January 13, 2000

Mr. Michael R. Kansler
Vice President, Operations Support
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286-1995

SUBJECT: RELIEF AUTHORIZATION FOR ALTERNATIVES TO THE REQUIREMENTS OF ASME SECTION XI, AS ENDORSED BY 10 CFR 50.55a FOR CONTAINMENT INSPECTIONS FOR ARKANSAS NUCLEAR ONE, UNITS 1 AND 2, GRAND GULF NUCLEAR STATION, RIVER BEND STATION, AND WATERFORD STEAM ELECTRIC STATION, UNIT 3 (TAC NOS. MA5373, MA5404, MA5386, MA5428, MA5387)

Dear Mr. Kansler:

In your application dated April 29, 1999, as supplemented by letters dated May 10, 1999, and December 9, 1999, Entergy Operations, Inc., submitted Alternative Request Nos. IWE-01, IWE-02, and IWE-03, requesting relief from the expedited examination of containment required by Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(6)(ii)(B) and the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Subsection IWE, 1992 Edition with the 1992 Addenda.

In Alternative Request No. IWE-01, you requested relief from the requirements of ASME Code Section XI, Paragraph IWE-2420(b). Your proposal would eliminate the requirement to perform any reexaminations during the next inspection period when a component containing a flaw or area of degradation is restored via a repair activity. In Alternative Request No. IWE-02, you requested relief from the requirements of ASME Code Section XI, Paragraph IWE-2500, Table IWE-2500-1, "Examination Category E-G," Item E8.20. Your proposal would eliminate the requirement to perform bolt torque or tension testing on containment bolted connections that have not been disassembled and reassembled during the inspection interval. In Alternative Request No. IWE-03, you proposed an alternative examination to the Requirements of ASME Code Section XI, Paragraph IWE-2500, Table IWE-2500-1, "Examination Category E-C," Item E5.10 and Item E5.20. This alternative would credit 10 CFR Part 50, Appendix J, Types B and C testing to verify the adequacy of seals and gaskets.

The staff has reviewed and evaluated the information in your request and finds that the existing requirements as discussed in Alternative Request Nos. IWE-01 and IWE-02 result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, the licensee's proposed relief requests are authorized pursuant to 10 CFR 50.55a(a)(3)(ii). In addition, the staff concludes that the proposed alternative contained in Alternative Request No. IWE-03 provides an acceptable level of quality and safety and, therefore, your proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i). Alternative Request Nos. IWE-01, IWE-02, and IWE-03 are authorized for Arkansas

Nuclear One, Units 1 and 2, Grand Gulf Nuclear Station, River Bend Station, and Waterford Steam Electric Station, Unit 3. The containment inspections are required to be completed, in accordance with 10 CFR 50.55a(g)(6)(ii)(B), by September 9, 2001.

Sincerely,

/RA/

Robert A. Gramm, Chief, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-313, 50-368, 50-416,
50-458, and 50-382

Enclosure: Safety Evaluation

cc w/encl: See next page

Nuclear One, Units 1 and 2, Grand Gulf Nuclear Station, River Bend Station, and Waterford Steam Electric Station, Unit 3. The containment inspections are required to be completed, in accordance with 10 CFR 50.55a(g)(6)(ii)(B), by September 9, 2001.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST FROM ASME CODE SECTION XI REQUIREMENTS

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNITS 1 AND 2

GRAND GULF NUCLEAR STATION

RIVER BEND STATION

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NOS. 50-313, 50-368, 50-416, 50-458, AND 50-382

1.0 INTRODUCTION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g), the inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class MC (metallic containments) and CC (concrete containments) components shall be performed in accordance with Section XI of the ASME Code and applicable addenda, except where relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) of 10 CFR states that alternatives to the requirements of paragraph (g) may be used, when authorized by the Commission 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.

As published in the *Federal Register* (61 FR 41303, dated August 8, 1996), the Commission announced an amendment to its regulation in 10 CFR Part 50, Section 50.55a (rule). The rule incorporated, by reference, the 1992 Edition with the 1992 Addenda of Subsections IWE and IWL of ASME Code, Section XI. Subsections IWE and IWL provide the requirements for ISI of Class CC and Class MC of light-water cooled power plants. The effective date for the amended rule was September 9, 1996, and requires licenses to incorporate the new requirements into their ISI plans and complete the first containment inspection by September 9, 2001. However, a licensee may submit a request for relief from one or more requirements of the regulation (or the endorsed ASME Code requirements) with proper justification.

