May 17, 2006

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

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 (ANO-2) - RELAXATION REQUEST FROM U.S. NUCLEAR REGULATORY COMMISSION (NRC) ORDER EA-03-009 FOR THE CONTROL ELEMENT DRIVE MECHANISM (CEDM) NOZZLES (TAC NO. MC8282)

Dear Mr. Forbes:

By letter dated September 9, 2005, Entergy Operations, Inc. (Entergy), submitted a relaxation request pertaining to its upcoming inspections (fall 2006) required by NRC First Revised Order EA-03-009 dated February 20, 2004 (the Order), at ANO-2. Entergy requested and received relaxation from the requirements of the Order during its fall 2003 outage and during its spring 2005 outage. Entergy's current request is identical to the previous requests, with the exception that greater-than-anticipated coverage during its fall 2003 outage prompted the licensee to re-evaluate the extent to which it was performing augmented inspections. Entergy has conducted reactor pressure vessel head (RPVH) nozzle examinations during three previous outages, which include the two aforementioned outages and the spring 2002 outage performed prior to the Order.

Section IV.C of the Order requires, in part, that inspections of Section IV.C.(5)(b) of the Order be performed every refueling outage for plants with high susceptibility to primary water stress corrosion cracking such as ANO-2. Entergy has requested relaxation from Section IV.C.(5)(b) of the Order.
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Relaxation is requested for the ANO-2 refueling outage in the fall of 2006 through the remainder of the current 10-year inservice inspection interval. Entergy has requested relaxation to implement an alternative to the requirements of Section IV, Paragraph C.(5)(b)(i), of the Order for all CEDM nozzles at ANO-2. Specifically, pursuant to the process specified in Section IV, Paragraph F of the Order, Entergy requested relaxation from the requirement specified in Section IV, Paragraph C, Item (5)(b)(i), to instead perform inspections using a three-step alternative, which involves the use of an analysis technique, ultrasonic testing, and augmented surface examination.

The NRC staff has completed its review and concludes that the proposed alternative examination of the RPVH provides reasonable assurance of structural integrity. The NRC's safety evaluation is enclosed. Further inspection of the RPVH surface in accordance with Section IV.C.(5)(b)(i) of the Order would result in hardship without a compensating increase in the level of quality and safety. Thus, Entergy has demonstrated good cause for the requested relaxation. Therefore, pursuant to Section IV, Paragraph F of the Order, Entergy is authorized to use, for the remainder of the current, 10-year inservice inspection interval at ANO-2, commencing with the startup from the fall 2006 refueling outage, the proposed alternative inspection for all CEDM RPVH nozzles at ANO-2 subject to the understanding, as included in your relief request, that:

If the NRC staff finds that the crack-growth formula in MRP-55, "EPRI [Electric Power Research Institute] Materials Reliability Program (MRP) Crack Growth Rates for Evaluating Primary Water Stress Corrosion," is unacceptable, Entergy shall revise its analysis that justifies relaxation of the Order within 30 days after the NRC informs Entergy of an NRC-approved crack-growth formula. If Entergy's revised analysis shows that the crack-growth acceptance criteria would be exceeded during a single operating cycle, this relaxation is rescinded and Entergy will, within 72 hours, submit to the NRC written justification for continued operation. If the revised analysis shows that the crack-growth acceptance criteria would be exceeded during a single operating cycle, Entergy shall, within 30 days, submit the revised analysis for NRC review. If the revised analysis shows that the crack-growth acceptance criteria would not be exceeded during a single operating cycle, Entergy shall, within 30 days, submit a letter to the NRC confirming that its analysis has been revised. Any future crack-growth analyses performed for Operating Cycle 19 and future cycles for RPVH penetrations would be based on the new NRC-accepted crack-growth rate formula.

Be aware that when RPVH inspections are performed using American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) requirements, acceptance criteria, or qualified personnel, those activities and all related activities fall within the jurisdiction of the ASME Code. Therefore, Order-related inspection activities may be subject to third party review, including those by the Authorized Nuclear Inservice Inspector.

