December 2, 2004

Mr. J. A. Stall
Senior Vice President, Nuclear and
Chief Nuclear Officer
Florida Power and Light Company
P.O. Box 14000
Juno Beach, Florida 33408-0420

SUBJECT: TURKEY POINT UNITS 3 AND 4 - SAFETY EVALUATION FOR RELIEF REQUEST NO. 2 REGARDING THE FORTH 10-YEAR INSERVICE INSPECTION INTERVAL (TAC NOS. MC2422 AND MC2423)

Dear Mr. Stall:

By a letter to the U.S. Nuclear Regulatory Commission (NRC), dated March 11, 2004, as supplemented by letter dated April 29, 2004, Florida Power and Light Company (FPL), submitted Relied Request (RR) No. 2 for Turkey Point, Units 3 and 4. FPL requested relief from the requirements specified in American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a paragraph (a)(3)(i). Specifically, FPL requested relief from certain requirements of Supplement 10 to Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of Section XI of the ASME Code. Supplement 10 contains the qualification requirements for procedures, equipment, and personnel involved with examining dissimilar metal welds using ultrasonic techniques. In lieu of these ASME Code requirements, FPL requested to use the dissimilar metal weld criteria of the Electric Power Research Institute-Performance Demonstration Initiative Program.

Based on the review of your submittals, the NRC staff has concluded that the alternatives proposed provide an acceptable level of quality and safety and, therefore, are authorized pursuant to 10 CFR 50.55a(a)(3)(i). These reliefs are authorized for the extension period for the forth 10-year inservice inspection interval for Turkey Point, Units 3 and 4.

Further details on the bases for the NRC staff conclusions are contained in the enclosed Safety Evaluation. Please note that RR No. 1, which was submitted by FPL in the same correspondence as RR No. 2, will be handled separately. If you have any questions regarding this issue, please feel free to contact Eva Brown at 301-415-2315.

Sincerely,

/RA/

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

Docket Nos. 50-250 and 50-251

Enclosure: As stated

cc w/encl: See next page

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Based on the review of your submittals, the NRC staff has concluded that the alternatives proposed provide an acceptable level of quality and safety and, therefore, are authorized pursuant to 10 CFR 50.55a(a)(3)(i). These reliefs are authorized for the extension period for the forth 10-year inservice inspection interval for Turkey Point, Units 3 and 4.

Further details on the bases for the NRC staff conclusions are contained in the enclosed Safety Evaluation. Please note that RR No. 1, which was submitted by FPL in the same correspondence as RR No. 2, will be handled separately. If you have any questions regarding this issue, please feel free to contact Eva Brown at 301-415-2315.

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Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-250 and 50-251

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION PROGRAM

RELIEF REQUEST NO. 2

FLORIDA POWER AND LIGHT

TURKEY POINT NUCLEAR PLANT, UNITS 3 AND 4

DOCKET NOS. 50-250 AND 50-251

1.0 INTRODUCTION

By a letter to the Nuclear Regulatory Commission (NRC), dated March 11, 2004, as supplemented by letter dated April 29, 2004, Florida Power and Light Company (FPL), submitted Relied Request (RR) No. 2 for Turkey Point Units 3 and 4. FPL requested relief from the requirements specified in American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a paragraph (a)(3)(i). Specifically, FPL requested relief from certain requirements of Supplement 10 to Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of Section XI of the ASME Code. Supplement 10 contains the qualification requirements for procedures, equipment, and personnel involved with examining dissimilar metal welds using ultrasonic techniques. In lieu of these ASME Code requirements, FPL requested to use the dissimilar metal weld criteria of the Electric Power Research Institute (EPRI) - Performance Demonstration Initiative (PDI) Program.

FPL's request applies to its Turkey Point Units 3 and 4 for its fourth 10-year inservice inspection (ISI) interval. The fourth 10-year ISI interval for Turkey Point Unit 3 began February 22, 2004, and ends on February 21, 2014, and for Unit 4, began April 15, 2004, and ends on April 14, 2014.

2.0 REGULATORY EVALUATION

Section 50.55a(g) requires that ISI of ASME Code Class 1, 2, and 3 components be performed in accordance with Section XI of the ASME Code and applicable addenda, except where specific written relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). According to 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if an applicant demonstrates that the proposed alternatives would provide an acceptable level of quality and safety or if the specified requirement 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 (ISI) 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 ISI 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 ISI Code of record for the fourth 10-year inspection interval for Turkey Point Units 3 and 4 is the 1998 Edition with Addenda through 2000 of ASME Section XI.

