October 20, 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 NOS. 34 AND 35 ASSOCIATED WITH (TAC NOS. MC3890 AND MC3891)

Dear Mr. Stall:

By a letter to the Nuclear Regulatory Commission (NRC), dated July 22, 2004, as supplemented by letter dated September 14, 2004, Florida Power and Light (the licensee), is requesting relief from the requirements specified in American Society of Mechanical Engineers Code (the Code), Section XI, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a paragraph a(3)(i). Specifically, the licensee requested relief from certain requirements for Class 1, pressure retaining dissimilar metal piping welds and reactor vessel upper shell-to-flange welds.

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 third 10-year inservice inspection (ISI) interval for Turkey Point, Units 3 and 4. The third 10-year ISI interval for Unit 3 was extended until February 21, 2005, while the third 10-year ISI interval for Unit 4 was extended until April 14, 2005.

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: 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 NOS. 34 AND 35

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 July 22, 2004, as supplemented by letter dated September 14, 2004, Florida Power and Light (FPL, the licensee), is requesting relief from the requirements specified in American Society of Mechanical Engineers Code (ASME Code, the Code), Section XI, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a, paragraph a(3)(i). Specifically, the licensee requested relief from certain requirements for Class 1, pressure retaining dissimilar metal piping welds and reactor vessel upper shell-to-flange welds.

2.0 REGULATORY REQUIREMENTS

The inservice inspection (ISI) of the ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the Code, Rules for Inservice Inspection of Nuclear Power Plant Components, and applicable edition and addenda as required by 10 CFR 50.55a(g), except when specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) of 10 CFR states, in part, that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the applicant 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) will meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, 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 ISI Code of record for Units 3 and 4 for the third 10-year ISI interval and their respective extension periods is the ASME Code, Section XI, 1989 Edition, no Addenda.

These reliefs were requested for the extension period for the third 10-year ISI interval Turkey Point, Units 3 and 4. The third 10-year ISI interval for Unit 3 was extended until February 21, 2005, while the third 10-year ISI interval for Unit 4 has been extended until April 14, 2005.

3.0 TECHNICAL EVALUATION

3.1 Relief Request No. 34

3.1.1 System/Component(s) for which Relief is Requested

This relief request applies to ASME Section XI Class 1, pressure retaining dissimilar metal piping welds subject to ultrasonic (UT) examination using procedures, personnel, and equipment qualified through the ASME Code, Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 10. The components affected by this relief request are identified below.

UNIT 3				
Component Identification	**Description**	**Inside Diameter**	**Wall Thickness**	**Base/Weld Material**
27.5"-RCS-1306-14 27.5"-RCS-1307-14 27.5"-RCS-1309-14	Cold Leg Elbow to Nozzle	27.5 inch	2.4 inch	Carbon Steel Nozzle buttered with Stainless Steel. Field welded to cast stainless steel elbow with stainless steel weld material
29"-RCS-1304-1 29"-RCS-1305-1 29"-RCS-1308-1	Hot Leg Nozzle to Pipe	29 inch	2.6 inch	Carbon Steel Nozzle buttered with Stainless Steel. Field welded to forged stainless steel pipe with stainless steel weld material.

UNIT 4				
Component Identification	**Description**	**Inside Diameter**	**Wall Thickness**	**Base/Weld Material**
27.5"-RCS-1406-14 27.5"-RCS-1407-14 27.5"-RCS-1409-14	Cold Leg Elbow to Nozzle	27.5 inch	2.4 inch	Carbon Steel Nozzle buttered with Stainless Steel. Field welded to cast stainless steel elbow with stainless steel weld material
29"-RCS-1404-1 29"-RCS-1405-1 29"-RCS-1408-1	Hot Leg Nozzle to Pipe	29 inch	2.6 inch	Carbon Steel Nozzle buttered with Stainless Steel. Field welded to forged stainless steel pipe with stainless steel weld material

3.1.2 Applicable Code Edition and Addenda

For both units the Code of record for the third 10-year ISI interval is the 1989 Edition, no Addenda of the ASME Section XI. In September 1999, 10 CFR 50.55a was issued, which required expedited implementation of ASME Section XI, Appendix VIII, Supplement 10, by November 22, 2002. Specifically, 10 CFR 50.55a(g)(6)(ii)(C)(2) states that:

> Licensees implementing the 1989 Edition and earlier editions and addenda of IWA-2232 of Section XI, Division 1 of the ASME Boiler and Pressure Vessel Code must implement the 1995 Edition with the 1996 Addenda of Appendix VIII and the supplements to Appendix VIII of Section XI, Division 1, of the ASME Boiler and Pressure Vessel Code.

