



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

ENCLOSURE

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
REQUEST FOR RELIEF FROM RADIOGRAPHIC EXAMINATION REQUIREMENTS

FOR THE REACTOR RECIRCULATION SYSTEM WELD REPAIR

TENNESSEE VALLEY AUTHORITY (TVA)

BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 2

DOCKET NO. 50-260

1.0 INTRODUCTION

During modification to the reactor recirculation piping, a surface indication was detected during the liquid penetrant (PT) examination of the weld removal area. The indication was located in an area where a pipe support attachment was removed. Six pipe lug attachments were removed in this area as part of a support modification required by Engineering Design. The modification required that more attachments be welded at other locations around the circumference of the pipe at the same azimuth. The indication was described as an approximately 1/2-inch star crater crack. As the indication was removed by grinding and subsequent PT inspections performed to verify removal, the indication evolved into a linear intermittent-type indication.

Although indications were observed where other attachments were removed at this support location, they were weld indications within the attachment weld. These indications required no base metal grinding for removal except the expected "clean-up" depth. There were no other repairs to the base material as a result of indications in weld removal areas at this support location. TVA concluded that the indication was induced by previous welding operations because that type of indication is indicative of welding (i.e., star crater crack and porosity) and also it was in the area of a previous weld. No other indications propagating into the base material have been discovered in this support location. Therefore, this indication was determined to be an isolated case. The indication was removed by grinding. The base material excavation was approximately 2 inches long by 2 inches wide and 0.280 inch deep. The excavation was repaired by welding in order to restore the original pipe material thickness. The weld repair was examined using two separate ultrasonic examination techniques which confirmed that the weld repair was acceptable.

2.0 EVALUATION

TVA's Evaluation

ASME Code Section XI, 1980 Edition, through the Winter 1981 Addenda, IWA-4120, requires that repairs be performed in accordance with the Owner's Design

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Specification and Construction Code. The original General Electric Company design specification 21A2100AE requires radiography of all pressure retaining full penetration groove welds. In addition, later editions and addenda of ASME Section III, require radiography based on the depth of the repair.

Radiography is not practical for in-service conditions at the repair area. The reactor pressure vessel and associated recirculation system is filled with water. It is impractical to drain the vessel to perform the radiography. It is also not feasible to obtain a Code-acceptable radiograph when using gamma rays to penetrate the approximate 1-inch pipe wall thickness and the volume of water within the 22-inch diameter pipe.

There are two conditions which contribute to the impracticality of draining the reactor vessel and associated recirculation piping:

- 1) ALARA impact associated with the assembly (and subsequent disassembly) of the Unit 2 reactor vessel for drain down are expected to be approximately two (2) REM. Radiological impacts associated with these evolutions are increased surface contamination levels and increased risks of airborne contamination due to drying of highly contaminated surfaces inside the reactor cavity and vessel. In addition, increased radiation exposures rates can be expected inside the Unit 2 drywell. The increase in exposure rates are expected to be significant above the 584' elevation and access to these areas would be restricted. The increase on the 584' elevation and below is expected to be approximately 20 percent. At the present time work activities in the drywell are accruing approximately ten REM per week. The increase in accumulated exposure realized would depend on the duration of the drain down but, assuming a drain down period of two weeks would result in an approximate four (4) REM increase in exposure. The total exposure increase resulting from drain down and continued drywell work is projected to be approximately six (6) REM.
- 2) Work associated with the drain down of the Unit 2 vessel would divert resources from other ongoing Unit 2 restart scheduled activities.

The resources required to drain the vessel, process the water through the radwaste system, delay scheduled work, combined with an adverse ALARA impact make draining the vessel impractical when an equivalent method of non-destructive examination exists to evaluate the repair area.

The weld repair was ultrasonically examined. Ultrasonic examinations were performed on the base metal repair area at weld identification area R-2-004-023-R1. A straight beam technique was employed. Also, additional ultrasonic examinations were performed using the TVA-approved procedure NUT 28 Revision 2, with TCR 90-41, "Ultrasonic Examination of Overlay Piping".

For weld bond and weld metal integrity, both dual element straight and high angle dual element refracted longitudinal creeping wave transducers were used to perform the examination of the weld repair. This examination method was developed to find intergranular stress-corrosion cracking (IGSCC) in overlay weld repairs and is considerably more sensitive than normal weld repair examination techniques.

Examinations were performed by Level II and Level III certified personnel, and no recordable indications were found.

In addition, a scheduled 10-year hydrostatic test of the recirculation system, which includes the repaired area, is to be performed prior to restart of the unit in accordance with ASME Code Section XI, IWA-5000. This test will be performed at a test pressure of 1104 to 1158 psig and a temperature of 182° to 207°F.

#### NRC Staff Evaluation

The NRC staff reviewed TVA's reasoning and basis for requesting relief from radiographic examination requirements for the recirculation system weld repair. The NRC staff concluded that the performed ultrasonic and surface examinations provided an acceptable alternative examination for the weld repair area. This provides reasonable assurance that the integrity of the reactor recirculation system would not be adversely effected as a result of this alternative weld examination.

#### 3.0 CONCLUSION

The NRC staff has reviewed and evaluated the information submitted by TVA in support of the relief request from the ASME Code radiographic examination requirement associated with the weld repair of the base material of the recirculation system at the Browns Ferry Nuclear Plant Unit 2. The staff has verified that this request is consistent with the requirements for class 1 components in NUREG-0800 (Standard Review Plan) Chapter 5, Section 5.2.4 paragraph II.3. The staff concludes that the ASME Code Section XI radiographic requirement is a hardship to perform and the performance of ultrasonic examination provides adequate assurance of structural integrity of the reactor coolant system pressure boundary and of safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), relief is granted as requested.

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Dated: December 6, 1990