3.0 TECHNICAL EVALUATION

3.1 Components for Which Relief Is Requested

Pressure retaining piping welds subject to examination using procedures, personnel, and equipment qualified to ASME Code Section XI, Appendix VIII, Supplement 10, "Qualification Requirements for Dissimilar Metal Piping Welds" criteria.

3.2 ASME Code Requirements (as stated)

The following paragraphs or statements are from ASME Section XI, Appendix VIII, Supplement 10 and identify the specific requirements that are included in this request for relief.

Item 1 - Paragraph 1.1 (b) states in part - Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent.

Item 2 - Paragraph 1.1 (d) states - All flaws in the specimen set shall be cracks.

Item 3 - Paragraph 1.1(d)(1) states - At least 50 percent of the cracks shall be in austenitic material. At least 50 percent of the cracks in austenitic material shall be contained wholly in weld or buttering material. At least 10 percent of the cracks shall be in ferritic material. The remainder of the cracks may be in either austenitic or ferritic material.

Item 4 - Paragraph 1.2(b) states in part - The number of unflawed grading units shall be at least twice the number of flawed grading units.

Item 5 - Paragraph 1.2(c)(1) and 1.3(c) state in part - At least ⅓ of the flaws, rounded to the next higher whole number, shall have depths between 10 percent and 30 percent of the nominal pipe wall thickness. Paragraph 1.4(b) distribution table requires 20 percent of the flaws to have depths between 10 percent and 30 percent.

Item 6 - Paragraph 2.0 first sentence states - The specimen inside surface and identification shall be concealed from the candidate.

Item 7 - Paragraph 2.2(b) states in part - The regions containing a flaw to be sized shall be identified to the candidate.

Item 8 - Paragraph 2.2(c) states in part - For a separate length sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate.

Item 9 - Paragraph 2.3(a) states - For the depth sizing test, 80 percent of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate.

Item 10 - Paragraph 2.3(b) states - For the remaining flaws, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.

Item 11 - Table VIII-S2-1 provides the false call criteria when the number of unflawed grading units is at least twice the number of flawed grading units.

3.3 Licensee's Proposed Alternatives and Basis for Request

FPL proposed the following alternatives to implement Appendix VIII, Supplement 10 requirements for Turkey Point Units 3 and 4 during its fourth 10-year ISI interval. FPL will implement the alternatives through the PDI Program.

Item 1 — The proposed alternative to Paragraph 1.1 (b) states:

> The specimen set shall include the minimum and maximum pipe diameters and thicknesses for which the examination procedure is applicable. Pipe diameters within a range of ½ in (13 mm) of the nominal diameter shall be considered equivalent. Pipe diameters larger than 24 in (610 mm) shall be considered to be flat. When a range of thicknesses is to be examined, a thickness tolerance of ±25 percent is acceptable.
>
> Technical Basis - The change in the minimum pipe diameter tolerance from 0.9 times the diameter to within ½ inch of the nominal diameter provides tolerances more in line with industry practice. Though the alternative is less stringent for small pipe diameters they typically have a thinner wall thickness than larger diameter piping. A thinner wall thickness results in shorter sound path distances that reduce the detrimental effects of the curvature. This change maintains consistency between Supplement 10 and the recent revision to Supplement 2.

Item 2 — The proposed alternative to Paragraph 1.1 (d) states:

> At least 60 percent of the flaws shall be cracks, the remainder shall be alternative flaws. Specimens with IGSCC [intergranular stress corrosion cracking] shall be used when available. Alternative flaws shall meet the following requirements:

(1) Alternative flaws, if used, shall provide crack-like reflective characteristics and shall only be used when implantation of cracks would produce spurious reflectors that are uncharacteristic of service-induced flaws.

(2) Alternative flaw mechanisms shall have a tip width no more than 0.002 in (0.05 mm).

Note, to avoid confusion the proposed alternative modifies instances of the term "cracks" or "cracking" to the term "flaws" because of the use of alternative flaw mechanisms.

Technical Basis - As illustrated below, implanting a crack requires excavation of the base material on at least one side of the flaw. While this may be satisfactory for ferritic materials, it does not produce a useable axial flaw in austenitic materials because the sound beam, which normally passes only through base material, must now travel through weld material on at least one side, producing an unrealistic flaw response. In addition, it is important to preserve the dendritic structure present in field welds that would otherwise be destroyed by the implantation process. To resolve these issues, the proposed alternative allows the use of up to 40 percent fabricated flaws as an alternative flaw mechanism under controlled conditions. The fabricated flaws are isostatically compressed which produces ultrasonic reflective characteristics similar to tight cracks.