Sincerely,

/RA/

David Terao, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosure:
Safety Evaluation

cc w/encl: See next page

to use, for the remainder of the current, 10-year inservice inspection interval at ANO-2, commencing with the startup from the fall 2006 refueling outage, the proposed alternative inspection for all CEDM RPVH nozzles at ANO-2 subject to the understanding, as included in your relief request, that:

If the NRC staff finds that the crack-growth formula in MRP-55, "EPRI [Electric Power Research Institute] Materials Reliability Program (MRP) Crack Growth Rates for Evaluating Primary Water Stress Corrosion," is unacceptable, Entergy shall revise its analysis that justifies relaxation of the Order within 30 days after the NRC informs Entergy of an NRC-approved crack-growth formula. If Entergy's revised analysis shows that the crack-growth acceptance criteria would be exceeded during a single operating cycle, this relaxation is rescinded and Entergy will, within 72 hours, submit to the NRC written justification for continued operation. If the revised analysis shows that the crack-growth acceptance criteria would be exceeded during a single operating cycle, Entergy shall, within 30 days, submit the revised analysis for NRC review. If the revised analysis shows that the crack-growth acceptance criteria would not be exceeded during a single operating cycle, Entergy shall, within 30 days, submit a letter to the NRC confirming that its analysis has been revised. Any future crack-growth analyses performed for Operating Cycle 19 and future cycles for RPVH penetrations would be based on the new NRC-accepted crack-growth rate formula.

Be aware that when RPVH inspections are performed using American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) requirements, acceptance criteria, or qualified personnel, those activities and all related activities fall within the jurisdiction of the ASME Code. Therefore, Order-related inspection activities may be subject to third party review, including those by the Authorized Nuclear Inservice Inspector.

Sincerely,
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David Terao, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
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Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELAXATION REQUEST FROM ORDER (EA-03-009)

ESTABLISHING INTERIM INSPECTION REQUIREMENTS FOR

REACTOR PRESSURE VESSEL HEADS AT PRESSURIZED WATER REACTORS

ARKANSAS NUCLEAR ONE UNIT 2

DOCKET NUMBER 50-368

1.0 INTRODUCTION

By letter dated September 9, 2005, Agencywide Documents Access and Management System (ADAMS) Accession No. ML052560109, Entergy Operations, Inc., (Entergy or the licensee) submitted a relaxation request pertaining to upcoming inspections (fall 2006) required by Nuclear Regulatory Commission (NRC) First Revised Order EA-03-009 (ADAMS Accession No. ML040220181) (the Order) at Arkansas Nuclear One, Unit 2 (ANO-2). The licensee requested and received relaxation from the requirements of the Order during its fall 2003 outage and from the Order during its spring 2005 outage. The licensee's current request is identical to the previous requests, with the exception that greater-than-anticipated coverage during its fall 2003 outage prompted the licensee to re-evaluate the extent to which it was performing augmented inspections. The licensee has conducted reactor pressure vessel head (RPVH) nozzle examinations during three previous outages, which include the two aforementioned outages and the spring 2002 outage performed prior to the Order.

2.0 REGULATORY EVALUATION

The Order, issued on February 20, 2004, requires specific examinations of the RPVH and vessel head penetration (VHP) nozzles of all pressurized water reactor plants. Section IV.F of the Order states that requests for relaxation of the Order associated with specific penetration nozzles will be evaluated by the NRC staff using the procedure for evaluating proposed alternatives to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code in accordance with 10 CFR 50.55a(a)(3). Section IV.F of the Order states that a request for relaxation regarding inspection of specific nozzles shall address the following criteria: (1) the proposed alternative(s) for inspection of specific nozzles will provide an acceptable level of quality and safety, or (2) compliance with this First Revised Order for specific nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

For ANO-2 and similar plants determined to have a high susceptibility to primary water stress corrosion cracking (PWSCC) in accordance with Sections IV.A and IV.B of the Order, the following inspections are required to be performed every refueling outage in accordance with Sections IV.C.(5)(a) and (b) of the Order:

(a) Bare metal visual examination (BMV) of 100 percent of the RPVH surface (including 360E around each RPVH penetration nozzle). For RPVHs with the surface obscured by support structure interferences which are located at RPVH elevations downslope from the outermost RPVH penetration, a BMV inspection of no less than 95 percent of the RPVH surface may be performed provided that the examination shall include those areas of the RPVH upslope and downslope from the support structure interference to identify any evidence of boron or corrosive product. Should any evidence of boron or corrosive product be identified, the licensee shall examine the RPVH surface under the support structure to ensure that the RPVH is not degraded.

