October 26, 2005

Mr. Jeffrey S. Forbes
Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 1 - RE: REQUEST FOR APPROVAL TO USE WIRE-TYPE PENETRAMETERS FOR PERFORMING RADIOGRAPHIC EXAMINATIONS (TAC NO. MC8314)

Dear Mr. Forbes:

By letter dated August 2, 2005 Entergy Operations, Inc., (the licensee) submited, pursuant to 10 CFR 50.55a(a)(3)(i), a request for relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, Code Case N-16-2 requirements to use “hole-type” penetrameters for radiographic examination of welds at Arkansas Nuclear One, Unit 1 (ANO-1). Instead the licensee proposed to use “wire-type” penetrameters for radiographic examinations, as permitted by ASME Code, Section III, 1992 Edition with 1993 Addenda.

ASME Code, Section XI, 1998 Edition with Addenda through 2000, is the applicable Code of record for the ANO-1 third 10-year inservice inspection (ISI) interval.

The NRC staff reviewed the information provided by the licensee in support of its request to use “wire-type” penetrameters in lieu of “hole-type” penetrameters to perform radiographic examinations at ANO-1. Based on the NRC staff’s evaluation, as outlined in the enclosed safety evaluation, the NRC staff concludes that the proposed alternative to use wire-type penetrameters for radiography examinations, as provided for in ASME Section III, 1992 Edition with 1993 Addenda, provides an acceptable level of quality and safety. Therefore, the NRC staff authorizes the proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at ANO-1.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

/RA/

David Terao, Chief, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure: As stated

cc w/encl: See next page

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION PROGRAM

REQUEST FOR RELIEF FROM AMERICAN SOCIETY OF MECHANICAL ENGINEERS

SECTION XI, CODE CASE N-416-2

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 1

DOCKET NO. 50-313

1.0 INTRODUCTION

By letter dated August 2, 2005 (Agencywide Documents Access and Management System Accession No. ML052210393), Entergy Operations, Inc., (Entergy, the licensee) submited, pursuant to 10 CFR 50.55a(a)(3)(i), a request for relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, Code Case N 416-2 requirements to use “hole-type” penetrameters for radiographic examination of welds at Arkansas Nuclear One, Unit 1 (ANO-1). Instead the licensee proposed to use “wire-type” penetrameters for radiographic examinations, as permitted by ASME Code, Section III, 1992 Edition with 1993 Addenda.

ASME Code, Section XI, 1998 Edition with Addenda through 2000, is the applicable Code of record for the ANO-1 third 10-year inservice inspection (ISI) interval.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g), ISI of nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI, except where specific written relief has been granted by the U.S. Nuclear Regulatory Commission (NRC or the Commission) pursuant to 10 CFR 50.55a(g)(6)(i). As stated in 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (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. Also, 10 CFR 50.55a(g)(5)(iii) states that, if the licensee has determined that conformance with certain code requirements is impractical for its facility, the licensee shall notify the Commission and submit written communication, as specified in 10 CFR 50.4, to support the determinations.

3.0 TECHNICAL EVALUATION

The information provided by the licensee in support of the request has been evaluated by the NRC staff and the bases for disposition are documented below.

3.1 Licensee's Evaluation

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested from the requirements of ASME Section XI, Code Case N-416-2, "Alternate Pressure Test Requirements for Welded Repairs, Fabrication Welds for Replacement Parts and Piping Subassemblies, or Installation of Replacement Items by Welding." The basis for the request is that the requirements included in Code Editions subsequent to ASME Code, Section III, 1992 Edition with 1993 Addenda, provide an acceptable alternative and, thus, an acceptable level of quality and safety.

3.1.1 Components

Component/Number: Various ASME Class 1 and 2 Items
Description: ASME Code Class 1 and 2 items with welds or repair welds requiring radiography

3.1.2 Code Requirements

Subarticle IWA-4170(b) of ASME Section XI, 1992 Edition states, "Repairs and installation of replacement items shall be performed in accordance with the Owner's Design Specification and the original Construction Code of the component or system. Later editions and addenda of the Construction Code or of Section III, either in their entirety or portions thereof, and Code Cases may be used."