Item 3 — The proposed alternative to Paragraph 1.1 (d) (1) states:

At least 80 percent of the flaws shall be contained wholly in weld or buttering material. At least one and no more than 10 percent of the flaws shall be in ferritic base material. At least one and no more than 10 percent of the flaws shall be in austenitic base material.

Technical Basis - Under the current [ASME] Code, as few as 25 percent of the flaws are contained in austenitic weld or buttering material. Recent experience has indicated that flaws contained within the weld are the likely scenarios. The metallurgical structure of austenitic weld material is ultrasonically more challenging than either ferritic or austenitic base material. The proposed alternative is therefore more challenging than the current [ASME] Code.

Item 4 — The proposed alternative to Paragraph 1.2(b) states:

Personnel performance demonstration detection test sets shall be selected from Table VIII-S10-1. The number of unflawed grading units shall be at least 1½ times the number of flawed grading units.

Technical Basis - Table VIII-S10-1 provides a statistically based ratio between the number of unflawed grading units and the number of flawed grading units. The proposed alternative reduces the ratio to 1.5 times. This reduces the number of test samples to a more reasonable number from the human factors perspective. However, the statistical basis used for screening personnel and procedures is still maintained at the same level with competent personnel being successful and less skilled personnel being unsuccessful. The acceptance criteria for the statistical basis are in Table VIII-S10-1.

Item 5 — The proposed alternative to the flaw distribution requirements of Paragraph 1.2(c)(1) (detection) and 1.3(c) (length) is to use the Paragraph 1.4(b) (depth) distribution table (see below) for all qualifications.

Flaw Depth (% Wall Thickness)	Minimum Number of Flaws
10-30%	20%
31-60%	20%
61-100%	20%

Technical Basis - The proposed alternative uses the depth sizing distribution for both detection and depth sizing because it provides for a better distribution of flaw sizes within the test set. This distribution allows candidates to perform detection, length, and depth sizing demonstrations simultaneously utilizing the same test set. The requirement that at least 75 percent of the flaws shall be in the range of 10 to 60 percent of wall thickness provides an overall distribution tolerance yet the distribution uncertainty decreases the possibilities for testmanship that would be inherent to a uniform distribution. It must be noted that it is possible to

achieve the same distribution utilizing the present requirements, but it is preferable to make the criteria consistent.

Item 6 — The proposed alternative to Paragraph 2.0 states:

> For qualifications from the outside surface, the specimen inside surface and identification shall be concealed from the candidate. When qualifications are performed from the inside surface, the flaw location and specimen identification shall be obscured to maintain a "blind test."
>
> Technical Basis - The current [ASME] Code requires that the inside surface be concealed from the candidate. This makes qualifications conducted from the inside of the pipe (e.g., PWR [pressurized-water reactor] nozzle to safe end welds) impractical. The proposed alternative differentiates between ID [inner diameter] and OD [outer diameter] scanning surfaces, requires that they be conducted separately, and requires that flaws be concealed from the candidate. This is consistent with the recent revision to Supplement 2.

Items 7 and 8 — The proposed alternatives to Paragraph 2.2(b) and 2.2(c) state:

> . . . containing a flaw to be sized may be identified to the candidate.
>
> Technical Basis - The current [ASME] Code requires that the regions of each specimen containing a flaw to be length sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region (Note, that length and depth sizing use the term "regions" while detection uses the term "grading units" - the two terms define different concepts and are not intended to be equal or interchangeable). To ensure security of the samples, the proposed alternative modifies the first "shall" to a "may" to allow the test administrator the option of not identifying specifically where a flaw is located. This is consistent with the recent revision to Supplement 2.

Items 9 and 10 — The proposed alternative to Paragraph 2.3(a) and 2.3(b) state[s]:

> . . . regions of each specimen containing a flaw to be sized may be identified to the candidate.
>
> Technical Basis - The current [ASME] Code requires that a large number of flaws be sized at a specific location. The proposed alternative changes the "shall" to a "may" which modifies this from a specific area to a more generalized region to ensure security of samples. This is consistent with the recent revision to Supplement 2. It also incorporates terminology from length sizing for additional clarity.

