

CNRO-2002-00013

March 14, 2002

U. S. Nuclear Regulatory Commission
Attn.: Document Control Desk
Washington, DC 20555-0001Subject: Entergy Operations, Inc.
Use of Electrical Discharge Machining (EDM)Arkansas Nuclear One – Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6Waterford Steam Electric Station, Unit 3
Docket No. 50-382
License No. NPF-38

Dear Sir or Madam:

Pursuant to 10CFR50.55a(a)(3)(i), Entergy Operations, Inc. (Entergy) proposes an alternative method to the thermal removal process requirements of ASME Section XI (Code) IWA-4322. Entergy plans to use an Electrical Discharge Machining (EDM) process to perform certain repairs and to prepare for Code required post repair testing if it becomes necessary during Waterford 3 and Arkansas Nuclear One (ANO) refueling outages. Later editions of the Code have recognized the different characteristics of the newer processes such as EDM and allow for the alternative of qualifying the process in lieu of further material removal of thermally cut surfaces. As documented in the attached Request No. PWR-R&R-002, Rev. 0, Entergy proposes to use the alternative rules of later editions of the Code to qualify the EDM process.

As a result of discussions with the Nuclear Regulatory Commission (NRC) staff, Entergy has agreed that ***in addition to the qualification testing requirements of IWA-4461.4 of ASME Section XI, 1995 Edition, 1997 Addenda, Entergy will determine the thickness of the resultant oxide layer on the cut surfaces as part of the EDM qualification. The thickness of the resultant oxide layer will be determined by metallographic examination. Based on the oxide thickness measurements obtained during the EDM process qualification, post-EDM polishing operations will be performed to ensure the oxide surface layer is removed.***

In order to support refueling activities at Waterford 3, Entergy requests that the NRC staff approve PWR-R&R-002, Rev. 0 by April 2, 2002, in order to support inspection activities at

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Waterford 3. ***Following NRC Staff approval, Entergy will incorporate this alternative into each facility's Inservice Inspection (ISI) Plan.***

This letter contains two commitments as denoted above in bold, italicized text.

Should you have any questions regarding this request, please contact Bill Brice at (601) 368-5076.

Very truly yours,



John R. Hamilton
Manager, Engineering Programs

JRH/WBB/baa

Attachment: Request No. PWR-R&R-002, Rev. 0

cc: Mr. C. G. Anderson (ANO)
Mr. W. R. Campbell (ECH) (w/o)
Mr. J. K. Thayer (ECH) (w/o)
Mr. J. E. Venable (W3)

Mr. T. W. Alexion, NRR Project Manager (ANO-2)
Mr. R. L. Bywater, NRC Senior Resident Inspector (ANO)
Mr. T. R. Farnholtz, NRC Senior Resident Inspector (W3)
Mr. N. Kalyanam, NRR Project Manager (W3)
Mr. E. W. Merschoff, NRC Region IV Regional Administrator
Mr. W. D. Reckley, NRR Project Manager (ANO-1)

ATTACHMENT TO CNRO-2002-00013

REQUEST No. PWR-R&R-002, Rev. 0

**ENTERGY OPERATIONS, INC.
ARKANSAS NUCLEAR ONE UNITS 1 and 2
WATERFORD 3 STEAM ELECTRIC STATION
REQUEST NO. PWR-R&R-002, Revision 0**

I. COMPONENT/EXAMINATION

Component/Number: 1R-1, 2R-1, and RC MRCT0001,

Description: Reactor Pressure Vessel (RPV) Head Penetration Nozzles

Code Class: 1

References:

1. ASME Section XI, 1992 Edition with portions of the 1993 Addenda as listed in References 3, 4, and 5
2. ASME Section XI, 1995 Edition, 1997 Addenda
3. CEP-ISI-001, "Waterford 3 Steam Electric Station Inservice Inspection Plan"
4. CEP-ISI-002, "Arkansas Nuclear One Unit 1 Inservice Inspection Plan"
5. CEP-ISI-004, "Arkansas Nuclear One Unit 2 Inservice Inspection Plan"
6. Letter 1CAN090102, "30 Day Response to NRC Bulletin 2001-01 for ANO-1; Circumferential Cracking of VHP Nozzles," dated September 4, 2001
7. Letter 2CAN090102, "30 Day Response to NRC Bulletin 2001-01 for ANO-2; Circumferential Cracking of VHP Nozzles," dated September 4, 2001
8. Letter W3F1-2001-0081, "30 Day Response to NRC Bulletin 2001-01 for Waterford 3; Circumferential Cracking of VHP Nozzles," dated September 4, 2001
9. Interpretation XI-1-95-60, Section XI, IWA-4322, EDM and MDM Processes

Unit / Inspection Interval:

Arkansas Nuclear One Unit 1 (ANO-1) / Third (3rd) 10-Year interval

Arkansas Nuclear One Unit 2 (ANO-2) / Third (3rd) 10-Year interval

Waterford 3 Steam Electric Station (Waterford 3) / Second (2nd) 10-Year Interval

II. REQUIREMENTS

IWA-4170 of ASME Section XI, 1992 Edition states that repairs and the 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 ASME Section III, either in their entirety or portions thereof, and Code Cases may be used.