In accordance with 10 CFR 50.55a(g)(6)(ii)(B), all licensees shall implement the inservice examinations specified for the first period of the first inspection interval in Subsection IWE, "Requirements for Class MC of Metallic Liners and Class CC Concrete Components of Light-Water Cooled Plants," of the 1992 Edition with the 1992 Addenda in conjunction with the

requirements of 10 CFR 50.55a(b)(2)(ix) by September 9, 2001. Licensees shall also implement the inservice examinations that correspond to the number of years of operation that are specified in Subsection IWL, "Requirements for Class CC Concrete Components of Light-Water Cooled Plants," of the 1992 Edition with the 1992 Addenda in conjunction with the requirements of 10 CFR 50.55a(b)(2)(ix) by September 9, 2001.

By letter dated April 29, 1999, as supplemented by letters dated May 10, 1999, and December 9, 1999, Entergy Operations, Inc. (the licensee), submitted Alternative Request Nos. IWE-01, IWE-02, and IWE-03, requesting relief from the expedited examination of containment required by 10 CFR 50.55a(g)(6)(ii)(B) and the requirements of the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Subsection IWE, 1992 Edition with the 1992 Addenda. The proposed request would apply for Arkansas Nuclear One, Units 1 (ANO-1) and 2 (ANO-2), Grand Gulf Nuclear Station (GGNS), River Bend Station (RBS), and Waterford Steam Electric Station, Unit 3 (Waterford-3).

In Alternative Request No. IWE-01, the licensee requested relief from the requirements of ASME Code Section XI, Paragraph IWE-2420(b). The licensee's proposal would eliminate the requirement to perform any reexaminations during the next inspection period when a component containing a flaw or area of degradation is restored via a repair activity. In Alternative Request No. IWE-02, the licensee requested relief from the requirements of ASME Code Section XI, Paragraph IWE-2500, Table IWE-2500-1, "Examination Category E-G," Item E8.20. The licensee's proposal would eliminate the requirement to perform bolt torque or tension testing on containment bolted connections that have not been disassembled and reassembled during the inspection interval. In Alternative Request No. IWE-03, the licensee proposed an alternative examination to the Requirements of ASME Code, Section XI, Paragraph IWE-2500, Table IWE-2500-1, "Examination Category E-D," Item E5.10 and Item E5.20. This alternative would credit 10 CFR Part 50, Appendix J, Type B and Type C testing to verify the adequacy of seals and gaskets.

2.0 EVALUATION

2.1 Alternative Request No. IWE-01, IWE-2420(b), Successive Examinations After Repair

Under the ASME Code ISI program, component examination results may require evaluation of flaws, areas of degradation, or repairs in accordance with Paragraph IWE-3000, "Acceptance Standards." Paragraph IWE-2420(b) requires that when examinations result in the evaluation of flaws or areas of degradation, and the component is determined to be acceptable for continued service, or when examinations result in performance of a repair activity, the items containing such flaws, areas of degradation, or areas subject to a repair, shall be reexamined during the next inspection period. The licensee is proposing not to perform any reexaminations during the next inspection period when the component is restored via a repair activity, to an acceptable condition for continuous service, in accordance with the acceptance standards of Paragraph IWE-3000. This approach is consistent with the successive examination requirements of Class 1, 2, and 3 components.

The NRC staff agrees with the licensee that a successive examination performed in the next period is not warranted after repair of the component. Repairs are performed in accordance with IWA-4000, the intent of which is to use the construction code to restore the component to its original condition. If the examination after a repair indicates that the repair has restored the component to an acceptable condition, successive examinations are not warranted. If the

post-repair examination indicates that the repair was not suitable, then the repair does not meet Code requirements and the component is not acceptable for continued service. Components that have been restored to their original condition through a Code repair do not require reexamination during the next inspection period listed in the schedule of the inspection program of IWE-2411, "Inspection Program A," or IWE-2412, "Inspection Program B," in accordance with Table IWE-2500-1, "Examination Category E-C." Furthermore, if the area requiring repair is subject to accelerated degradation, it would still require augmented examination in accordance with Table IWE-2500-1, "Examination Category E-C." The position proposed by the licensee is consistent with the requirements reflected in the 1998 Edition of the ASME Code, Section XI. The licensee's proposed alternative to omit the performance of successive examinations after repair and replacement activities will provide an acceptable level of quality and safety. As a result, compliance with the successive examination requirements in Paragraph IWE-2420(b) for conditions restored through a repair would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, the licensee's proposed alternative contained in Alternative Request No. IWE-01 is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