(b) For each penetration, perform nonvisual nondestructive examination (NDE) in accordance with either (i), (ii), or (iii):

(i) Ultrasonic testing [UT] of the RPVH penetration nozzle volume (i.e., nozzle base material) from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches [see Figure IV-1]); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPVH penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi [thousand pounds per square inch] tension and greater (see Figure IV-2). In addition, an assessment shall be made to determine if leakage has occurred into the annulus between the RPVH penetration nozzle and the RPVH low-alloy steel.

(ii) Eddy current testing [ECT] or dye penetrant testing [PT] of the entire wetted surface of the J-groove weld and the wetted surface of the RPVH penetration nozzle base material from at least 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches [see Figure IV-3]); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPVH penetration nozzle surfaces below the J-groove weld have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater (see Figure IV-4).

(iii) A combination of (i) and (ii) to cover equivalent volumes, surfaces, and leak paths of the RPVH penetration nozzle base material and J-groove weld as described in (i) and (ii). Substitution of a portion of a volumetric exam on a nozzle with a surface examination may be performed with the following requirements:

1. On nozzle material below the J-groove weld, both the outside diameter [OD] and inside diameter [ID] surfaces of the nozzle must be examined.

2. On nozzle material above the J-groove weld, surface examination of the inside diameter surface of the nozzle is permitted, provided a surface examination of the J-groove weld is also performed.

3.0 FIRST REVISED NRC ORDER EA-03-009 RELAXATION REQUEST FOR EXAMINATION COVERAGE FOR REACTOR PRESSURE VESSEL HEAD PENETRATION NOZZLES

3.1 First Revised Order Requirements for Which Relaxation is Requested

Section IV.C of the Order requires, in part, that inspections of Section IV.C.(5)(b) of the Order be performed every refueling outage for high susceptibility plants similar to ANO-2.

The licensee has requested relaxation from Section IV.C.(5)(b) of the Order. The specific relaxation requested is identified below.

Relaxation was requested for the upcoming ANO-2 refueling outage in the fall of 2006 through the remainder of the current 10-year inservice inspection interval.

3.2 Licensee's Proposed Alternative Method

Ultrasonic Examination

The licensee states that the ID of each control element drive mechanism (CEDM) nozzle (i.e., nozzle base material) shall be UT examined from 2 inches above the root of the J-weld (on a horizontal plane perpendicular to the nozzle axis) to 1.544 inches above the bottom of the nozzle. The licensee will also perform an assessment to determine if leakage has occurred into the interference fit zone, as currently specified in Section IV.C.(5)(b)(i) of the Order. Figure 1 of this safety evaluation (SE) is from the licensee's submittal and shows the inspection areas of a CEDM nozzle as defined by the licensee.

Augmented Inspection

The licensee states that CEDM nozzles that have been demonstrated by analysis to have inadequate free-span to ensure a crack will not grow to the J-groove weld within one operating cycle will receive an augmented inspection. These nozzles and their associated augmented inspection areas are identified in Table 2 of the licensee's September 9, 2005, letter. Specifically, an augmented inspection of the OD will be performed on that portion of the nozzle that has been determined by analysis as necessary to prevent a crack from reaching the J-groove weld in less than one operating cycle. The augmented inspection will utilize either ECT or PT, or a combination of both techniques.