ASME Section XI also imposes repair requirements that supplement or amend the repair rules of the construction code. Where applicable, compliance with these additional requirements is mandatory. When performing defect removal of P-Number 43 (inconel) materials using a thermal removal process, the supplemental requirements of IWA-4322 apply:

- IWA-4322

"If thermal removal processes are used on P-No. 8 and P-No. 43 materials, a minimum of 1/16" material shall be mechanically removed from the thermally processed areas."

III. PROPOSED ALTERNATIVE

A. Background

RPV head penetration nozzles at ANO-2 and Waterford 3 are considered to have a moderate susceptibility to Primary Water Stress Corrosion Cracking (PWSCC) based upon a susceptibility ranking of greater than 5 effective full power years (EFPY) but less than 30 EFPY from the Oconee Nuclear Station 3 time-at-temperature condition. ANO-1 has already experienced cracking. Susceptibility rankings for ANO-1, ANO-2, and Waterford 3 have been reported to the NRC in response to NRC Bulletin 2001-01 (References 6, 7, and 8). RPV head penetration nozzles at ANO-1, ANO-2, and W3 are manufactured from SB-166 or SB-167 Alloy 600 materials which are P-Number 43 inconel alloys.

Should repairs of RPV head penetration nozzles or J-welds become necessary at ANO-1, ANO-2, or Waterford 3, Entergy plans to utilize the electrical discharge machining (EDM) process to excavate PWSCC cracks or defects and remove weld crown surfaces of repair welds to facilitate performance of final NDE. EDM is considered a thermal removal process by the ASME Code (References 2 and 9). As such, a minimum of 1/16" of material must be mechanically removed from all EDM processed areas to comply with IWA-4322. However, use of mechanical removal processes would have deleterious affects on the Alloy 600 RPV head penetration nozzles and welds. Specifically, the use of mechanical removal processes such as grinding or machining results in an increased susceptibility of Alloy 600 materials and their associated welds to PWSCC.

B. Proposed Alternative

Pursuant to 10CFR50.55a(a)(3)(i), Entergy proposes an alternative to the thermal removal requirements of IWA-4322 applicable to P-No. 43 materials. Instead of mechanically removing 1/16" of material from all thermally processed areas as required by IWA-4322, Entergy proposes to qualify the EDM process in accordance with IWA-4461.4 of the 1995 Edition, 1997 Addenda of ASME Section XI. In addition to the requirements of IWA-4461.4, Entergy will also perform the following:

- Determine the thickness of the resultant oxide layer on the cut surface by metallographic examination during EDM process qualification.
- Based upon the oxide thickness measurements obtained during the EDM qualification process, remove the oxide layer from cut or excavated surfaces when performing repair activities on RPV head penetration nozzles or J-welds.

IV. BASIS FOR PROPOSED ALTERNATIVE

IWA-4322 of the 1992 Edition of ASME Section XI requires the removal of a minimum of 1/16" of material from all thermally processed areas of P-Number 43 materials. Entergy believes that the basis of this requirement is to ensure that thermally cut or excavated surfaces are free of unacceptable surface irregularities, oxides, and fissures that were created by the thermal removal process.

Suitability of IWA-4461.4 of ASME Section XI, 1995 Edition, 1997 Addenda

The qualification requirements of IWA-4461.4 ensure that the proposed thermal process is capable of producing a surface finish that is free of cracks or fissures and meets the required surface roughness criteria of the owner. Where the cut surface is exposed to a corrosive medium, then corrosion testing or evaluations must also be performed. The qualification requirements of IWA-4461.4 are summarized below.

- (a) The qualification test shall consist of two coupons of the same P-Number material to be cut in production.
- (b) The qualification coupons shall be cut using the maximum heat input to be used in production.
- (c) The thermally cut surface of each coupon shall be visually examined at 10X and shall be free of cracks. The Owner shall specify surface roughness acceptable for the application and shall verify that the qualification coupon meets the criterion.
- (d) Each qualification test coupon shall be cross-sectioned, and the exposed surfaces shall be polished, etched with a suitable etchant, and visually examined at 10X. All sectioned surfaces shall be free of cracks.
- (e) Corrosion testing of the thermally cut surface and heat affected zone shall be performed if the cut surface is to be exposed to a corrosive media. Alternatively, corrosion resistance of the thermally cut surface may be evaluated. The Owner shall specify the acceptance criteria.

In addition to the qualification testing requirements of IWA-4461.4 of ASME Section XI, 1995 Edition, 1997 Addenda, Entergy will determine the thickness of the resultant oxide layer on the cut surfaces as part of the EDM qualification. The thickness of the resultant oxide layer will be determined by metallographic examination. Based on the oxide thickness measurements obtained during the EDM process qualification, post-EDM polishing operations will be performed to ensure that the oxide surface layer is removed.

V. CONCLUSION

10CFR50.55a(a)(3)(i) states:

“Proposed alternatives to the requirements of (c), (d), (e), (f), (g), and (h) of this section or portions thereof may be used when authorized by the Director of the Office of Nuclear Reactor Regulation. The applicant shall demonstrate that:

- (i) The proposed alternatives would provide an acceptable level of quality and safety, or
- (ii) Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.”

Entergy believes that compliance with the repair rules as stated in Reference 1 and as described in Section II of this request would result in an increased susceptibility of RPV head penetration nozzles to PWSCC. The proposed alternative would provide an acceptable level of quality and safety. Therefore, we request that the proposed alternative be authorized pursuant to 10CFR50.55a(a)(3)(i).