFORMATION
ST. LUCIE UNIT 2 RELAXATION REQUEST NO. 3
FROM THE FIRST REVISED NRC ORDER EA-03-009**

By letter dated October 12, 2004, the NRC sent a request for additional information (RAI) regarding a relaxation from The First Revised Order EA-03-009 for the non visual inspection of reactor pressure vessel (RPV) head penetration nozzles submitted by FPL in letter L-2004-095 for St. Lucie Unit 2. Below are the responses to those RAI questions.

NRC Question 1: *The proposed alternative invokes a supplemental examination by nonvisual nondestructive examination on nozzles with less than 0.50-inch ultrasonic coverage below the J-groove weld. Since the First Revised Order EA-03-009 requires examinations to 1 inch below the J-groove weld provided the stress level at below 1 inch is less than 20 ksi, please justify use of the 0.50-inch criterion, which will limit the supplemental examinations to only 18 nozzles.*

FPL Response to Question 1: The inspection distance below the weld toe is limited by the physical condition of the internally threaded guide cone. No technology is currently available that will increase this distance for NDE performed from the nozzle internal diameter (ID). A previous relaxation for this condition, based on hardship, was requested and approved by the NRC on May 29, 2003.[1] That relaxation request supplemented the internal UT examinations with an external (OD) surface method, for nozzles that could not be inspected to at least 0.41 inches below the weld. During the St. Lucie Unit 2 Spring 2003 refueling outage, nine nozzles were manually inspected by external PT in accordance with this criteria. These supplemental inspections resulted in total personnel exposure of 2.45 Rem.

The current relaxation request seeks approval to utilize a supplemental nonvisual NDE method on RPV nozzles for which internal UT cannot be performed to a distance of at least 0.50 inches below the weld. Based on the dimensional data collected from the prior examination,[2] this criteria will require that 18 nozzles be inspected by nonvisual NDE on their OD surfaces. If the 1 inch criteria of the

[1] NRC Safety Evaluation, Saint Lucie Nuclear Plant, Unit 2, Order EA-03-009 Relaxation Requests Nos. 1 and 2 Regarding Examination Coverage of Reactor Pressure Vessel Head Penetration Nozzles (Tac Nos. MB8165 and MB8166), from Scott W. Moore (NRC) to J. A. Stall, Dated May 29, 2003.

[2] FPL letter, L-2003-129, St. Lucie Unit 2, Docket No. 50-389, Order (EA-03-009) Interim RPVH Inspection Requirements, Revised Relaxation Request Nos. 1 and 2, Supplement 4, William Jefferson Jr. to NRC, dated May 11, 2003.

Order were applied, eighty-one nozzles would require supplemental surface exams.

At the time of the relaxation request, the supplemental nonvisual NDE method had not been selected. A mechanized external UT is being pursued, but this method has not been field tested at any plant and its reliability in a full scale campaign has not been established. Additionally, the schedule to deliver a separate external UT devise for eighty-one RPV nozzles could nearly double the examination time. The dose intensive manual PT is still a contingency should the external UT fail to function on some or all of the 18 nozzles. The manual PT of 18 nozzles could result in a personnel dose of approximately 4.9 Rem (based on the actual dose accumulated during the previous outage manual PT efforts). If the examination were not limited to 0.50 inches below the weld, manual PTs for 81 nozzles could result in personnel exposure of approximately 22 Rem. Therefore, a hardship or unusual difficulty, without a compensating increase in the level of quality and safety would result if the inspection were required to extend to 1 inch below the weld toe. Based on this hardship, a technical basis to limit the external nonvisual examination was pursued.

The technical justification for the 0.50 inches criteria is based on the plant specific hoop stress plots of nozzles presented in WCAP-16038-P. Specifically, Figures E-1, E-2, E-4, and E-6 of WCAP-16038-P show that the operational hoop stresses on the outside surface of the RPV nozzles drop below 20 ksi within 0.50 inches of the lowest point below the weld toe (on the downhill side). These stress conditions satisfy the stress criteria of the Order, thereby minimizing the potential for cracking to exist in the un-inspected areas of the nozzles. The 0.50 inches criteria is also justified by the crack growth rate in this low stressed area which allows a period of operation greater than 5 years. FPL is requesting an 18 month period of operation between inspections. The relaxation request states:

> "A flaw tolerance approach was developed to determine the minimum coverage distance below the weld required to assure that a postulated flaw would not grow into the weld in one 18-month period of operation. The basis for the approach is documented in WCAP–16038-P (previously transmitted to the NRC) and shown in WCAP Figures 6-12 through 6-18 for the CEDMs. These figures show that for all nozzle intersection angles evaluated, if an axial through wall flaw were to exist 0.50 inches below the end of the weld, the predicted time for the flaw to grow to a point of contacting the weld would take greater than 5 years of operation."