Item 11 — The proposed alternative modifies the acceptance criteria of Table VIII-S2-1 as follows:

10

TABLE VIII-S2-1
PERFORMANCE DEMONSTRATION DETECTION TEST
ACCEPTANCE CRITERIA

Detection Test Acceptance Critera		False Call Test Acceptance Criteria	
No. of Flawed Grading Units	Minimum Detection Criteria	No. of Unflawed Grading Units	Maximum Number of False Calls
~~5~~	~~5~~	~~10~~	~~0~~
~~6~~	~~6~~	~~12~~	~~1~~
~~7~~	~~6~~	~~14~~	~~1~~
~~8~~	~~7~~	~~16~~	~~2~~
~~9~~	~~7~~	~~18~~	~~2~~
10	8	~~20~~ 15	~~3~~ 2
11	9	~~22~~ 17	~~3~~ 3
12	9	~~24~~ 18	~~3~~ 3
13	10	~~26~~ 20	~~4~~ 3
14	10	~~28~~ 21	~~5~~ 3
15	11	~~30~~ 23	~~5~~ 3
16	12	~~32~~ 24	~~6~~ 4
17	12	~~34~~ 26	~~6~~ 4
18	13	~~36~~ 27	~~7~~ 4
19	13	~~38~~ 29	~~7~~ 4
20	14	~~40~~ 30	~~8~~ 5

Technical Basis - The proposed alternative is identified as new Table VIII-S10-1 above. It was modified to reflect the reduced number of unflawed grading units and allowable false calls. As a part of ongoing [ASME] Code activities, Pacific Northwest National Laboratory has reviewed the statistical significance of these revisions and offered the revised Table S10-1.

3.4 Evaluation

FPL proposed using the program developed by PDI that is similar to the ASME Code requirements. The differences between the ASME Code and the PDI program are discussed below.

3.4.1 Item 1 — Paragraph 1.1(b)

The ASME Code requirement of “0.9 to 1.5 times the nominal diameter are equivalent” was established for a single nominal diameter. When applying the ASME Code-required tolerance to a range of diameters, the tolerance rapidly expands on the high side. Under the current ASME Code requirements, a 5-inch OD pipe would be equivalent to a range of 4.5-inch to 7.5-inch diameter pipe. Under the proposed PDI guidelines, this would be reduced to a range of 4.5-inch to 5.5-inch diameter pipe. With current ASME Code requirements, a 16-inch nominal diameter pipe would be equivalent to a range of 14.4-inch to 24-inch diameter pipe. The proposed alternative would significantly reduce the equivalent range of 15.5-inch to 16.5-inch diameter pipe. The difference between ASME Code requirements and the proposed

alternative for diameters less than 5 inches is not significant because of shorter metal path and beam spread associated with smaller diameter piping. The proposed alternative is considered more conservative overall than current ASME Code requirements. The staff finds that the proposed alternative will provide an acceptable level of quality and safety and, therefore, is acceptable.

3.4.2 Item 2 — Paragraph 1.1 (d)

The ASME Code requires all flaws to be cracks. Manufacturing test specimens containing cracks free of spurious reflections and telltale indicators is extremely difficult in austenitic material. To overcome these difficulties, the PDI program developed a process for fabricating flaws that produce ultrasonic testing acoustic responses similar to responses associated with real cracks. The PDI program discussed its process at public meetings held June 12 through 14, 2001, and January 31 through February 2, 2002, at the EPRI Nondestructive Examination Center, Charlotte, NC. The NRC staff attended these meetings and determined that the process parameters used for manufacturing fabricated flaws resulted in acceptable acoustic responses. The PDI program is selectively installing these fabricated flaws in specimen locations that are unsuitable for real cracks. The staff finds that the proposed alternative will provide an acceptable level of quality and safety and, therefore, is acceptable.

3.4.3 Item 3 — Paragraph 1.1(d)(1)

The ASME Code requires that at least 50 percent of the flaws be contained in austenitic material, and 50 percent of the flaws in the austenitic material shall be contained fully in weld or buttering material. This means that at least 25 percent of the total flaws must be located in the weld or buttering material. Field experience shows that flaws identified during ISI of dissimilar metal welds are more likely to be located in the weld or buttering material. The grain structure of austenitic weld and buttering material represents a much more stringent ultrasonic scenario than that of a ferritic or austenitic base material. Flaws made in austenitic base material are difficult to create free of spurious reflectors and telltale indicators. The proposed alternative of 80 percent of the flaws in the weld metal or buttering material provides a challenging testing scenario, reflective of field experience and minimizes testmanship associated with telltale reflectors common to placing flaws in austenitic base material. The NRC staff considers the proposed alternative to be more conservative than current ASME Code requirements. The staff finds that the proposed alternative will provide an acceptable level of quality and safety and, therefore, is acceptable.

