Florida Power & Light Company, P. O. Box 14000, Juno Beach, FL 33408-0420

FPL

November 1, 2001

L-2001-247
10 CFR 50.4
10 CFR 50.54(f)

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

RE: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
Supplemental Response to NRC Bulletin 2001-01

On August 3, 2001, the NRC issued Bulletin (NRCB) 2001-01, *Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles.* NRCB 2001-01 requested information related to the structural integrity of the reactor pressure vessel head penetration (VHP) nozzles for their respective facilities; including the extent of VHP nozzle leakage and cracking that has been found to date; the inspections and repairs that have been undertaken to satisfy applicable regulatory requirements; and the basis for concluding that their plans for future inspections will ensure compliance with applicable regulatory requirements.

In the initial response to the bulletin, FPL committed to a partial inspection of Unit 2 during the upcoming fall 2001 outage (SL2-13), followed by complete inspections in the following Unit 1 and Unit 2 outages. The reason for the partial inspection was due to the complex insulation package and the significant personnel exposure that would be incurred to remove insulation. FPL's approach was to utilize the upcoming outage to determine the best method of removal, develop the remote tooling necessary, and be better prepared for the next two outages which would result in significant personnel exposure reduction.

Subsequent to the response L-2001-198 dated September 4, 2001, FPL has continued to investigate and develop alternatives to the insulation removal with vendors and has increased confidence in remote visual capabilities. During phone calls with the NRC on October 4, 2001, October 11, 2001, and October 18, 2001, the NRC requested FPL to inspect 100 percent of the St. Lucie Unit 2 reactor pressure vessel head penetrations during the Fall 2001 refueling outage (SL2-13). By this letter, FPL is providing a complete replacement for the responses to question numbers 4 and 5 in NRC Bulletin 2001-01 for St. Lucie Units 1 and 2.

This response is provided pursuant to the requirements of Section 182a of the Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f). Should there be any questions, please call me at (561) 694-4848.

Very truly yours,

R. S. Kundalkar
Vice President
Nuclear Engineering

Attachments

A088

STATE OF FLORIDA)
) ss.
COUNTY OF PALM BEACH)

R. S. Kundalkar being first duly sworn, deposes and says:

That he is Vice President, Nuclear Engineering, of Florida Power and Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

R. S. Kundalkar

Subscribed and sworn to before me this

1st day of November 2001.

Name of Notary Public (Type or Print)

OFFICIAL NOTARY SEAL
JUDITH ANN CREASMAN
NOTARY PUBLIC STATE OF FLORIDA
COMMISSION NO. CC980677
MY COMMISSION EXP. DEC. 5,2004

R. S. Kundalkar is personally known to me.

NRC Bulletin 2001-01
Supplemental Response for St. Lucie Units 1 and 2

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***NRC Question 4**: If the susceptibility ranking for your plant is greater than 5 EFPY and less than 30 EFPY of ONS3, addressees are requested to provide the following information:*

a. ***your plans for future inspections (type, scope, qualification requirements, and acceptance criteria) and the schedule;***

FPL Response to NRC Questions 4a: For St. Lucie Unit 1, FPL is planning a visual inspection (VT-2) of the bare metal on the top of the reactor pressure vessel (RPV) head during the fall 2002 refueling outage (SL1-18). A visual examination (VT-2) will be conducted using direct or remote methods including boroscopes and cameras to record the area of interest for any evidence of leakage. The scope is planned for essentially 100 percent of the surface (as implied in 10 CFR 50.55a; more than 90 percent of the

examination of each weld or item, where the reduction in coverage is due to interferences) at the interface between the RPV head and the 78 vessel head penetrations (VHP) of St. Lucie Unit 1.

For St. Lucie Unit 2, FPL is planning an effective remote visual inspection of the bare metal on the top of the reactor vessel heads during the fall 2001 refueling outage (SL2-13) using VT-2 Qualified personnel.

FPL plans to use remote inspection methods using cameras, video probes, crawlers, and/or boroscopes to conduct an "under-insulation" inspection. As discussed in response to Question 1c, seventeen panels of insulation cover the closure head penetrations on Unit 2. These panels are intricately assembled in two concentric circles containing eight panels each, with a center panel at the top of the dome. The panels are offset from the head at varying distances, and according to the design drawings for the insulation package, can accommodate an under-insulation inspection by remote methods. However, the center panel at the top of the head presents a challenge in that the offset distance from the head converges to approximately one half inch at the center of the dome. Although access to these VHPs is feasible, the clearance limits the range of motion and maneuverability of the remote equipment.

