



Duke Energy

Oconee Nuclear Station
7800 Rochester Highway
Seneca, SC 29672

(864) 885-3107 OFFICE
(864) 885-3564 FAX

W. R. McCollum, Jr.
Vice President

August 07, 2001

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

SUBJECT: Oconee Nuclear Station - Units 1 and 3
Docket No. 50-269, 287
Request for Alternative 01-12
(Use Alloy 690 Welding Filler Material for
Thermowell Replacement)

Pursuant to 10 CFR 50.55a(a)(3)(i), Duke Energy Corporation (DEC) requests the NRC to authorize the use of Alloy 690 welding filler material along with the associated ASME Boiler and Pressure Vessel Code, Section IX, Code Cases 2142-1 and 2143-1. These code cases would be applied as an alternative to the ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition with no addenda for Oconee Units 1 and 3.

On May 11, 2001, DEC requested relief to allow the use of Alloy 690 type weld filler material (Inconel 52/152) for the repair of Reactor Coolant System (RCS) RTD Thermowells on Oconee Unit 2. Industry studies show that Alloy 690 weld filler materials possess a high resistance to primary water corrosion. DEC has evaluated and determined that the alternative material provides an acceptable level of quality and safety, when compared to the materials allowed by the referenced code, because of its superior corrosion resistant properties. NRC approval was granted on May 23 2001.

Subsequently, DEC personnel recognized that no similar relief had been requested for similar repairs performed during June 1999 and October 1998. On those occasions DEC replaced RCS RTD Thermowells on Oconee Units 1 and 3, respectively. These RCS RTD Thermowells also were welded in place using Alloy 690 type weld filler material (Inconel 52/152).

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Therefore, this request is being submitted to obtain and document NRC approval of the application of Alloy 690 type weld filler material (Inconel 52/152) for the repair of RCS RTD thermowells on the Oconee Units 1 and 3.

As stated above, the NRC has approved the use of Inconel 52/152 for this same application on Oconee Unit 2 (TAC No MB1918). The NRC has also previously approved the use of Inconel 52/152 for other DEC applications. Specifically, DEC received approval: 1) to apply Alloy 690 (and the associated Code Cases) to the Oconee replacement steam generators (TAC Nos. MA6209, MA6210, and MA6211 on September 10, 1999), and 2) to apply Alloy 690 (and the associated Code Cases) for reactor vessel head weld repairs (Unit 1, TAC No. MB0854, January 8, 2001; Unit 2, TAC No. MB1835, May 21, 2001; Unit 3, TAC No. MB1319, April 13, 2001).

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 Randy Todd at (864) 885-3418.

Very truly yours,



William R. McCollum, Jr.

Attachment:

Request for Alternative, Serial Number 01-012

xc w/att:

L. A. Reyes, Regional Administrator
U.S. Nuclear Regulatory Commission, Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, GA 30303

D. E. Labarge, Senior Project Manager (ONS)
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Stop O-8 H12
Washington, D.C. 20555-0001

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
SC Dept. of Health & Environmental Control
2600 Bull St.
Columbia, SC 29201

DUKE ENERGY CORPORATION
Oconee Nuclear Station, Unit 1 and 3

Request for Alternative Material than approved by the
ASME Boiler and Pressure Vessel Code, Section XI

Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 1989
Edition with no addenda.

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

The Code utilized for the repairs to the Reactor Coolant System (RCS) RTD thermowells described in this request is the 1989 ASME Code Section XI with no addenda. The 1989 code allows, by reference, the use of Alloy 600 based weld filler material (Inconel 82/182) but does not include the use of Alloy 690 based weld filler material (Inconel 52/152).

Code cases 2142-1 and 2143-1 introduce and classify new nickel based weld metals that closely match Alloy 690. Code Case 2142-1 establishes welding classifications and other requirements for bare wire filler metal (UNS N06052 Ni-Cr-Fe). Code Case 2143-1 establishes welding classifications and other requirements for a coated electrode (UNS W86152 Ni-Cr-Fe). These two Code cases have not been incorporated by reference into the regulations; therefore, their use requires NRC approval.

Description of Proposed Alternative

In lieu of the requirements of the 1989 code, the use of Alloy 690 weld filler material is proposed for the partial penetration weld that installed the new replacement Reactor Coolant System (RCS) RTD thermowells located on the Oconee Units 1 and 3 Reactor Coolant System piping. The Alloy 690 weld filler material was also used for additional non-pressure retaining attachment welds. This filler material was used for the installation of new RCS RTD thermowells at nozzle location Nos. 2, 6, 10, 13, 23, 24, 25, 33, 34, and 35.

