

April 18, 2002

Mr. Michael A. Krupa
Director
Nuclear Safety & Licensing
Entergy Operations, Inc.
1340 Echelon Parkway
Jackson, MS 39213-8298

SUBJECT: ARKANSAS NUCLEAR ONE, UNITS 1 AND 2, AND WATERFORD STEAM
ELECTRIC STATION, UNIT 3 - REQUEST FOR ADDITIONAL INFORMATION
REGARDING PROPOSED ALTERNATIVES TO AMERICAN SOCIETY OF
MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE
REQUIREMENTS FOR WELD REPAIRS (TAC NOS. MB4288, MB4289, AND
MB4286)

Dear Mr. Krupa:

By letter dated March 4, 2002, as supplemented by letter dated March 29, 2002, you proposed an alternative method to the temper bead welding requirements of American Society of Mechanical Engineers (ASME) Section XI IWA-4500 and IWA-4300 (PWR-R&R-001, Revision 0) and requested Nuclear Regulatory Commission (NRC) staff approval. Request No. PWR-R&R-001, Revision 0, proposes performing ambient temperature temper bead welding repairs to reactor pressure vessel head penetration nozzles.

During the course of review of this request, the NRC staff determined that additional information is necessary to complete our review. The enclosed request for additional information (RAI) was e-mailed to your licensing staff on April 11, 2002. Your staff agreed to respond within 30 days of the receipt of this RAI. If circumstances result in the need to revise the target date, please call me at the earliest opportunity.

Sincerely,

/RAI

N. Kalyanam, Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

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

Enclosure: As stated

cc: See next page

PROPOSED ALTERNATIVE TO ASME EXAMINATION REQUIREMENTS FOR

REPAIRS PERFORMED ON REACTOR VESSEL HEAD PENETRATIONS

REQUEST FOR ADDITIONAL INFORMATION

TAC NOS. MB4286, MB4288, AND MB4289

1. Americal Society of Mechanical Engineers Boiler and Pressure Vessel Code (Code) 1992 Edition, IWA 4170(b) allows for repairs and installation of replacement items the use of later editions of Section III of the Code, and states "If repair welding cannot be performed in accordance with these requirements, the applicable alternative requirements of IWA-4200, IWA-4400, or IWA-4500 may be used."
 - a) Explain why a repair cannot be performed according to the criteria in Section III of the Code.
 - b) If an alternative to IWA-4XXX is determined necessary, explain why the repair should not be performed according to Section III requirements.
2. Assuming IWA-4530 applies, it has a limitation, "The repairs to a completed joint shall not exceed one-half the joint thickness. The surface of the completed repair shall not exceed 100 sq. in." From the descriptions of Figures 2 and 3 of the submittal dated March 29, 2002, the repairs could extend through-wall. Explain why Code limited repairs to one-half the joint thickness. What are the concerns with a through-wall temper bead repair?
3. In Section IV of the submittal dated March 29, 2002, there is statement that a significant reduction in radiation dose could be realized using an automated GTAW temper bead process over the temper bead process in 1992 Edition of the Code. Prove an estimated of the reduction in dosage for the repair.
4. Were micro-structure evaluations performed on the as-welded material used for the demonstration? What proof is there that martensite is not present in the as-welded condition?
5. In the second paragraph of page 9 of the submittal dated March 29, 2002, the statement is made that "Any moisture on the surface of the component being welded will be vaporized ahead of the welding torch." The area of interest is the opening between the reactor pressure vessel (RPV) head, outside surface of the control element drive mechanism (CEDM), and above the J-groove weld. Hydrated boric crystals in this confined space may be a source of hydrogen and boron. The disassociated constituents from hydrated boric crystals would increase the susceptibility for cracks in steel. Describe the results and finding from the demonstration used to simulate the conditions that exists at the repair location. Discuss primary water stress corrosion cracking (PWSCC) tests performed on the weldment manufactured in the presences of hydrated boric crystals.
6. The proposed non-destructive examination (NDE) of the weld surface and surrounding area is from a surface examination from inside the CEDM or the accessible surface of the J-groove weld. The surface examination of the opening between the RPV head, outside surface of the CEDM, and above the J-groove weld, is inaccessible for a surface

examination. If surface flaws were to occur as a result of the dissimilar metal weld (DMW) process, they would most likely occur at the inaccessible surface. Explain why cracks in the inaccessible surfaces DMW should not be a concern.

7. The proposed NDE of the repair to the J-groove weld is to use progressive liquid penetrant testing (PT). The progressive surface examine is applicable for partial penetration welds. For a full penetration weld in the J-groove, progressive PT may be appropriate. However, according to IWA-4533, the temper bead repair is surrounded by the weld material and that may extend into the RPV head material. Because the temper bead is surrounded by metal, it is not a partial penetration weld. Therefore, a temper bead repair should be volumetrically inspected. Explain why the repair cannot be volumetrically examined.
8. The proposed NDE of the weld volume and surrounding area is a volumetric examination from inside the CEDM. The proposed examination is a single side DMW from inside the CEDM. Explain the reliability of the proposed ultrasonic testing (UT) to detect and characterize cracks in the RPV head performed from inside the CEDM. Discuss the detection of cracks located in the base material within the weld zone.
9. Discuss the different demonstrations. Specifically, the orientation, kinds, types, number, and characteristics of the flaws and the flaw locations in the mock-up. Include a discussion of the flaws located in the weld zone of the CEDM and the steel head.
 - a. Discuss the cold isostatic pressure - electric discharge machined notches used in the mock-ups. How was the acoustic characteristic determined and how does it compare to PWSCC? What is the average tip radius and standard tip deviation for this process.
 - b. Discuss the representativeness of the flaws to PWSCC or welding cracks (shrinkage, hydrogen, or micro-structure) in the heat affected zone of the steel head and in the CEDM.
 - c. Provide the technical justification, single-to-noise ratios showing the presence of different type/size flaws, layout of flaw locations in the mock-ups, calibrations, and UT procedure. The justification should contain sufficient detailed information for a third party UT expert to arrive at the same detection and characterization conclusions, i.e. digital images of qualification test data depicting flaw detection.

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