FPL will inspect the penetrations by gaining access (via holes or other means) to the space between the insulation panels and the reactor head surface. FPL's assessment of using the under-insulation visual inspection method included drawing reviews, insulation contractor interviews, and vendor discussions. FPL believes that the penetrations underneath the concentric rings of insulation panels will be accessible for complete visual inspection around the periphery of each penetration. Under the center insulation panel are 20 penetrations (19 control rod drive mechanisms (CRDM) and the reactor head vent penetration). The clearances below the center panel could limit the access angle, and could limit the ability to fully traverse around the full circumference of the penetrations particularly the top penetrations located within approximately 18 inches of the apex of the dome. Although the limited access may not provide ideal viewing conditions such as described in the EPRI guidance document[1], FPL believes that there will be sufficient access to identify evidence of boric acid buildup similar to that identified at Oconee, ANO-1, and Crystal River. Therefore, the inspection will constitute an effective visual examination. This conclusion is based on reviews of leakage photographs from the plants that have identified leakage thus far. Use of the under-insulation method of inspection will result in a significant personnel dose reduction.

The video acquisition will be reviewed on a real time basis to ensure that the visual inspection is sufficient to identify leakage similar to that found at Oconee and Crystal River. FPL is developing contingencies should the video results not be sufficient to identify leakage. The first contingency plan is to increase the under-insulation clearance using remote tools. FPL is working with a vendor to develop a long handled

1 "Visual Examination for Leakage of PWR Reactor Head Penetrations", EPRI NDE Center, Charlotte, NC: 2001. 1006296.

pneumatic scissors-type spreader, an inflatable bladder, and/or a suction cup tool to raise the insulation panel sufficiently to view the penetrations. Another contingency plan is to remove all of the CRDM coil stacks, cabling, and related supports, in order to lift the shroud/plenum plate assembly, and remove the insulation package (in whole or in part). The removed insulation would be replaced with similar or blanket-type insulation. FPL is currently assessing the availability of spare coil stacks and other parts in the industry to support this contingency.

The personnel qualification for visual examiners will be in accordance with the requirements of IWA-2300 of the 1989 ASME Section XI. The visual acceptance criteria will be no visible evidence of leakage at the VHPs. Any indication of leakage will be evaluated using photos available from the Oconee Units 1, 2, and 3; ANO-1; and the most recent Crystal River-3 inspections. Experience from Oconee Units 1, 2, and 3; ANO-1; and Crystal River-3 indicates that although past leakage (from leaking jointed connections) may result in boric acid residue on the head and insulation, the characteristics of leakage that has clearly initiated at the VHP nozzle is boric acid crystal deposits that appear to have been pushed out of the annulus between the nozzle and the vessel head and is evident around a large portion of the VHP perimeter. The unique appearance of boric acid that has been pushed out of the annulus between the nozzle and the vessel head should be detectable even in the presence of some quantity of boric acid from other sources or minor interference. By utilizing the remote visual equipment described, the scope of the examination is planned to be essentially 100 percent of the surface of interest (as discussed in 10 CFR 50.55a; more than 90 percent of the examination of each weld or item, where the reduction in coverage is due to interference) of the 102 VHPs at St. Lucie Unit 2. The visual acceptance criteria will be zero leakage from the VHPs. Any evidence of boric acid deposits will be documented and evaluated in accordance with the St. Lucie corrective action program.

FPL is also developing an additional contingency to perform ultrasonic examination (UT) of the CRDM drive sleeves. Rotating head UT equipment would be delivered from underneath the head to scan the drive sleeves from a point two to three inches above the weld, to the bottom of the drive sleeve. The UT equipment would be capable of detecting outside diameter initiated flaws and inside diameter initiated flaws. The UT arrays are such that both axial and circumferential flaws would be detected.