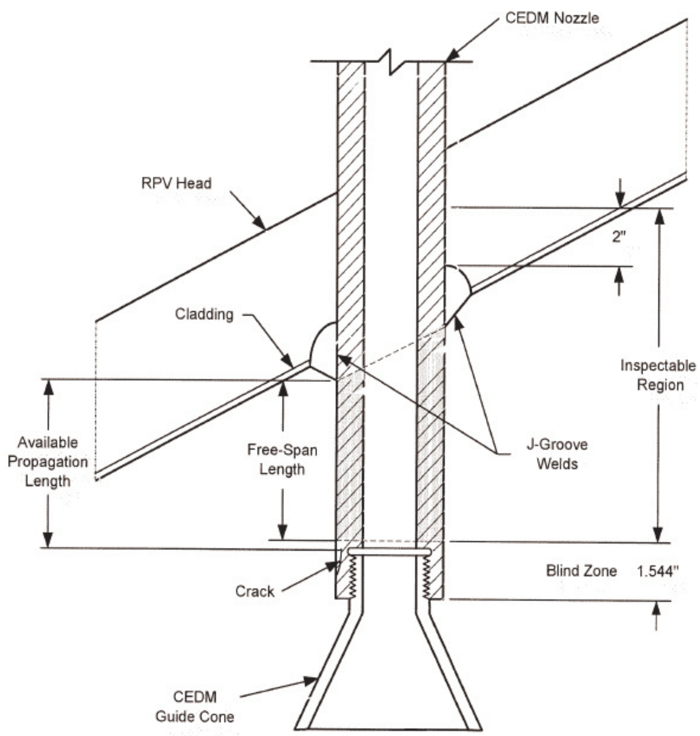

Figure 1

3.3 Licensee's Basis for Relaxation

Nozzle Configuration Limitation

The licensee states that the guide cones are attached to the bottom of the ANO-2 CEDM nozzles via threaded connections. The guide cones screw into the end of the CEDM nozzles with a welded set screw and two tack welds at the cone-nozzle interface to secure the guide cone to the nozzle. There is a 45E chamfer at the top of the threaded region that is 0.094-inch in length. The length of the threaded region is 1.25 inches.

According to the licensee, meaningful UT data cannot be collected in the threaded area or the chamfer region. The chamfer region geometry causes sporadic signals while, once the guide cone is reached, sound cannot pass into the CEDM nozzle base material because of the gap that exists between the guide cone and the nozzle at the threaded connection. This leaves a length of 1.344 inches (1.25 + 0.094) at the bottom of the CEDM nozzle that cannot be inspected by UT examination due to nozzle configuration.

The licensee contends that resolving the UT limitations due to nozzle configuration would require eliminating the CEDM nozzle-to-guide cone threaded connection. This would require cutting off the top of the nozzle thread region and changing it to a welded design for attachment of the guide cone. The licensee states that the aforementioned modification would result in a total personnel exposure of 101.25 man-Roentgen-equivalent-mammal (man-Rem) and a reduction in the inspection region between the blind zone and the J-groove weld. Installing the new guide cones would result in high residual stresses in the weld heat affected zone, which would increase the probability of PWSCC.

Inspection Probe Limitation Design

In addition to the limitations of inspecting the chamfer and threaded area of the bottom of the CEDM nozzles, there are limitations regarding the inspection probe's ability to collect data 0.2-inch above the chamfer area. The inspection probe that is to be used for the ANO-2 CEDM nozzles consists of seven (7) individual transducers. The transducers consist of one pair used for circumferential scanning using time of flight diffraction (TOFD), one pair for axial scanning using TOFD, one standard zero-degree scan transducer, and two ECT transducers. These transducers are slightly recessed into the probe holder that must be filled with water to provide coupling between the transducers and the nozzle wall. The licensee states that prior UT examinations performed on the CEDM nozzles at ANO-2 indicate that the circumferential-scanning TOFD transducer pair only collects data down to a point 0.200-inch above the chamfer. This makes the total distance at the bottom of the nozzle that cannot be UT inspected equal to 1.544 inches (1.25 inch threads + 0.092 inch chamfer + 0.2 inch). This area is referred to as the "blind zone." The licensee knows of no UT equipment currently available that resolves the blind zone limitation and, therefore, new UT equipment would have to be developed and appropriately qualified. According to the licensee, the time and resources required to develop this equipment is unknown.

The licensee contends that in order to perform a PT examination, it would be required to remove the CEDM nozzle guide cones, perform the PT examinations and reinstall the CEDM nozzle guide cones, which would result in a total personnel exposure of approximately 202.5 man-Rem. The licensee further states that performing an ECT examination, as with a UT inspection, would not yield results in the 1.344-inch threaded region.

The licensee evaluated the feasibility of inspecting the blind zone (ID and OD surfaces) using the PT or ECT method as specified in Section IV.C.(5)(b)(ii) of the Order. In order to perform a PT examination, it would be required to remove all 81 of the CEDM nozzle guide cones, perform a PT examination and reinstall all 81 CEDM nozzle guide cones, which would result in a total personnel exposure of approximately 202.5 man-Rem. Furthermore, performing an ECT examination, as with a UT inspection, would not yield results in the 1.344-inch threaded region.

