

December 20, 2004

Mr. J. A. Stall  
Senior Vice President, Nuclear and  
Chief Nuclear Officer  
Florida Power and Light Company  
P.O. Box 14000  
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SUBJECT: ST. LUCIE UNIT 2 - SAFETY EVALUATION FOR REVISED RELIEF REQUEST  
NOS. 1A AND 10A REGARDING THE CLOSEOUT OF THE SECOND 10-YEAR  
INSERVICE INSPECTION INTERVAL (TAC NO. MC4045)

Dear Mr. Stall:

By letter dated August 6, 2004, Florida Power and Light Company (FPL) submitted, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(6)(i), revised Relief Requests (RRs) 1A and 10A for the closeout of the second 10-year inservice inspection (ISI) interval at St. Lucie Unit 2. FPL requested relief from certain volumetric examination requirements of the *American Society of Mechanical Engineers* (ASME) Code, Section XI, 1989 Edition, for some reactor pressure vessel welds and some Class 2 piping welds for St. Lucie Unit 2. These reliefs pertain to the limited volumetric examinations conducted for each of the welds due to the configuration of these welds or interference from adjacent components. These reliefs are applicable to specific longitudinal and circumferential shell welds, meridional head welds, nozzle-to-vessel welds, and piping welds.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed FPL's proposed alternatives and concluded that the ASME Code-required examinations are impractical, and that the proposed inspections provide reasonable assurance of structural integrity. Granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Therefore, revised RRs 1A and 10A are granted pursuant to 10 CFR 50.55a(g)(6)(i), for the closeout of the second 10-year ISI interval at St. Lucie Unit 2.

Further details on the bases for the NRC staff's conclusions are contained in the enclosed Safety Evaluation. If you have any questions regarding this issue, please feel free to contact Brendan Moroney at (301) 415-3974.

Sincerely,

/RA/

Michael L. Marshall, Jr., Chief, Section 2  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No.: 50-389

Enclosure: Safety Evaluation

cc w/enclosures: See next page

Mr. J. A. Stall  
Florida Power and Light Company

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION PROGRAM

REVISED RELIEF REQUEST NOS. 1A AND 10A

FLORIDA POWER AND LIGHT COMPANY

ST. LUCIE PLANT, UNIT 2

DOCKET NO. 50-389

1.0 INTRODUCTION

By letter dated August 6, 2004, Florida Power and Light Company (FPL) submitted, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(6)(i), revised Relief Requests (RRs) 1A and 10A for the closeout of the second 10-year inservice inspection (ISI) interval at St. Lucie Unit 2. FPL requested relief from certain volumetric examination requirements of the *American Society of Mechanical Engineers* (ASME) Code, Section XI, 1989 Edition, for some reactor pressure vessel (RPV) welds and some Class 2 piping welds for St. Lucie Unit 2. These reliefs pertain to the limited volumetric examinations conducted for each of the welds due to the configuration of these welds or interference from adjacent components. These reliefs are applicable to specific longitudinal and circumferential shell welds, meridional head welds, nozzle-to-vessel welds, and piping welds.

2.0 REGULATORY EVALUATION

The ISI of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME *Boiler and Pressure Vessel Code* (Code) and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). It is stated in 10 CFR 50.55a(a)(3) that alternatives to the requirements of paragraph (g) may be used, when authorized by the U.S. Nuclear Regulatory Commission (NRC), if the licensee demonstrates that (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by

reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable ISI Code of Record for the second 10-year ISI interval of St. Lucie Unit 2, is the 1989 Edition.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Systems/Component(s) for Which Relief is Requested:

RPV Lower Head Meridional Welds (101-154-A through F)  
Examination Category B-A, Item B1.22. 58% volumetric coverage obtained.

RPV Circumferential Lower Shell-to-Lower Head Weld (201-141)  
Examination Category B-A, Item B1.21. 80% volumetric coverage obtained.

RPV Intermediate Shell-to-Lower Shell Circumferential Weld (101-171)  
Examination Category B-A, Item B1.11. 86% volumetric coverage obtained.

RPV Upper Shell-to-Flange Weld (101-121)  
Examination Category B-A, Item B1.30. 75% volumetric coverage obtained.

RPV Outlet Nozzles to Shell Welds (105-121-A & 105-121-B)  
Examination Category B-D, Item B3.90. 65% volumetric coverage obtained.

RPV Closure Head (101-101)  
Examination Category B-A, Item B1.40. 81% volumetric coverage obtained.

Pipe to penetration 37, Low-pressure safety injection (LPSI) pump 2A discharge header piping  
Examination Category C-F-1, Item No. C5.11. 50% volumetric coverage obtained.