FPL is performing the examinations during the first outage of the fourth 10-year ISI interval and crediting the examinations to the third 10-year ISI interval, only utilizing the provision of ASME Section XI, Paragraph IWA-2430. Unit 3 began the first outage of the fourth 10-year interval in September 2004. The first refueling outage for Unit 4 is scheduled for spring 2005.

3.1.3 Code Requirements for which Relief is Requested

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee requested approval to implement an alternative to the requirements of Appendix VIII, Supplement 10 to the 1995 Edition, 1996 Addenda of the ASME Code, Section XI, Qualification Requirements for Dissimilar Metal Piping Welds. This request for relief is specifically for through-wall sizing of flaws identified during examination of dissimilar metal welds from the inside surface.

Paragraph 3.2(b) of Appendix VIII, Supplement 10 to the 1995 Edition, 1996 Addenda of the ASME Code, Section XI states that the examination procedures, equipment, and personnel are

qualified for depth sizing when the root mean square (RMS) error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inch.

3.1.4 Licensee's Reason for Request (as stated by the licensee)

FPL is required to perform the UT examination of the reactor vessel nozzle-to-safe end welds in accordance with the requirements of 10 CFR 50.55a, plant Technical Specifications, and the 1989 Edition, no Addenda of the ASME Section XI. 10 CFR 50.55a invokes the examination requirements of Appendix VIII, Supplement 10.

FPL requests relief to use the following alternative requirements for implementation of Appendix VIII, Supplement 10. These alternatives will be implemented through the Performance Demonstration Initiative (PDI) Program.

3.1.5 Licensee's Proposed Alternative and Basis for Use (as stated by the licensee)

Proposed Alternative:

FPL requests an alternative to Paragraph 3.2(b) of the ASME Section XI Code, 1995 Edition with the 1996 Addenda, to evaluate the vendor's depth sizing performance of 0.224 inch RMS error against the ASME Code Section XI, Appendix VIII, Supplement 10 flaw depth sizing tolerance for dissimilar metal welds of 0.125 inch RMS error, and determine the appropriate sizing error to consider during such flaw evaluation. FPL proposes to add the difference between the vendor's achieved sizing error and the Code-required value to the size of flaws measured during the examination for the purpose of flaw evaluation.

Basis for Use:

FPL has been informed that its inspection vendor, Areva (formerly Framatome ANP), has been unsuccessful at achieving the 0.125 inch RMS error depth sizing criterion for the procedure and personnel qualifications. To date, there has not been a vendor who has met the RMS error Code requirement for examinations from the inside surface. ASME Section XI, 1995 Edition with the 1996 Addenda, Appendix VIII, Supplement 10, "Qualification Requirements for Dissimilar Metal Piping Welds," performance demonstrations include both field and shop weld configurations. The ASME Section XI, Appendix VIII qualified procedure, 54-ISI-822-00, "ID [Inside Diameter] Automated Ultrasonic Examination of Austenitic and Dissimilar Metal Piping Welds for Depth Sizing," which will be used for FPL's hot and cold leg weld examinations, achieved an RMS error depth sizing error of 0.224 inch when sizing from the inside surface for the wall thickness range in the demonstration test set.

Configuration	RMS (inches)
Shop Welds	0.232
Field Welds	0.215
Shop and Field Welds Combined	0.224

Compliance with the proposed alternatives will provide an acceptable level of quality and safety for examination of the affected welds.

3.1.6 Duration of Proposed Alternative

The licensee proposes to use the alternative during the third 10-year ISI interval and the respective extension periods for Units 3 and 4. The third 10-year ISI interval for Unit 3 has been extended until February 21, 2005, and Unit 4 has been extended until April 14, 2005.

3.1.7 Evaluation

The applicable Code of record for both units during the third 10-year ISI interval and the respective extension periods is the 1989 Edition, no Addenda of the ASME Code, Section XI. Section 50.55a(g)(6)(ii)(C)(2) of 10 CFR requires, in part, implementation of Appendix VIII, Supplement 10 in 1995 Edition, 1996 Addenda of the ASME Code, Section XI for qualification purposes. The licensee proposes to use an RMS error value of 0.224 inch in lieu of the Code-required value of 0.125 inch imposed by Appendix VIII, Supplement 10. The proposed alternative applies to through-wall sizing of flaws identified during examinations of dissimilar metal welds from the inside surface.