The licensee believes that removing the CEDM nozzle guide cones and reinstalling new nozzle guide cones in order to remove the threaded area, or removing and reinstalling the existing nozzle guide cones to conduct additional inspections, would impose hardships and unusual difficulties without a compensating increase in the level of quality and safety.

Crack Growth Analysis

As a result of the aforementioned NDE limitations, the licensee performed an analysis to determine if sufficient free-span length exists between the "blind zone" and the weld that would allow one operating cycle of crack growth without the postulated crack reaching the weld. For nozzles or portions of nozzles that did not have sufficient free span length to accommodate one operating cycle of crack growth, the licensee determined how much propagation length would be required before a postulated crack in the blind zone would reach the weld within one operating cycle. The licensee’s analysis is detailed in Entergy Engineering Report M-EP-2003-002, Revision 1, “Fracture Mechanics Analysis for the Assessment of the Potential for Primary Water Stress Corrosion Crack (PWSCC) Growth in the Uninspected Regions of the Control Element Drive Mechanism (CEDM) Nozzles at Arkansas Nuclear One, Unit 2," ADAMS Accession No. ML032690649.

At the time that the analysis was performed, the only UT data available to the licensee was that obtained during the ANO-2 spring 2002 refueling outage. To ensure that the finite element analysis adequately modeled the as-built configuration of the selected ANO-2 CEDM nozzles, the licensee used detailed design drawings and UT inspection data from the ANO-2 spring 2002 refueling outage for the design input. The ANO-2 spring 2002 UT examinations were performed prior to the first issuance of the Order and the licensee indicated that, although the examination procedure endeavored to examine the nozzle to below the bottom of the weld, Entergy was not focused on driving the transducer to the lowest point that meaningful data could be collected. The ANO-2 fall 2003 UT examinations were performed after the first issuance of the Order. Also, due to the coverage area specified in the Order, the licensee stated that the examination procedure did focus on driving the transducer to the lowest point that meaningful data could be collected. As a result, Entergy confirmed by the 2003 UT data that some nozzles could be examined to lower locations than the 2002 data indicated. The 2003 data indicates that the available propagation lengths used in the licensee’s original analyses are conservative; that is, the actual lengths are longer. Entergy performed an updated evaluation using the same analysis methodology as documented in M-EP-2003-002 Revision 1. The results of this updated evaluation indicate that 24 CEDM nozzles have adequate available propagation lengths, and thus, will not receive an augmented inspection. Therefore, 57 of the 81 CEDM nozzles will be inspected as described in the licensee’s submittal.

Augmented Inspection

OD surface examinations are needed due to the inability of the UT probes to inspect the full extent of the CEDM nozzles as required by the Order. The Order recognizes and allows combining techniques per Section IV.C.(5)(b)(iii) of the Order. Table 1 of the licensee's September 9, 2005, letter specifies the minimum axial lengths and circumferential extent that must be examined for each nozzle group location. Table 2 provides individual nozzle information. Tables 1 and 2 (licensee’s September 9, 2005, submittal) indicate the minimum OD axial lengths range from 0.320-inch to 0.661-inch below the top of the blind zone.

During the fall 2003 and spring 2005 augmented inspections of the CEDM nozzles, Entergy performed manual ECT to examine the OD surface of the selected CEDM nozzles. Entergy was able to attain greater coverage than the minimum criteria specified in Table 1 (licensee’s submittal). Specifically, Entergy obtained axial coverage of approximately 0.8-inch below the top of the blind zone. Entergy plans to continue using the manual ECT technique employed during the fall 2003 and spring 2005 augmented inspections.

Entergy believes that by employing analytical and inspection techniques, the proposed alternative, as discussed in its submittal dated September 9, 2005, provides an adequate process for inspecting, evaluating, and determining the condition of the ANO-2 RPVH penetration CEDM nozzles with regard to the presence of PWSCC. Therefore, Entergy concludes that the proposed alternative adequately meets the intent of the Order.