Subarticle IWA-4710(a) of ASME Section XI, 1992 Edition states, "After a welded repair on a pressure retaining boundary or the installation of a replacement by welding, a system hydrostatic test shall be performed in accordance with IWA-5000."

As an alternative to the hydrostatic test of IWA-4710(a), a system leakage test can be performed in accordance with the ASME Section XI, Code Case N-416-2. Code Case N-416-2 has been conditionally approved by the NRC in Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1" (Revision 13). Regarding Code Case N-416-2, Table 2, "Conditionally Acceptable Section XI Code Cases," RG 1.147 states, "The provisions of IWA-5213, 'Test Condition Holding Times,' 1989 Edition, are to be used." Entergy's request will meet this condition.

Paragraph (a) of Code Case N-416-2 states that, "NDE [non-destructive examination] shall be performed on welded repairs and fabrication and installation joints in accordance with the methods and acceptance criteria of the applicable Subsection of the 1992 Edition of Section III."

Paragraphs NB-5111 (ASME Class 1) and NC-5111 (ASME Class 2) of ASME Section III, 1992 Edition contain the following requirements regarding the use of penetrameters (image quality indicators):

- NB-5111 states in part, "Radiographic examination shall be in accordance with Section V, Article 2, except that fluorescent screens are not permitted, the geometric unsharpness shall not exceed the limits of T-285, and the penetrameters of Table NB-5111-1 shall be used in lieu of those shown in Table T-276."

- NC-5111 states in part, "Radiographic examination shall be in accordance with Section V, Article 2, except that fluorescent screens are not permitted, the geometric unsharpness shall not exceed the limits of T-285, and the penetrameters of Table NC-5111-1 shall be used in lieu of those shown in Table T-276."

Tables NB-5111-1 and NC-5111-1 of the 1992 Edition of Section III permit the use of “hole-type” penetrameters only; "wire-type" penetrameters are not permitted.

3.1.3 Proposed Alternative

Pursuant to the provisions of 10 CFR 50.55a(a)(3)(i), Entergy proposes an alternative to the NDE requirements of ASME Section XI Code Case N-416-2, paragraph (a) when performing radiographic examination of ASME Class 1 and 2 welds and repair welds associated with the performance of ASME Section XI repair/replacement activities. More specifically, as an alternative to the penetrameter requirements of Tables NB-5111-1 (ASME Class 1) and NC-5111-1 (ASME Class 2) in the 1992 Edition of Section III for the performance of radiographic examinations, Entergy proposes to use wire-type penetrameters in accordance with Tables NB-5111-1 and NC-5111-1 of ASME Section III, 1992 Edition with 1993 Addenda.

3.1.4 Basis for Proposed Alternative

Hole-type penetrameters are difficult to use due to placement and shim requirements. Specifically, the use of hole-type penetrameters can be difficult because the essential "T" hole is often obscured or distorted due to specimen anomalies, part geometry, or film artifacts outside the area of interest. This creates a re-shoot condition that has a negative as low as reasonably achievable impact due to the additional radiation exposure to the radiography crew. These characteristics make hole-type penetrameters better suited for use on flat plate and objects with a geometry such that the penetrameters hole image is not distorted. Unfortunately, these simple configurations are not typical with many nuclear piping components.

For more complex configurations, the wire-type penetrameter is superior in that it is placed directly across the area of interest, thus, encompassing the object's range of density and geometry. The one-inch minimum length of the essential penetrameters wire eliminates this problem. The wire-type penetrameter provides the same function as the hole-type penetrameter by indicating a change in thickness and spatial resolution of the image without the use of shim blocks and pipe standards.