Supplement 10 requires that examination procedures, equipment, and personnel used for examination of dissimilar metal piping welds shall meet specific criteria for flaw depth sizing accuracy. The Code requires that the maximum error for flaw depth measurements, when compared with the true flaw depths, must be less than or equal to an RMS error value of 0.125 inch. The nuclear industry is in the process of qualifying personnel in accordance with Supplement 10 requirements, as implemented through the PDI program. However, personnel have been unsuccessful at achieving the Code-required RMS error value for flaw depth sizing demonstrations performed from the inside surface of a pipe weldment. At this time, achieving an RMS error value of 0.125 inch is impractical. The licensee has stated that its vendor, Areva, has only been able to achieve an RMS error value of 0.224 inch. As a result, the licensee is proposing to use a depth sizing criterion of 0.224 inch to size any detected flaw during the examination of the components identified in Section 3.1.1. The licensee also proposes to add the difference (0.099 inches) between the Code-required RMS error (0.125 inches) and the demonstrated accuracy (0.224 inches) to the measurements acquired from flaw sizing.

The NRC staff finds that compliance with the Code-required RMS error value is impractical and that adding the difference between the Code-required RMS error and the demonstrated accuracy to the measurements acquired from flaw sizing, in addition to the use of the acceptance standards specified in Section IWB-3500 of the Code, provides reasonable assurance of structural integrity.

3.1.8 Summary

Based upon review of the information provided by the licensee in support of its Request for Relief No. 34, Revision 1, the NRC staff concludes that compliance with the Code-required RMS error value is impractical, and that the proposed alternative to Paragraph 3.2(b) in Supplement 10, Appendix VIII of the 1995 Edition, 1996 Addenda of the ASME Code, Section XI provides reasonable assurance of structural integrity. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted for Units 3 and 4 during the third 10-year ISI interval and their respective extension periods.

3.2 RELIEF REQUEST NO. 35

3.2.1 System/Component(s) for which Relief is Requested

This relief request applies to the ASME Code, Section XI, Class 1, Examination Category B-A, Item No. B1.30 welds identified below:

A) 3-WR-18

B) 4-WR-18

3.2.2 Applicable Code Edition and Addenda

The Code of record for the Turkey Point, Units 3 and 4, third 10-year ISI interval is the 1989-Edition, no Addenda of the ASME Code, Section XI. The licensee is performing the examination during the first outage of the fourth 10-year ISI interval and will credit these examinations to the third 10-year ISI interval only, utilizing the provision of ASME Section XI, Paragraph IWA-2430. Unit 3 began the first outage of the fourth 10-year interval in September 2004. The first refueling outage for Unit 4 is scheduled for spring 2005.

3.2.3 Code Requirements for which Relief is Requested

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee requested approval to implement an alternative to the requirements within ASME Section XI, 1989 Edition, no Addenda, Appendix I, Article I-2100. Article I-2100 requires ultrasonic examinations of reactor vessels greater than 2-inch thickness be conducted in accordance with Article 4 of Section V, as supplemented by Appendix I. Supplements identified in Table I-2000-1 shall be applied.

3.2.4 Licensee's Reason for Request (as stated by the licensee)

> FPL is required to perform the UT examination of the reactor vessel-to-flange weld in accordance with the requirements of 10 CFR 50.55a, plant Technical Specifications, and the 1989 Edition, no Addenda of the ASME Section XI Code. This Code edition invokes the examination requirements of Appendix I, Article I-2000 that essentially prescribes 20-year old examination methodology. The examination is performed from the reactor vessel inside surface and the flange surface. This examination methodology is typically "qualified" by calibration on side drilled holes in a calibration block fabricated from similar material.

In the 1989 Addenda of ASME Section XI, a qualification by performance demonstration, Appendix VIII, approach for UT examinations of reactor vessel welds, excluding the flange-to-shell weld, was introduced. In September 1999, 10 CFR 50.55a was issued and required an expedited implementation of the ASME section XI, 1995 edition with 1996 Addenda, Appendix VIII supplements in accordance with specific dates. Although the reactor flange-to-upper-shell weld is excluded from Appendix VIII requirements, FPL believes that supplementing the ASME Section XI Appendix I examination from the flange surface with the performance of the reactor vessel inside surface examination using procedures, equipment, and personnel qualified by demonstration in accordance with ASME Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 4 (clad-base metal interface) and 6 (vessel welds other than clad-base metal interface) surpass the quality of the generic examination techniques specified by the referencing Code edition and will provide an acceptable level of safety.