3.4.4 Item 4 — Paragraph 1.2(b) and Item 11 - Table VIII-S2-1

The ASME Code requires that detection sets meet the requirements of Table VIII-S2-1, which specifies the minimum number of flaws in a test set to be five with 100-percent detection. The current ASME Code also requires the number of unflawed grading units to be two times the number of flawed grading units. The proposed alternative would follow the detection criteria of the table beginning with a minimum number of flaws in a test set being 10, and reducing the number of false calls to one-and-a-half times the number of flawed grading units. The changes to Table VIII-S2-1 are shown in Table VIII-S10-1. The staff finds that the proposed alternative satisfies the pass/fail objective established for Appendix VIII performance demonstration acceptance criteria. The staff finds that the proposed alternative will provide an acceptable level of quality and safety and, therefore, is acceptable.

3.4.5 Item 5 — Paragraphs 1.2(c)(1) and 1.3(c)

For detection and length sizing, the ASME Code requires at least one third of the flaws be located between 10 and 30 percent through the wall thickness and one third located greater than 30 percent through the wall thickness. The remaining flaws would be located randomly throughout the wall thickness. The proposed alternative sets the distribution criteria for detection and length sizing to be the same as the depth sizing distribution, which stipulates that at least 20 percent of the flaws be located in each of the increments of 10-30 percent, 31-60 percent and 61-100 percent. At least 75 percent of the flaws shall be in the range of 10 to 60 percent of the wall thickness with the remaining flaws located randomly throughout the wall thickness. With the exception of the 10-30-percent increments, the proposed alternative is a subset of the current ASME Code requirements. The 10-30-percent increments would be in the subset if it contained at least 30 percent of the flaws. The change simplifies assembling test sets for detection and sizing qualifications and is more indicative of conditions in the field. The staff finds that the proposed alternative will provide an acceptable level of quality and safety and, therefore, is acceptable.

3.4.6 Item 6 — Paragraph 2.0

The ASME Code requires that the inside surface of the specimen be concealed from the candidate. This requirement applies to test specimens used for qualification performed from the outside surface. With the expansion of Supplement 10 to include qualifications performed from the inside surface, the inside surface must be accessible while maintaining the specimen integrity. The proposed alternative requires that flaws and specimen identifications be obscured from candidates, thus maintaining blind test conditions. The staff considers this to be consistent with the intent of ASME Code requirements. The staff finds that the proposed alternative will provide an acceptable level of quality and safety and, therefore, is acceptable.

3.4.7 Items 7 and 8 — Paragraphs 2.2(b) and 2.2(c)

The ASME Code requires that the location of flaws added to the test set for length sizing shall be identified to the candidate. The proposed alternative is to make identifying the location of additional flaws an option. This option provides an additional element of difficulty to the testing process because the candidate would be expected to demonstrate the skill of detecting and sizing flaws over an area larger than a specific location. The NRC staff considers the proposed alternative to be more conservative than current ASME Code requirements. The staff finds that the proposed alternative will provide an acceptable level of quality and safety and, therefore, is acceptable.

3.4.8 Items 9 and 10 — Paragraphs 2.3(a) and 2.3(b)

In paragraph 2.3(a), the ASME Code requires that 80 percent of the flaws be sized in a specific location that is identified to the candidate. The proposed alternative permits detection and depth sizing to be conducted separately or concurrently. In order to maintain a blind test, the location of flaws cannot be shared with the candidate. For depth sizing that is conducted

separately, allowing the test administrator the option of not identifying flaw locations makes the testing process more challenging. The staff considers the proposed alternative to be more conservative than current ASME Code requirements. The staff finds that the proposed alternative will provide an acceptable level of quality and safety and, therefore, is acceptable.

In paragraph 2.3(b), the ASME Code also requires that the location of flaws added to the test set for depth sizing shall be identified to the candidate. The proposed alternative is to make identifying the location of additional flaws an option. This option provides an additional element of difficulty to the testing process because the candidate would be expected to demonstrate the skill of finding and sizing flaws in an area larger than a specific location. The staff considers the proposed alternative to be more conservative than current ASME Code requirements. The staff finds that the proposed alternative will provide an acceptable level of quality and safety and, therefore, is acceptable.

4.0 CONCLUSION

The NRC staff has determined that the proposed alternative to Supplement 10, as administered by the EPRI-PDI Program, will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the proposed alternative, for RR No. 2, described in FPL's letter of March 11, 2004, as supplemented by letter dated April 29, 2004, for Turkey Point Units 3 and 4 for its fourth 10-year ISI interval. 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