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A Duke Energy Company

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December 28, 2000

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

SUBJECT: Oconee Nuclear Station - Unit 1
Docket No. 50-269
Request to use an Alternative to ASME Boiler and Pressure Vessel Code, Section XI in accordance with 10 CFR 50.55a(a)(3)(i)

Pursuant to 10 CFR 50.55a(a)(3)(i), Duke Energy Corporation requests the use of an alternative to the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWA 4533, 1992 Edition with no addenda for Oconee Unit 1.

This request is to allow the use of an alternative to the volumetric examination requirements of IWA 4533 following repair of Class A Reactor Vessel head components. It has been evaluated and determined the proposed alternative to IWA 4533 will provide an acceptable level of quality and safety.

A detailed description of this proposed alternative, including a background discussion and justification is included as an attachment to this letter. Questions regarding this request may be directed to Larry E. Nicholson at (864) 885-3292.

Very truly yours,

William R. McCollum

Attachment:

Request for Alternative, Serial Number 00-04

A047

xc w/att:

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U.S. Nuclear Regulatory Commission, Region II
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xc(w/o attch):

M. E. Shannon,
NRC Senior Resident Inspector
Oconee Nuclear Station

Mr. Virgil Autrey
Division of Radioactive Waste Management
Bureau of Land and Waste Management
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DUKE ENERGY CORPORATION
Oconee Nuclear Station, Unit 1

Request for Alternative to the Requirements of the
ASME Boiler and Pressure Vessel Code, Section XI

Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWA, 1992 Edition with no addenda.

Description of Code Requirement(s) for Which an Alternative is Requested

Paragraph IWA-4533 specifies that "The weld repair as well as the preheated band shall be examined by the liquid penetrant method after the completed weld has been at ambient temperature for at least 48 hours. The repaired region shall be examined by the radiographic method and, if practical, by the ultrasonic method," following repair of dissimilar materials using the temper bead process in accordance with IWA-4530. IWA-4500 (e) (2) defines the band around the weld repair area of 1-1/2 times the component thickness or 5 inches, whichever is less.

An alternative to the requirements of IWA-4533 is requested.

Description of Proposed Alternative

In lieu of the requirements of IWA-4533, the following alternatives are proposed:

1. Within the band around the weld repair, as defined by IWA-4500 (e) (2), several interference(s) exist that would prevent using the liquid penetrant examination method over 100% of the band area. It is proposed that the band area exclusive of the interferences will be examined by the liquid penetrant method. A diagram of the band area surrounding the thermocouple nozzle penetrations #2 and #5 repair areas showing the interferences is attached.

2. Due to the complex geometry of the Oconee Unit 1 Reactor Vessel Head in the area of the #2 and #5 thermocouple nozzles, examination of the repair region by the radiographic method is not practical. It is proposed that examination by the ultrasonic method be substituted for the radiographic method.

Background Information and Justification for Using the Proposed Alternative

Repairs to the Oconee Unit 1 Reactor Vessel Head thermocouple nozzle penetrations #2 and #5 involve installing a plug in each penetration and applying a weld pad directly to the outside radius of the head and over the plug using the temper bead technique per the provisions of IWA-4500. IWA-4500 (e) (2) defines a band around the weld repair of at least 1-1/2 times the component thickness or 5 inches, whichever is less, that shall be preheated and maintained at a minimum temperature based on the welding process to be used. Due to the thickness of the head at Oconee Unit 1, the 5 inches minimum is utilized for definition of the band area. IWA-4533 requires that the repair area, as well as 100% of the band area defined in IWA-4500 (e) (2), be examined using the liquid penetrant method forty-eight hours after the repair is completed. Due to the existence of several interferences within the band areas surrounding the repairs for the #2 and #5 thermocouple nozzle penetrations 100% coverage is not practical. A diagram of the band area surrounding the repair areas of thermocouple nozzle penetrations #2 and #5 showing the interferences is attached. It is proposed that band area exclusive of the interferences shall receive examination following the weld repairs using the liquid penetrant method. This same area will also receive examination following the weld repairs using the ultrasonic method. The combination of these two methods will provide assurance unacceptable flaws in the Reactor Vessel Head material around the thermocouple nozzle penetrations #2 and #5 can be detected.

IWA-4533 also requires that the weld repair region shall receive an examination by the radiographic method. The deposited temper bead pad lies on the outside of the head normal to the head thickness. As such the geometry is a

poor orientation for an effective radiographic examination. The thickness of the head limits the sensitivity of the detection of defects in the small pad thickness. It is proposed that examinations by the ultrasonic method be used in lieu of examinations by the radiographic method. The ultrasonic method will provide assurance equal to that gained from the radiographic method in that unacceptable flaws in the Reactor Vessel Head material around the #2 and #5 thermocouple nozzle penetrations can be detected.