3.2.5 Licensee's Proposed Alternative and Basis for Use (as stated by the licensee)

Proposed Alternative:

FPL requests an alternative to the ASME Section XI, Article I-2100 required examination from the reactor vessel inside surface. FPL proposes supplementing the ASME Section XI, 1989 Edition, no Addenda, Appendix I examination from the flange surface using procedures, equipment, and personnel qualified by demonstration to perform remote mechanized examination of the reactor vessel-to-flange weld from the inside surface in accordance with ASME Code 1995 Edition, 1996 addenda, Section XI, Appendix VIII, Supplements 4 and 6, in lieu of Section V, Article 4 requirements. The ASME Section XI, 1995 Edition, 1996 Addenda Appendix VIII qualified procedures, 54-ISI-801, "Automated UT of PWR [Pressurized-Water Reactor] Vessel Shell Welds," have been demonstrated to perform detection, length sizing and through-wall sizing of reactor vessel shell welds, including those of similar thickness and material composition as the flange-to-shell weld. The procedures, equipment, and personnel for the remote mechanized examination from the inside surface have been qualified by demonstration in accordance with the PDI program.

Basis for Use:

The Appendix VIII procedure is technically superior to the standard ASME Code, Section V, Article 4 methodologies that are amplitude based. Enhanced performance is possible by:

(a) increased sensitivity to flaws, (b) demonstrated flaw measurement capability using amplitude independent sizing techniques, and (c) compatibility of the Appendix VIII examination technique with the flange-to-shell weld joint geometry resulting in good ultrasonic beam coverage.

(a) Increased sensitivity to flaws: The Appendix VIII procedure is more sensitive to flaws because the exam sensitivity level compares to the ASME DAC

(distance-amplitude correction) level of 10 percent DAC. Previous examinations of the reactor vessel shell welds in accordance with ASME Section V were conducted at the less sensitive level of 50 percent DAC for flaws located in the outer 80 percent of the material thickness and 20 percent DAC for flaws located from the clad-base metal interface to a depth of about 20 percent thickness (i.e., near surface region).

The Appendix VIII procedure offers an additional level of assurance in the detection of flaws because the procedure requires that all signals interpreted by the analyst as flaws, regardless of amplitude response, shall be measured and assessed in accordance with the applicable criteria. The Appendix VIII procedure recognizes that some flaws can exhibit low amplitude response depending on orientation. This evidence has not been factored into the ASME Section V techniques that have traditionally had a flaw response cut-off point of 20 percent DAC.

(b) Demonstrated Flaw Measurement Capability using Amplitude Independent Sizing Techniques: 54-ISI-801, "Automated UT of PWR Vessel Shell Welds" in accordance with ASME Section XI, Appendix VIII, Supplements 4 and 6 was demonstrated in 2004 to the Electric Power Research Institute (EPRI) PDI. The reference number for the performance demonstration test is PDQS No. 449.

The procedure complies with ASME Code, Section XI 1995 Edition with 1996 Addenda as modified by 10 CFR 50.55a. The procedure was qualified using tip diffraction sizing techniques, which are amplitude independent. The amplitude-based flaw bounding criteria specified in ASME Section V procedures have been proven inaccurate because the size of the reflection is measured. This may or may not accurately reflect true flaw sizes.

(c) Compatibility of the Appendix VIII technique to the flange-to-shell weld joint and synergy with the previous examination: The Appendix VIII shell weld examination procedure requires the use of 45°L, 45°S, and 70°L to examine the weld and heat affected zone. The procedure requires the exam volume to be examined with sound beams in four orthogonal directions, although it has also been successfully demonstrated as a single sided examination technique. The increment size is 0.5 inch for dual side examinations and 0.2 inch for single side examinations. When examination coverage using Appendix VIII techniques are combined with the manual examination performed from the flange seal surface, the expected coverage is a minimum 68 percent. It is not anticipated that greater coverage could be obtained scanning along the ID surface by using additional transducers and beam angles, due to the fact that the flange taper geometry will partially obstruct the path of all transducers. Attachment 1 illustrates that the inner 15 percent is well interrogated, with the exception of the area directly beneath the curved surface above the weld. This is a common limitation for the flange-top-shell weld joint.

The last remote mechanized exam of the flange-to-shell weld was conducted in 1990. At that time, 45, 60, and 50/70 degree exam angles were used, and the results were acquired and analyzed using an automated ultrasonic exam system.