4.0 EVALUATION

The NRC staff's review of this request was based on criterion (2) of paragraph F of Section IV of the Order, which states:

> [C]ompliance with this Order for specific nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Within the context of the licensee's proposed alternative examination of the RPVH penetration nozzles, the licensee has demonstrated the hardship that would result from implementing examinations far enough down on the CEDM nozzles to meet the requirements of Section IV.C.(5)(b) of the Order. The hardship identified by the licensee includes the nozzle configuration, limitation of the UT probe used for nozzle examination and radiation exposure to perform UT examination in accordance with the Order. The staff agrees that the nozzles' threaded areas that mate with the guide cones make inspection of these nozzles, in accordance with the Order, very difficult and would result in a hardship. This evaluation focuses on the issue of whether there is a compensating increase in the level of quality and safety such that these nozzles should be inspected despite this hardship.

The licensee's current request is based on the fracture mechanics methodology detailed in Entergy Engineering Report M-EP-2003-002, Revision 1. The licensee's prior request for its fall 2003 outage, based on the aforementioned Engineering Report, was approved by the NRC staff by letter dated October 9, 2003, ADAMS Accession No. ML032820552, to the licensee. The licensee's spring 2005 outage relaxation request was approved by the NRC staff by letter dated February 7, 2005, ADAMS Accession No. ML043560492, to the licensee and was also based on Entergy Engineering Report M-EP-2003-002, Revision 1.

In its previous two relaxation requests, the licensee stated that its analysis showed that seventy-five (75) of eighty-one (81) CEDM nozzles did not have sufficient free span length to accommodate one operating cycle of crack growth. Therefore, it performed augmented inspections on seventy-five (75) of eighty-one (81) CEDM nozzles. The licensee's selection of seventy-five (75) nozzles was based on UT data obtained during the 2002 RPVH inspection, which was performed prior to issuance of the original Order. UT data acquired by the licensee in 2003 and 2005 showed that the free-span lengths for some nozzles are greater than the free-span lengths used in its analysis. The licensee has, therefore, performed an updated evaluation using the same analysis methodology used for its previous relaxation request (Entergy Engineering Report M-EP-2003-002, Revision 1). The revised evaluation shows that 57 of the 81 CEDM nozzles will be subjected to an augmented inspection.

Since the boundaries for the proposed augmented inspection, as defined in Table 1 of the licensee's submittal are based on an acceptable fracture mechanics methodology (i.e, Entergy Engineering Report M-EP-2003-002, Revision 1) and the approach of inspecting the area below the top of the "blind zone" to ensure adequate propagation length for all assumed flaws to grow in one fuel cycle is reasonable, the staff accepts the results summarized in Table 1 and the licensee's selection of nozzles that will receive an augmented inspection as shown in Table 2.

The licensee’s crack-growth analysis used the approach described in Footnote 1 of the Order, with the exception of the crack growth rate, as the criteria to set the necessary height of the surface examination. Therefore, the coverage addressed by this request provides reasonable assurance of structural integrity of the component. However, this analysis incorporates a crack-growth formula different from that described in Footnote 1 of the Order, as provided in Electric Power Research Institute (EPRI) report MRP-55, "EPRI Materials Reliability Program (MRP) Crack Growth Rates for Evaluating Primary Water Stress Corrosion." Entergy is aware that the NRC staff has not yet completed a final assessment regarding the acceptability of the EPRI report. If the NRC staff finds that the crack-growth formula in MRP-55 is unacceptable, Entergy shall revise its analysis that justifies relaxation of the Order within 30 days after the NRC informs Entergy of an NRC-approved crack-growth formula. If Entergy's revised analysis shows that the crack-growth acceptance criteria would be exceeded during a single operating cycle, this relaxation is rescinded and Entergy will, within 72 hours, submit to the NRC written justification for continued operation. If the revised analysis shows that the crack-growth acceptance criteria would be exceeded during a single operating cycle, Entergy shall, within 30 days, submit the revised analysis for NRC review. If the revised analysis shows that the crack-growth acceptance criteria would not be exceeded during a single operating cycle, Entergy shall, within 30 days, submit a letter to the NRC confirming that its analysis has been revised. Also, any future crack-growth analyses performed for Operating Cycle 19 and future cycles for RPVH penetrations would be based on the new NRC-acceptable crack growth rate formula.