2.2 Alternative Request No. IWE-02, Class MC Pressure Retaining Bolting

ASME Code, Section XI, Paragraph IWE-2500 requires bolt torque or tension testing on containment bolted connections that have not been disassembled and reassembled during the inspection interval to be conducted in accordance with Table IWE-2500-1, "Examination Category E-G," Item E8.20. Determination of the bolt torque or tension value would require that the bolting be un-torqued and then re-tensioned. The licensee's proposal, as stated in Alternative Request No. IWE-02, requests relief from the requirements to perform bolt torque or tension testing on containment bolted connections that have not been disassembled and reassembled during the inspection interval.

Each containment penetration receives a 10 CFR Part 50, Appendix J, Type B test in accordance with the specified testing frequencies. As noted in 10 CFR Part 50, Appendix J, the purpose of Type B tests is to measure leakage of containment or penetrations whose design incorporates resilient seals, gaskets, sealant compounds, and electrical penetrations fitted with flexible mechanical seal assemblies. The performance of the Type B test itself proves that the bolt torque or tension remains adequate to provide a leak rate that is within acceptable limits. The torque or tension value only becomes an issue if the leak rate is excessive. Once a bolt is torqued or tensioned, it is not subject to a dynamic loading that could cause it to experience significant changes. Appendix J testing and visual inspection is adequate to demonstrate that the design function is met. Torque or tension testing is not required for any other ASME Code Section XI, Class 1, 2, or 3 bolted connections or their supports as part of the ISI program.

The requirement to perform bolt torque or tension tests has been removed from the 1998 Edition of the ASME Code, Section XI, Paragraph IWE-2500, Table IWE-2500-1, "Examination Category E-G."

The following examinations and tests required by ASME Code, Section XI, Subsection IWE would still apply to ensure the structural integrity and the leak-tightness of Class MC pressure retaining bolting. Paragraph IWE-2500 requires that exposed surfaces of bolted connections shall be visually examined in accordance with the requirements of Table IWE-2500-1, "Examination Category E-G," Item E8.10. Additionally, Paragraph IWE-2500 requires that bolted connections

receive a pressure test in accordance with Table IWE-2500-1, “Examination Category E-P,” Item E9.40. The examination test requirements for this item refer to 10 CFR Part 50, Appendix J, Type B.

The majority of the containment bolted connections are designed to be pressure-seating. Pressure-seating connections are considered to be those connections that have additional seating loads due to accident pressures acting on the inboard side of the penetration. Pressure-seating connections have a lower potential for leakage under accident conditions as the bolting ensures the quality of the seal and containment pressure acts to increase the sealing force. In contrast, pressure-unseating bolted connections will experience an unloading force due to an increased containment pressure during the postulated accident response. Therefore, the integrity of the bolted connection is more dependent on proper tensioning of the threaded fasteners. The licensee provided a description of the pressure-unseating bolted connections that would be covered under this relief request for each of the affected plants. The staff was able to conclude that the licensee’s proposal was appropriate for both pressure-seating and pressure-unseating bolted connections. The licensee demonstrated that, with one exception, the affected pressure-unseating bolted connections would either be routinely opened and remade during the inspection interval (e.g., containment equipment hatch, fuel transfer tube) or would be the redundant seal in series with a pressure-seating connection that would have to fail for the joint in question to experience the unseating force. The licensee described one exception involving the ANO-2 electrical penetrations that would not be routinely opened during the interval or be placed in series with a pressure-seating connection. However, the electrical penetrations have an inherently reliable design and are provided with a double O-ring seal. This joint is periodically subjected to a Type B leak-test at pressures in the pressure-unseating direction that bound accident conditions in accordance with 10 CFR Part 50, Appendix J. Therefore, the staff concluded that the licensee’s proposal appropriately treats pressure-seating and pressure-unseating bolted connections.