No indications were found exceeding the allowable limits of Section XI. Scan limitations were reported due to the flange inside surface configuration.

FPL will ensure that the flange-to-shell weld is examined from the inside surface with ultrasonic examination techniques qualified by demonstration in lieu of standard amplitude-based ultrasonic examination techniques currently specified. The examination will be conducted to the maximum extent practical in four orthogonal directions. When these results are combined with the manual examination performed from the flange seal surface, the coverage is expected to be 68 percent minimum. The examination sensitivity and flaw measurement capability of the proposed alternative are superior to the method prescribed and coverage will be acceptable, considering the difficult geometric presentation.

3.2.6 Duration of Proposed Alternative

The licensee proposes to use the alternative during the third 10-year ISI interval and the respective extension periods for Units 3 and 4. The third 10-year ISI interval for Unit 3 has been extended until February 21, 2005 and Unit 4 has been extended until April 14, 2005.

3.2.7 Evaluation

The applicable Code of record for both units during the third 10-year ISI interval is the 1989 Edition, no Addenda of the ASME Code, Section XI. The licensee proposes to use the qualification requirements contained in Supplements 4 and 6 in the 1995 Edition, 1996 Addenda of the ASME Code in lieu of the qualification requirements of Section V, Article 4 of the ASME Code. The two supplements use a performance-based approach for the qualification of procedures, personnel and equipment used for the inspection of welds in the clad-base metal interface of the reactor vessel (Supplement 4) and reactor vessel welds other than clad-base metal interface (Supplement 6).

Qualified prescriptive-based UT procedures in Section V, Article 4 have been applied in a controlled setting containing real flaws in mockups of reactor vessels and the results have been statistically analyzed according to the screening criteria in Appendix VIII of the ASME Code, Section XI. The results show that the procedures are less effective than UT procedures qualified through Supplements 4 and 6. Qualification through Supplements 4 and 6 uses fewer transducers than Section V, Article 4, and UT examination is performed with higher sensitivity, which increases the chances of detecting a flaw sizing when compared to the prescriptive-based requirements in the ASME Code, Section V, Article 4. Also, flaw sizing is more accurately determined with the echo-dynamic motion and tip diffraction criteria used by Supplements 4 and 6, as opposed to the less accurate amplitude criteria for the prescriptive-based requirements in Section V, Article 4. Procedures, equipment, and personnel qualified through the PDI program have shown high probability of detection levels. This has resulted in an increased reliability of inspections for weld configurations within the scope of the PDI program.

The licensee provided a drawing showing the flange-to-shell weld coverage in the attachment to the submittal. The NRC staff reviewed this information and noted that the limitation in volumetric coverage is due to a surface geometry on the weld, which interferes with the positioning of the equipment and does not allow full coverage of the inspection volume. The

licensee stated that they will expect a minimum coverage of 68 percent with the use of the proposed alternative. This coverage accounts for the coverage obtained from the flange seal surface exam and the examination performed from the inside surface of the weld. The licensee also stated that the results obtained during the last remote mechanized exam of the welds did not find any indications exceeding the allowable limits of Section XI. Based on these considerations, the NRC staff finds that the expected coverage obtained with the proposed alternative will reliably identify any service-related indications of degradation in the reactor upper shell-to-flange weld affected by this relief request.

3.2.8 Summary

Based upon review of the information provided by the licensee in support of Relief Request No. 35, the NRC staff concludes that the proposed alternative to use personnel, procedures, and equipment qualified to Supplements 4 and 6 in the 1995 Edition, 1996 Addenda of the ASME Code for examination of the reactor vessel upper shell-to-flange weld, will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the use of the proposed alternative at Units 3 and 4 during the third 10-year ISI interval and their respective extension periods.

4.0 CONCLUSION

Based on the information provided in the licensee's submittals, the NRC staff concludes that the proposed alternatives, as described above, provide an acceptable level of quality and safety, and are, therefore, authorized pursuant to 10 CFR 50.55a(a)(3)(i). These reliefs are authorized for the extension period for the third 10-year ISI interval Turkey Point Units 3 and 4. The third 10-year ISI interval for Unit 3 was extended until February 21, 2005, while the third 10-year ISI interval for Unit 4 was extended until April 14, 2005. This authorization is limited to those components described in Sections 3.1.1 and 3.2.1 above. 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: Rafael Rodriguez, NRR

Date: October 20, 2004

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