Augmented Inspection

According to the licensee, 57 of the 81 CEDM nozzles at ANO-2, will not receive enough UT coverage of nozzle material below the J-groove weld to accommodate crack-growth of a postulated flaw for one operating cycle. The aforementioned nozzles will receive an augmented inspection to a minimum distance as shown in Table 1 of the licensee’s September 9, 2005, letter. The licensee’s analysis shows that these minimum distances will accommodate one operating cycle of crack-growth. Although the licensee’s analysis shows an axial length to be inspected ranging from 0.320-inch to 0.661-inch below the top of the "blind zone," Entergy’s previous inspection in 2003 and 2005 attained coverage of an approximate axial length of 0.8-inch below the top of the blind zone. The licensee stated that it plans to use the same technique for its fall 2006 outage.

The augmented examinations will be performed using ECT, PT, or a combination of both inspection methods. It must be noted that UT examination is a volumetric examination of the base metal and gives a higher level of interrogation than an ECT or PT examination which inspect the surface only. According to the licensee’s analysis, through-wall and OD part through-wall flaws are the limiting flaws as established by analysis. The ECT and PT examination methods are very effective in locating surface flaws. It is highly likely that ECT or PT will locate surface flaws in the inspection area, if they are present.

Based on the results from the crack-growth analysis and the proposed augmented inspections, there is reasonable assurance of structural integrity for the uninspected portions of the nozzles. Therefore, performance of UT to the requirements of Section IV.C.(5)(b)(i) of the Order would result in hardship without a compensating increase in the level of quality and safety.

5.0 LICENSEE COMMITMENTS

a. As required by Section IV.E of the Order, the final results of the inspections will be provided in the 60-day report submitted to the NRC.

b. If the NRC staff finds that the crack-growth formula in MRP-55 is unacceptable, Entergy shall revise its analysis that justifies relaxation of the Order within 30 days after the NRC informs Entergy of an NRC-approved crack-growth formula.

c. If Entergy's revised analysis shows that the crack growth acceptance criteria would be exceeded during a single operating cycle, this relaxation is rescinded and Entergy will, within 72 hours, submit to the NRC written justification for continued operation.

d. If the revised analysis shows that the crack growth acceptance criteria would be exceeded during a single operating cycle, Entergy shall, within 30 days, submit the revised analysis for NRC review.

e. If the revised analysis shows that the crack growth acceptance criteria would not be exceeded during a single operating cycle, Entergy shall, within 30 days, submit a letter to the NRC confirming that its analysis has been revised.

f. If the NRC staff finds that the crack-growth formula in MRP-55 is unacceptable, any future crack-growth analyses performed for RPV head penetrations will be based on the new NRC-acceptable crack growth rate formula.

6.0 CONCLUSION

The staff concludes that the licensee’s proposed alternative examination of the CEDM RPVH penetration nozzles using UT from 2 inches above the J-groove weld to 1.544 inches above the bottom of the CEDM nozzles, and the augmented examination of nozzles without sufficient free-span length, provide reasonable assurance of the structural integrity of the RPVH, VHP nozzles, and welds. Further inspection of the CEDM nozzles in accordance with Section IV.C.(5)(b) of the Order would result in hardship without a compensating increase in the level of quality and safety. Therefore, pursuant to Section IV, paragraph F of the Order, good cause has been shown for relaxation of the Order, and the staff authorizes, for the remainder of the current third 10-year inservice inspection interval, commencing with the start of the fall 2006 refueling outage, the proposed alternative inspection for all CEDM head penetration nozzles at ANO-2, subject to the following condition as stated in the licensee’s submittal dated September 9, 2005:

> If the NRC staff finds that the crack-growth formula in MRP-55 is unacceptable, Entergy shall revise its analysis that justifies relaxation of the Order within 30 days after the NRC informs Entergy of an NRC-approved crack-growth formula. If Entergy's revised analysis shows that the crack growth acceptance criteria would be exceeded during a single operating cycle, this relaxation is rescinded and Entergy will, within 72 hours, submit to the NRC written justification for continued operation. If the revised analysis shows that the crack growth acceptance criteria would be exceeded during a single operating cycle, Entergy shall, within 30 days, submit the revised analysis for NRC review. If the revised analysis shows that the crack growth acceptance criteria would

not be exceeded during a single operating cycle, Entergy shall, within 30 days, submit a letter to the NRC confirming that its analysis has been revised. Any future crack-growth analyses performed for Operating Cycle 19 and future cycles for RPVH penetrations would be based on the new NRC-acceptable crack growth rate formula.

Date: May 17, 2006

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