The licensee requested relief from the requirements ASME Code, Section XI, IWE-2500, Table IWE-2500-1, “Examination Category E-G,” Item E8.20 in accordance with 10 CFR 50.55a(a)(3)(ii). Untorquing and subsequent retorquing of bolted connections that are verified not to experience unacceptable leakage through 10 CFR Part 50, Appendix J, Type B testing result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, the licensee’s proposed alternative contained in Alternative Request No. IWE-02 is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

2.3 Alternative Request No. IWE-03, Examination Category E-D, Items E5.10 and E5.20 of IWE-2500, Table IWE-2500-1, Visual Examination of Seals and Gaskets

The ASME Code, Section XI, Paragraph IWE-2500 requires that seals and gaskets on electrical penetrations, air locks, hatches, and other devices be VT-3 visually examined once each interval to assure containment leak-tight integrity in accordance with Table IWE-2500-1, “Examination Category E-D,” Items E5.10 and E5.20. The licensee proposes to use existing 10 CFR Part 50, Appendix J testing as a verification of containment integrity, rather than disassembling the subject components for the sole purpose of examination.

For ANO-1, ANO-2, RBS, and Waterford-3, electrical penetrations use a header plate attached to a containment penetration nozzle flange with redundant O-rings between the header plate and flange face. Modules through which electrical conductors pass are installed in the header plate.

One type, manufactured by Amphenol, uses seals and gaskets to assure leak tight integrity. A second type, manufactured by Conax, uses a set of compression fittings. Replacement modules for Amphenol penetrations use a combination of O-rings and compression fittings. These seals and gaskets cannot be inspected without disassembly of the penetration to gain access. These electrical penetrations are currently tested in accordance with 10 CFR Part 50, Appendix J, Type B.

For GGNS, the electrical penetrations are manufactured by Westinghouse Electric Corporation. The penetration bulkhead plate, similar to a flange, is welded to the penetration tube. Modules through which the electrical conductors pass are held in place on the bulkhead by bolted retaining lugs and are sealed using O-rings. Within the modules, epoxy surrounding the conductors forms an environmental seal. These seals and gaskets, which cannot be inspected without disassembly of the penetration, are currently tested in accordance with 10 CFR Part 50, Appendix J, Type B.

The equipment hatch is a single door, utilizing a double O-ring seal to ensure leak-tight integrity. The equipment hatch is removed during maintenance outages, when necessary, and during each refueling outage. Prior to final closure, the hatch seals and door sealing surface are inspected for damage that could prevent sealing. Seals are replaced if found damaged. The equipment hatch is currently Type B leak-tested in accordance with 10 CFR Part 50, Appendix J.

The containment personnel air locks utilize an inner and outer door with redundant sealing surfaces to ensure leak-tight integrity. For ANO-1 and ANO-2, the inner and outer doors are equipped with double gaskets without inflatable seals. In order for the VT-3 examination to be successfully completed, the gaskets must be removed, which could result in damage. For GGNS and RBS, the containment personnel air locks use double inflatable seals for the inner and outer doors to ensure leak-tight integrity. The inflatable seal design is accessible for VT-3 inspection without disassembly or damage. For Waterford-3, the inner and outer doors are equipped with double seals on each door to ensure leak-tight integrity. In order to perform the VT-3 examination, these seals must be removed from the seating surface which could result in damage. The air locks for ANO-1, ANO-2, GGNS, RBS, and Waterford-3 also contain other seals, which may include handwheel shaft seals, electrical penetration seals, double O-ring seals for blank flanges, view port O-ring seals, and seals for the equalizing pressure connections. Each of these affected components would require disassembly to successfully complete the required VT-3 inspection. Sealing surfaces are periodically inspected for damage and the seals and gaskets for these joints are replaced, as required. Both inner and outer air lock assemblies are currently leak tested in accordance with 10 CFR Part 50, Appendix J, Type B.