In the event that FPL is required to perform the UT examination, the personnel qualification will be in accordance with the requirements of IWA-2300 of the 1989 ASME Section XI for Non-Destructive Examiners. Flaw acceptance criteria for the UT examination is dependent on the location of the flaw. Axial flaws that are initiated from the inside diameter (ID) within the pressure boundary of the CRDM penetration would be evaluated in accordance with ASME Section XI flaw standards for austenitic piping specified in IWB-3514.3, including the rules of IWB-3640. The margins maintained after crack growth will be evaluated for the period of service until the next inspection. The maximum flaw depth as allowed by IWB-3640 is 75 percent of the nozzle thickness. The estimated crack growth to be used for axial ID initiated flaws will be determined

from EPRI TR-109136[2]. Any ID initiated circumferential flaw within the pressure boundary would be repaired. Any outside diameter (OD) initiated axial or circumferential flaws within the pressure boundary would be repaired. Any rejectible flaws or indications would be documented and evaluated in accordance with the St. Lucie corrective action program.

Flaws that are initiated from the ID or OD below the weld (i.e., outside of the penetration pressure boundary) will be evaluated for acceptance. Axially oriented flaws will be considered acceptable regardless of depth as long as their upper extremity does not reach the bottom of the weld during the period of service until the next inspection. Circumferentially oriented flaws will be acceptable provided that crack growth is evaluated for the period of service until the next inspection and provided that the projected end of cycle circumferential flaw length will not exceed 75 percent of the nozzle circumference.

In summary, FPL plans to perform an under-insulation inspection. In the event that the under-insulation method does not result in 100 percent inspection of the penetrations, FPL will utilize any or a combination of the three contingencies described above in order to achieve 100 percent inspection of the reactor vessel closure head penetrations.

NRC Question 4b: ***your basis for concluding that the inspections identified in 4.a will assure that regulatory requirements are met (see Applicable Regulatory Requirements section). Include the following specific information in this discussion:***

1) ***If your future inspection plans do not include a qualified visual examination at the next scheduled refueling outage, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.***
2) ***The corrective actions that will be taken, including alternative inspection methods (for example, volumetric examination), if leakage is detected.***

FPL Response to NRC Questions 4b: The technical basis for concluding that the regulatory bases are met for St. Lucie Units 1 and 2 are provided in the Regulatory Requirements Section of MRP-48. The following is a supplement to that response with plant specific clarification.

The visual and under the RPV head inspections identified in the response to question 4a will meet the requirements of 10CFR50 Appendix B *Criterion V, Criterion IX, and Criterion XVI* because all examinations will be performed to written procedures by

2 "Crack Growth and Microstructural Characterization of Alloy 600 Vessel Head Penetration Materials", by Bamford, W. H., and Foster, J. P., EPRI, Palo Alto, CA:1997. TR-109136.

qualified personnel using qualified procedures in accordance with written acceptance criteria and schedule as previously identified in the response to question 4a.

Should leakage be detected during the examinations identified in the response to question 4a, corrective action will be conducted to identify the source. If the leakage is identified as pressure boundary leakage and confirmed to be coming from the VHP annulus region or other component, additional inspection techniques would be used to locate and characterize the flaw. NDE methods would likely include eddy current, ultrasonic, dye penetrant, or a combination of these examination methods. Following flaw characterization, the flaw would be removed and/or repaired using an ASME Code or NRC approved method. This corrective action would occur prior to returning to a mode of operation that the St. Lucie Units 1 and 2 Technical Specification 3/4.4.6.2 requirement for pressure boundary leakage is applicable.

NRC Question 5: *Addressees are requested to provide the following information within 30 days after plant restart following the next refueling outage:*

a. *a description of the extent of VHP nozzle leakage and cracking detected at your plant, including the number, location, size, and nature of each crack detected;*

b. *if cracking is identified, a description of the inspections (type, scope, qualification requirements, and acceptance criteria), repairs, and other corrective actions you have taken to satisfy applicable regulatory requirements. This information is requested only if there are any changes from prior information submitted in accordance with this bulletin.*

FPL Response to NRC Questions 5a and b:

FPL will provide the requested information from St. Lucie Unit 1 inspection within 30 days after plant restart following the next refueling outage (SL1-18) currently scheduled for the fall of 2002.

FPL will provide the requested information from St. Lucie Unit 2 inspection within 30 days after plant restart following the next refueling outage (SL2-13) currently scheduled for the fall of 2001.