Pipe to valve 3144, LPSI pump 2B discharge header piping  
Examination Category C-F-1, Item No. C5.11. 54% volumetric coverage obtained.

Pipe to penetration 39, LPSI pump 2B discharge header piping  
Examination Category C-F-1, Item No. C5.11. 80% volumetric coverage obtained.

Pipe to penetration 38, LPSI pump 2B discharge header piping  
Examination Category C-F-1, Item No. C5.11. 50% volumetric coverage obtained.

Pipe to valve 3260, Safety Injection piping to safety injection tank 2B1  
Examination Category C-F-1, Item No. C5.11. 50% volumetric coverage obtained.

Pipe to valve 3614, Safety injection tank 2A2 piping  
Examination Category C-F-1, Item No. C5.11. 50% volumetric coverage obtained.

Pipe to valve 3235, Safety injection tank 2B1 piping  
Examination Category C-F-1, Item No. C5.11. 50% volumetric coverage obtained.

Pipe to valve 3427, High-pressure safety injection pump (HPSI) 2A to header A

Examination Category C-F-1, Item No. C5.21. 72% volumetric coverage obtained.

Pipe to valve 3414, HPSI pump 2B to header B

Examination Category C-F-1, Item No. C5.21. 75% volumetric coverage obtained.

Pipe to valve 3654, HPSI pump 2B to header B

Examination Category C-F-1, Item No. C5.21. 45% volumetric coverage obtained.

Pipe to valve 3547, Combined HPSI discharge piping

Examination Category C-F-1, Item No. C5.21. 74% volumetric coverage obtained.

Pipe to flange, Combined HPSI discharge piping (SI-381, SI-179, SI-137)

Examination Category C-F-1, Item No. C5.21. 47% minimum coverage obtained.

Pipe to tee, Combined HPSI discharge piping

Examination Category C-F-1, Item No. C5.21. 50% volumetric coverage obtained.

Pipe to tee, HPSI header B to shutdown cooling loop 2B (SI-213, SI-220)

Examination Category C-F-1, Item No. C5.21. 68% volumetric coverage obtained.

Elbow to flange, HPSI header B to shutdown cooling loop 2B

Examination Category C-F-1, Item No. C5.21. 50% volumetric coverage obtained.

Pipe to valve 3522, HPSI header B to shutdown cooling loop 2B

Examination Category C-F-1, Item No. C5.21. 50% volumetric coverage obtained.

Pipe to valve 3526, HPSI 2B discharge to shutdown cooling loop 2B

Examination Category C-F-1, Item No. C5.21. 50% volumetric coverage obtained.

### 3.2 Code Requirements for which Relief is Requested:

ASME Code, Section XI, 1989 Edition, Table IWB-2500-1, Examination Category B-A, and Table IWC-2500-1, Examination Category C-F-1 require volumetric examination of essentially 100 percent of the weld examination volume. In accordance with ASME Code Case - 460, "Alternative Examination Coverage for Class 1 and Class 2 Welds," as approved by NRC, essentially 100 percent means more than 90 percent of the examination volume of each weld where reduction in coverage is due to interference by another component or part geometry. In addition, 10 CFR 50.55a requires the ultrasonic examination to be performed using procedures, personnel, and equipment qualified to the requirement of Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of the ASME Code, Section XI, 1995 Edition with the 1996 Addenda.

### 3.3 Licensee's Proposed Alternative:

#### 3.3.1 Revised Relief Request No. 1A

1. Conduct ultrasonic examinations to the maximum extent possible.
2. Periodic system pressure tests in accordance with ASME Section XI



Category B-P, Table IWB-2500-1.

3.3.2 Revised Relief Request No. 10A

1. Surface examination per category C-F-1 of the ASME Code, Section XI.
2. Conduct ultrasonic examinations to the maximum extent possible.

3.4 Licensee's Basis for Use of Proposed Alternative:

3.4.1 Revised Relief Request No. 1A - Category B-A and B-D Items

It is not possible to obtain ultrasonic interrogation of greater than 90 percent of the required examination volume due to interference caused by configuration and/or permanent attachments. Examinations are performed to the maximum extent possible. The ultrasonic techniques for each weld were reviewed to determine if additional coverage could be achieved. For the welds listed above, it was not possible to remove the obstruction without significant work, increased radiation exposure, and/or damage to the plant.