The fuel transfer tube for ANO-1 and ANO-2 utilizes a bolted blind flange with two gaskets to provide a leak tight seal. These gaskets are either inspected or replaced each time the fuel transfer tube is opened. Removal of these seals would be required to perform a VT-3 examination. Seal removal could result in damage, necessitating replacement of the gaskets. The inclined fuel transfer tube for RBS has triple O-ring seals on the blind flange which, when in the closed position, isolates the containment. The triple O-ring seal is replaced each refueling outage. A VT-3 inspection cannot be performed on the fuel transfer tube O-ring seals without removing the blind flange, which could damage the seals. The fuel transfer tube for Waterford-3 uses double O-ring seals on a blind flange. The O-rings are replaced each refueling outage and inspected for damage. A VT-3 inspection cannot be performed on the fuel transfer tube O-ring seals without removing the blind flange, which could damage the seals. In each of these

applications, the fuel transfer tube is subjected to a Type B leak test in accordance with 10 CFR Part 50, Appendix J.

The horizontal fuel transfer tube for GGNS has double O-ring seals on the hatch head that, when clamped in place on the inside surface of the containment, provides a pressure-seating leak-tight seal. In order for the VT-3 examination to be successfully completed, the hatch must be disassembled which could damage the seals. The seals are currently Type C water tested in accordance with 10 CFR Part 50, Appendix J.

The RBS containment control rod drive (CRD) removal tube hatch uses double O-ring seals between the head cover and the flange at the bolted connection. The hatch cover is open during outages, as necessary, to support CRD removal. The O-ring seals are inspected and replaced as necessary. In order for the VT-3 examination to be successfully completed, the hatch must be disassembled which could damage the seals. This hatch is Type B leak-tested in accordance with 10 CFR Part 50, Appendix J.

As noted in 10 CFR Part 50, Appendix J, the purpose of Type B testing is to measure leakage of containment or penetrations whose design incorporates resilient seals, gaskets, sealant compounds, and electrical penetrations fitted with flexible mechanical seal assemblies. Type C testing is intended to measure containment leakage from such sources that provide a direct connection between the containment and outside atmosphere. Examination of seals and gaskets typically require the joints, which are proven adequate through Appendix J testing, to be disassembled. This imposes a risk that equipment could be damaged. The 1992 Edition and the 1993 Addenda of the ASME Code, Section XI recognizes that disassembly of joints to perform these examinations is not warranted. Note 1 in Examination Category E-D was modified in the 1995 Edition of ASME Code, Section XI to state that sealed gasket connections need not be disassembled solely for the performance of the examination. Additionally, Table IWE-2500-1, “Examination Category E-D,” Items E5.10 and E5.20 have been removed from the 1998 Edition of ASME Code, Section XI.

For those penetrations that are routinely disassembled, a Type B or Type C test is required upon final assembly and prior to start-up. Since the Type B or Type C test will ensure leak-tight integrity of primary containment, the performance of the visual examination would not result in an increase in the level of safety and quality.

Seals and gaskets are not part of the containment pressure boundary under current ASME Code, Section III, Paragraph NE-1220(b) requirements. When the air locks, hatches, and penetrations containing these materials are tested in accordance with 10 CFR Part 50, Appendix J, degradation of the seal or gasket material would be revealed by an increase in the leakage rate. Corrective measures would be applied and the component retested. Repair and replacement of seals or gaskets are not subject to Code rules in accordance with Paragraph IWA-4111(b)(5) of ASME Code, Section XI, 1992 Edition, 1992 Addenda.

The staff believes that the functionality of the containment penetration seals and gaskets would be verified during the Type B or Type C testing as required by 10 CFR Part 50, Appendix J. Consequently, the proposed alternative provides an acceptable level of quality and safety. Therefore, the licensee’s proposed alternative contained in Alternative Request No. IWE-03 is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

3.0 CONCLUSION

The staff has evaluated the information contained in the licensee's submittal dated April 29, 1999, as supplemented by letters dated May 10, 1999, and December 9, 1999, for ANO-1, ANO-2, GGNS, RBS, and Waterford-3. On the basis of the preceding evaluation, the staff concludes that the existing requirements as discussed in the licensee's proposal as described in Alternative Request Nos. IWE-01 and IWE-02 results in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, the licensee's proposed relief requests contained in Alternative Request Nos. IWE-01 and IWE-02 are authorized pursuant to 10 CFR 50.55a(a)(3)(ii). In addition, the staff concludes that the proposed alternative contained in Alternative Request No. IWE-03 provides an acceptable level of quality and safety and, therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

Principal Contributor: C. Nolan

Date: January 13, 2000