Wire-type penetrameters have been shown to provide quality and sensitivity equivalent to hole-type penetrameters, as documented in Table 4 of ASME Section V, Article 22,

Standard SE-747. Because of the equivalent sensitivity, the wire-type penetrameters provide equivalent results to currently-required hole-type penetrameters. Therefore, the quality of the examination and resulting safety of the plant, based on examination results, are not impacted by this proposed alternative.

The 1992 Edition with 1993 Addenda of ASME Section III, which includes the provision for use of equivalent wire-type penetrameters, has been endorsed by the NRC in 10 CFR 50.55a. Furthermore, the NRC staff has approved the use of wire-type penetrameters for Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (Calvert Cliffs), and Indian Point Energy Center, Unit 2.

In its approval of the use of wire-type penetrameters for Calvert Cliffs, the NRC staff compared performance of wire-type penetrameters to hole-type penetrameters. In its safety evaluation, the staff stated in part, "Based on the above comparison [performed by the NRC staff] of commonly used industry references and the widespread use of wire penetrameters in industry, the staff believes that the wire penetrameters listed in Table NB-5111-1 (NC-5111-1) to the 1992 Edition with 1993 Addenda of the ASME Code will provide an acceptable level of quality and safety."

3.2 Staff Evaluation

The staff reviewed the information provided by the licensee in support of its request to use “wire-type” penetrameters in lieu of “hole-type” penetrameters to perform radiographic examinations at ANO-1. The staff evaluation of the relief request follows.

IWA-4700 and IWA-5000 require a hydrostatic test following repairs. However, Code Case N-416-2, which the NRC has approved for use, allows the use of a system leakage test in lieu of the hydrostatic test, provided certain requirements are met. One of those requirements states, "NDE shall be performed in accordance with the methods and acceptance criteria of the applicable Sub-section of the 1992 Edition of Section III." With respect to radiography, the pertinent articles of Section III are NB-5111 and NC-5111 and Tables NB-5111-1 and NC-5111-1. The 1992 Edition of Section III did not include the use of wire-type penetrameters. Wire penetrameters were not included in Section III of the ASME Code until the 1992 Edition with 1993 Addenda.

Volume 17 of the Ninth Edition of the American Society of Metals (ASM) Handbook Series, published in 1989, states that wire-type penetrameters are widely used in Europe, including the United Kingdom, Germany, the Netherlands, and Scandinavia. International organizations have also incorporated the use of wire penetrameters, such as the International Organization for Standardization and the International Institute of Welding. The ASM Handbook goes on to state that wire penetrameters specified in American Society for Testing and Materials (ASTM) E 747-87 are widely used in the United States. ASTM developed this specification using a public forum with approval by public consensus.

The ASTM Standard E 747 referenced in the ASM Handbook is the same as ASME's Standard SE-747.

The NRC staff made a comparison to determine the equivalency of the previously allowed plaque-type penetrameters with the proposed alternative of wire-type penetrameters.

The comparison showed that the wire diameters were essentially the same. Of the 18 wire diameters compared, two wire diameters were more conservative (smaller diameters), two wire diameters interpolated from two known values were less conservative (larger diameters), and 14 wire diameters were identical to the wire diameters in Table NB-5111-1 (NC-5111-1) to the 1992 Edition with 1993 Addenda of the ASME Code. Based on the above comparison of commonly used industry references and the widespread use of wire penetrameters in industry, the staff finds that the wire penetrameters listed in Table NB-5111-1 (NC-5111-1) to the 1992 Edition with 1993 Addenda of the ASME Code will provide an acceptable level of quality and safety.

4.0 CONCLUSION

Based on the above evaluation, the NRC staff concludes that the proposed alternative to use wire-type penetrameters for radiography examinations, as provided for in ASME Section III, 1992 Edition with 1993 Addenda, provides an acceptable level of quality and safety. Therefore, the NRC staff authorizes the proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval at ANO-1.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributors: G. Georgiev

Date: October 25, 2005

cc:

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