3.4.2 Revised Relief Request No. 10A - Category C-F-1 Items

It is not possible to obtain ultrasonic interrogation of greater than 90 percent of the required examination volume due to interference caused by configuration and/or permanent attachments. Configuration, permanent attachments and/or structural interference prohibit 100 percent ultrasonic examination of Code-required volume. Additional ultrasonic techniques are employed, where practical, to achieve the Code-required volume. In the cases where austenitic materials were examined (Code category C-F-1), the credited volumetric examination of the weld required volume (WRV) is limited when access can only be obtained from one side. It should be noted that the volumetric examination was performed through 100 percent of the Code WRV, however, the Performance Demonstration Initiative (PDI) program requirements of Appendix VIII to ASME Code, Section XI, procedure used is not qualified for the detection of flaws on the far side of single sided access examinations of austenitic piping welds. The techniques employed for the single sided access examinations provide for a best effort examination. The coverage obtained was the maximum practical.

3.5 Evaluation:

3.5.1 Revised Relief Request No. 1A

The RPV welds require a 100 percent volumetric examination during each inspection interval in accordance with the applicable ASME Code, Section XI. The NRC staff notes that each of the welds identified in revised RR 1A was examined in accordance with the PDI program requirements of Appendix VIII to Section XI, and did receive a limited volumetric examination coverage ranging from 58 to 86 percent. The limitation in coverage is due to an obstruction or interference from an adjacent component. Nevertheless, ASME Code Case - 460, allows a reduction in examination coverage of less than 10 percent for a weld due to interference by another component or part geometry. The NRC staff has determined that it is impractical to perform the Code-required examination of the welds due to interference from an adjacent component. In order to comply with the Code requirement, a design modification of the RPV

will have to be performed which would impose a significant burden on the licensee. The NRC staff has further evaluated the impact of limited volumetric examination coverage on the structural integrity of the welds.

In assessing the structural integrity of the welds in the vessel affected by this relief request, the NRC staff focused on the issues of active degradation mechanisms, the likelihood of a flaw existing in the subject welds, and the growth of an existing flaw necessary to cause a failure during the current inspection interval. The factors considered were:

1. The welds for which relief from Code-required examination coverage is requested are composed of low-alloy carbon steel which is not susceptible to stress corrosion cracking in the exposed environment. Also, there is no degradation mechanism other than fatigue active in the subject welds which would cause a failure of the weld. Further, the examination conducted for each weld provides reasonable assurance of structural integrity of the weld since fatigue-type cracks in the weld would have been detected during examination of the accessible weld volume.
2. Further, the system pressure test routinely conducted at the end of the refueling outage prior to operation, will likely result in detection of a leak before any gross failure occurs.

The NRC staff, therefore, has determined that there is reasonable assurance of structural integrity of these welds with the limited volumetric examination and the tests conducted during the second 10-year inspection interval.

### 3.5.2 Revised Relief Request No. 10A

The piping welds addressed in revised RR 10A require a 100 percent volumetric examination during each inspection interval in accordance with the applicable ASME Code, Section XI. The NRC staff notes that each of the welds identified in this relief request was examined in accordance with the PDI program requirements of Appendix VIII to Section XI, and did receive a limited volumetric examination coverage ranging from 45 to 80 percent. It should also be noted that the volumetric examination was performed through 100 percent of the Code-required volume, however, the PDI program requirements of Appendix VIII to Section XI procedure used is not qualified for the detection of flaws on the far side of single sided access examinations of austenitic piping welds. The techniques employed for the single sided access examinations provide for a best effort examination. Each of these welds is a stainless steel weld and the sound beam is markedly attenuated on the far side to detect and size flaws.

For the subject welds, ultrasonic scanning in the axial direction could be performed from only one side of the weld due to component configuration which prevented scanning from the tapered surface on the other side of the weld. Therefore, it is impractical to meet the Code requirements. In order to meet the Code requirements, the components would have to be redesigned, fabricated, and installed in the systems, which would impose a significant burden on the licensee. The results of examination did not identify any rejectable indication. The NRC staff further believes that, if there were any service-induced flaws existing in the welds and/or in the base metal adjacent to the welds, the examination of the accessible weld volume would have at least detected a portion of it with a high degree of confidence. Therefore, the NRC staff



has determined that the licensee's limited examination of the welds provides reasonable assurance of structural integrity of the subject welds.

#### 4.0 CONCLUSION

Based on the above, the NRC staff concludes that the Code examination requirements are impractical and compliance would require design modification of the welds resulting in significant burden to the licensee. The NRC staff concludes that reasonable assurance of structural integrity of the welds has been provided with the licensee's best-effort examination. Therefore, revised RRs 1A and 10A are granted pursuant to 10 CFR 50.55a(g)(6)(i) for St. Lucie Unit 2 for the closeout of the second 10-year ISI interval.

Granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result in the requirements were imposed on the facility. All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: P. Patnaik

Date: December 20, 2004