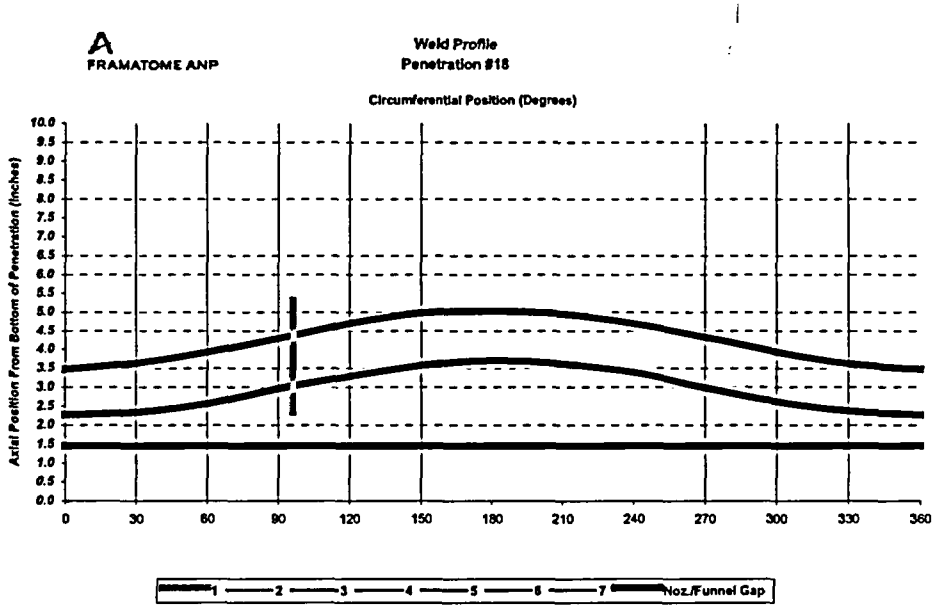
NRC Question 2: *The proposed alternative was mainly based on a "flaw tolerance analysis" as documented in WCAP-16038-P, which was completed in March 2003. There has been an inspection since, during which axial cracks were found in two nozzles. The submittal references a previous letter (Ref. 3, FPL Letter L-2003-129) which documented the findings. However, there is no*

analysis or discussion assessing the impact of the findings on the flaw tolerance analysis. The inspection findings appear to call into question the validity of the flaw tolerance analysis.

1. *Please provide your failure analysis regarding the cracks, including a sketch of the flaw found on nozzle 18.*

FPL Response to Question 2.1:

There was no traditional failure analysis since the flaw was destroyed during the repair. The sketch of the flaw in nozzle 18 was provided in Attachment 1, page 14 of FPL letter L-2003-129.



The phenomenon of PWSCC in alloy 600 RVHPs is well documented in industry reports and in the background sections of the NRC Bulletins and the Order. Failure analyses have been performed on earlier alloy 600 RVHPs with cracks such as Bugey and the retired North Anna head. The conclusions to date all point to PWSCC. The flaws detected at St. Lucie 2 during the spring 2003 inspection were characterized as PWSCC and typical of other cracks found in the industry. The cracks were contained completely within the inspection region proposed by this relaxation request.

NRC Question 2.2: *Have the findings been used to update the flaw tolerance analysis in WCAP-16038?*

FPL Response to Question 2.2:

The St. Lucie Unit 2 flaws were detected during the first volumetric inspection for this unit. Therefore, no crack growth rate information is available to question the finding of the WCAP. The crack growth rate used in the WCAP is based on MRP-55 Rev 1, which is the latest compilation of all available lab data and industry field experience with PWSCC flaws in RV head penetrations that were left in service.

FPL contacted the vendor that prepared the WCAP to determine if recent repeat examinations in the industry have resulted in crack growth rates that would require revision of the WCAP. Westinghouse identified that the recent industry data did not invalidate the crack growth rate used in WCAP-16038. Westinghouse identified that any assessment of crack growth rate must include the lower limit of detection as the initiation point instead of 0% through wall. It is also noted that no leakage has been identified from flaws detected during the repeat inspection. Therefore, the one cycle inspection frequency is effective at identifying flaws before pressure boundary leakage can occur or the flaws become safety significant.

NRC Question 2.3: *Are the results and conclusions in WCAP-16038 still valid? Provide technical bases, including the growth rate calculated from the cracks, to substantiate your conclusions.*

FPL Response to Question 2.3:

The conclusions are still valid. There are no new crack growth rates that challenge the MRP-55 Rev 1 report. No crack growth rates are available from the St. Lucie Unit 2 spring 2003 inspection as it was a first time inspection.

NRC Question 3: *The requested duration for the relaxation includes the next two refueling outages (SL2-15 and SL2-16). If the Nuclear Regulatory Commission (NRC) staff determines that the relaxation request is acceptable, approval may be granted for two refueling outages, subject to a condition such as the following:*

> *"If there are significant adverse findings during the inspection in the SL2-15 outage, the NRC staff, at its discretion, may rescind or modify approval of the relaxation for the SL2-16 outage inspection."*

Please indicate your acceptance of this condition or propose alternative wording.

FPL Response to Question 3:

FPL accepts the NRC proposed wording of this condition.

NRC Question 4: *Granting of relaxation will also be subject to the following condition, which was included in the previous relaxation for the SL2-14 outage:*

> *"If the NRC staff finds that the crack growth formula in industry report MRP-55 is unacceptable, the licensee shall revise its analysis that justifies relaxation of the Order within 30 days after the NRC informs the licensee of an NRC-approved crack growth formula. If the licensee's revised analysis shows that the crack growth acceptance criteria are exceeded prior to the end of the current operating cycle, this relaxation is rescinded and the licensee shall, within 72 hours, submit to the NRC written justification for continued operation. If the revised analysis shows that the crack growth acceptance criteria are exceeded during the subsequent operating cycle, the licensee shall, within 30 days, submit the revised analysis for NRC review. If the revised analysis shows that the crack growth acceptance criteria are not exceeded during either the current operating cycle or the subsequent operating cycle, the licensee shall, within 30 days, submit a letter to the NRC confirming that its analysis has been revised."*

Please indicate your continued acceptance of this condition

FPL Response to Question 4:

FPL accepts the NRC proposed wording for this condition.