The Quality and Safety Provided by the Proposed Alternative

The purpose of the examinations required by IWA-4533 is two-fold:

1. The original rules were written within the context of repairing a detected flaw in the base metal. As such, there was a concern for other existing flaws in the immediate area. The first purpose of the examination is to detect flaws that may be revealed as a result of the repair. In this case there are no flaws in the base metal that are being repaired. The purpose of the pad is to re-establish the pressure boundary due to detected flaws on the inner radius of the head. The proposed inspection method of all available surfaces within the heated band is sufficient to verify that defects have not been induced on the edge of the pad due to the repair process.

2. Performance of the temper bead repair could result in under bead hydrogen induced cracking. The second purpose of the examination is to verify that no under bead cracking has occurred during the 48-hour hold period. The ultrasonic inspection method is perfectly suited for the examination of the pad to head interface through the pad thickness to detect the possible presence of under bead cracks.

In conclusion, the proposed alternatives provide adequate assurance that the flaws that might result from the repairs can be detected. Therefore, the proposed alternative provides an acceptable level of quality and safety.

Duration of the Proposed Alternative

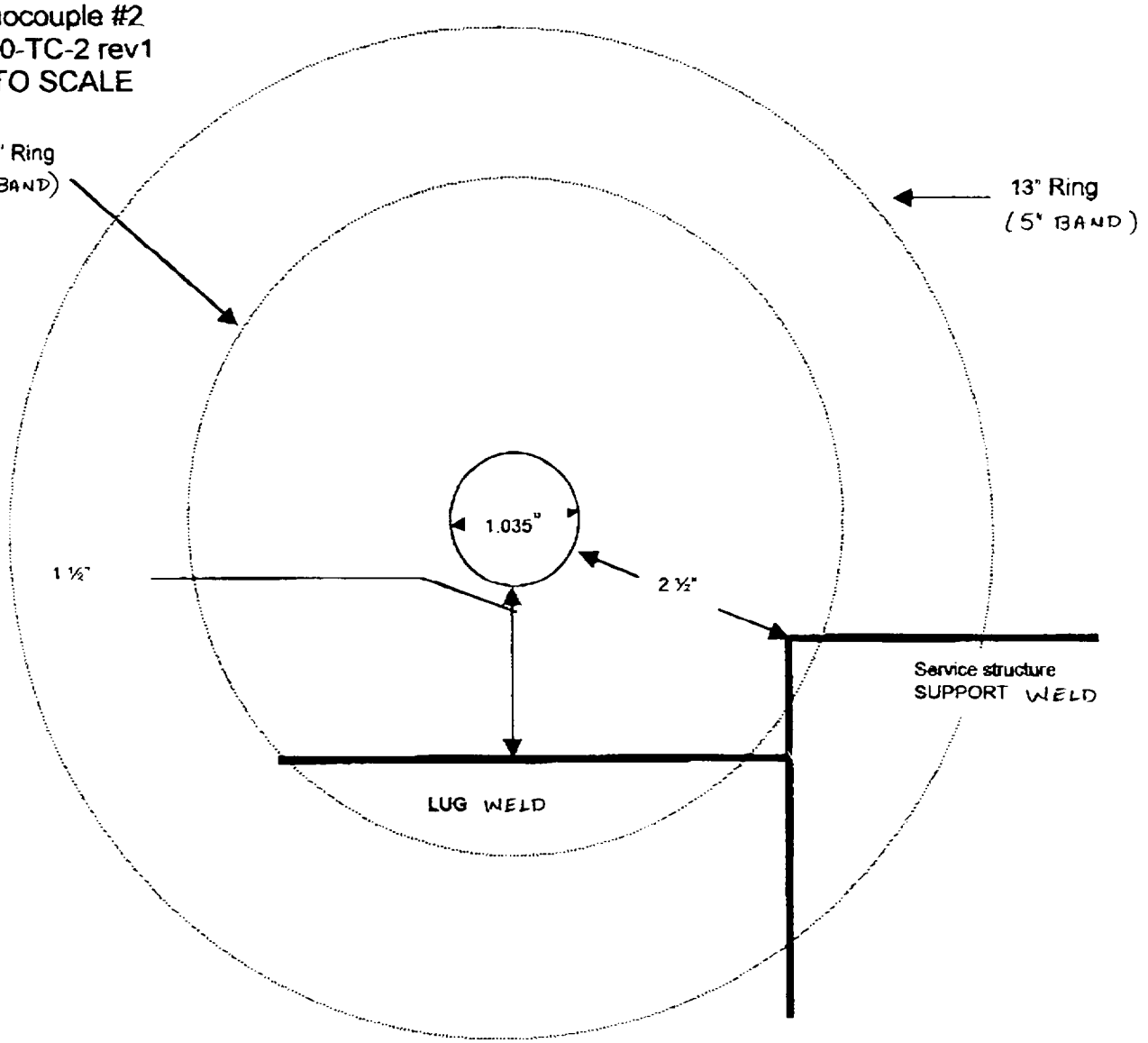
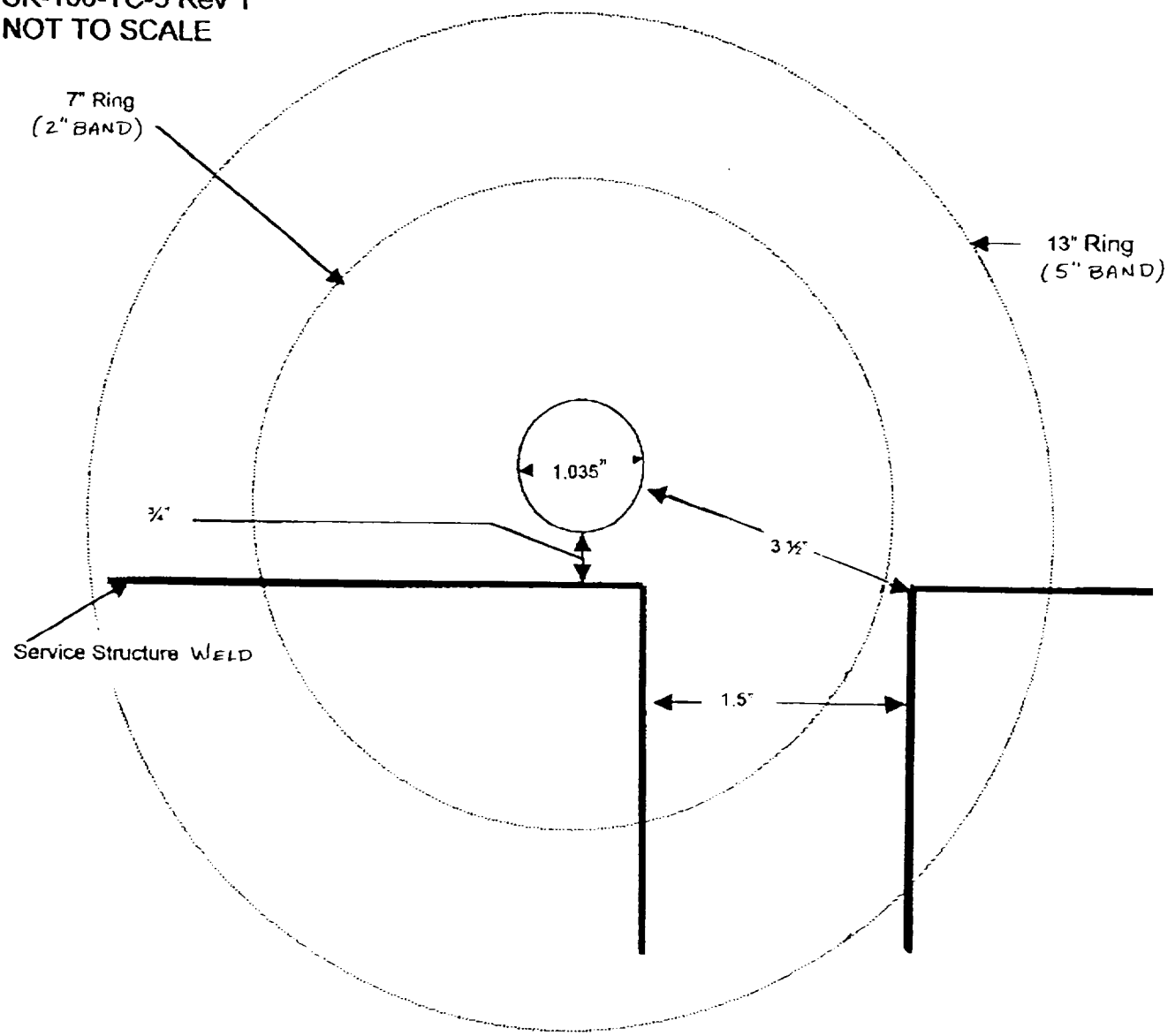
The proposed alternative is only applicable to the examinations to be made after the repairs to the Oconee Unit 1 Reactor Vessel Head the #2 and #5 thermocouple nozzle penetrations during refueling outage 19.

Originated By: Timothy D. Brown — Timothy D. Brown — 12-28-00 — Date

Reviewed By: L. J. Azzarello — Leonard J. Azzarello — 12/28/00 — Date

Diagrams of band surrounding the two repair areas are provided on the following two pages.

Thermocouple #2
SK-100-TC-2 rev1
NOT TO SCALE



Thermocouple #5
SK-100-TC-5 Rev 1
NOT TO SCALE