In addition, DEC requests the use of ASME Code Cases 2142-1 and 2143-1 that group the new weld filler material in the same welding category as other commonly employed nickel based weld filler metals. This allows the use of appropriate existing welding procedures and performance qualifications with the new weld metals.

Justification for Using the Proposed Alternative

Industry studies have demonstrated that Alloy 690 weld materials possess a high resistance to primary water corrosion. The use of Alloy 690 has been previously approved for other applications at Oconee.

The material properties of the existing Alloy 600 (82/182) weld material were compared to the new proposed Alloy 690 (52/152) weld material. The thermal expansion coefficient of the 52/152 weld material is somewhat higher than the coefficient of the 82/182 weld material (at 600F, the difference is about 4%), however the modulus of elasticity is lower for the 52/152 weld material than the 82/182 weld material. Since the thermal stress is a function of the product of the modulus of elasticity and the thermal expansion coefficient ($\sigma = E\alpha\Delta T$), the effects tend to cancel each other. For example, at 600F the difference in the products is only 2%. Thus, the presence of the two materials will have an insignificant effect on the thermal stresses in the total weld.

An evaluation of possible weld dilution concluded that the percentage of chromium in the deposited welds, in all repair scenarios would exceed 22%. Materials with chromium concentrations above 22% have demonstrated resistance to Primary Water Stress Corrosion Cracking (PWSCC). In summary, the chromium content of the repaired surfaces containing the proposed Alloy 690 material, considering chromium dilution, will exceed that of the original Alloy 600 material, and thus afford superior corrosion resistance.

Background Information

The original RCS RTD's thermowells were held in with a gasket and nut arrangement. These joints have leaked in the past. The RTD's themselves were becoming obsolete. Nuclear Station Modifications ON-12865 and ON-32865 replaced the original RTD's and thermowells with a new welded design (see attached figure). The repairs described herein involve installing the new RTD thermowells using a J groove partial penetration weld. The thermowells on Unit 1 were replaced in June 1999. The thermowells on Unit 3 were replaced in October 1998. The DEC personnel involved did not recognize that a request for alternative was appropriate to obtain approval for the use of use the Alloy 690 (52/152) weld material.

As an additional non-code enhancement, a retaining nut similar to the original was installed over the new thermowell. The purpose of this nut is to prevent ejection of the thermowell should the pressure retaining weld shown in the attached figure fail. This nut will be locked to the mounting boss by non-pressure retaining attachment tack welds. This is the same method used to prevent rotation of the presently installed retaining nuts.

The Quality and Safety Provided by the Proposed Alternative

Alloy 690 material has been shown to be superior to Alloy 600 material in resisting Primary Water Stress Corrosion Cracking (PWSCC). In a letter to the NRC dated August 6, 1999, DEC requested authorization to use the Alloy 690 material in the construction of the replacement steam generators to be installed at Oconee starting in 2003. The NRC approved the request by letter dated September 10, 1999. Similarly, the NRC has authorized the use of Alloy 690 material in the construction of replacement steam generators for McGuire Nuclear Station Units 1 & 2, and Catawba Nuclear Station Unit 1. The NRC has also approved a similar request by letter dated January 8, 2001, for use of Alloy 690 material in the repairs to several of the Oconee Unit 1 thermocouple nozzles, and for reactor vessel head weld repairs (Unit 1, TAC No. MB0854, January 8, 2001;

Unit 2, TAC No. MB1835, May 21, 2001; Unit 3, TAC No. MB1319, April 13, 2001).

ASME Code Cases 2142-1 and 2143-1 establishes the uniform chemical and material properties and the classification of the weld material with respect to its welding characteristics. Code Case 2142-1 establishes the F-No. for the American Welding Society (AWS) specification AWS A5.14 and Unified Numbering System (UNS) designation UNSN06052 (Inconel 52) as F-No. 43 for both procedure and performance qualification purposes. Code Case 2143-1 establishes the F-No. for AWS A5.11 and UNS designation W86152 (Inconel 152) for a coated electrode as F-No. 43 for welding purposes. These sets of specifications and F-No. assignments completely describe this material for welding purposes as similar in their welding characteristics to other Code approved nickel based weld metals.

In conclusion, the use of Alloy 690 welding filler material (Inconel 52/152) and the associated ASME Code Cases 2142-1 and 2143-1 for the repairs to Oconee Units 1 and 3 RCS RTD thermowells will provide superior corrosion protection over that provided by Alloy 600 (Inconel 82/182) material. A detailed analysis of the specific application has produced acceptable results. The use of Alloy 690 has been previously authorized for new construction and other repair activities. Therefore, the proposed alternative provides an acceptable level of quality and safety.

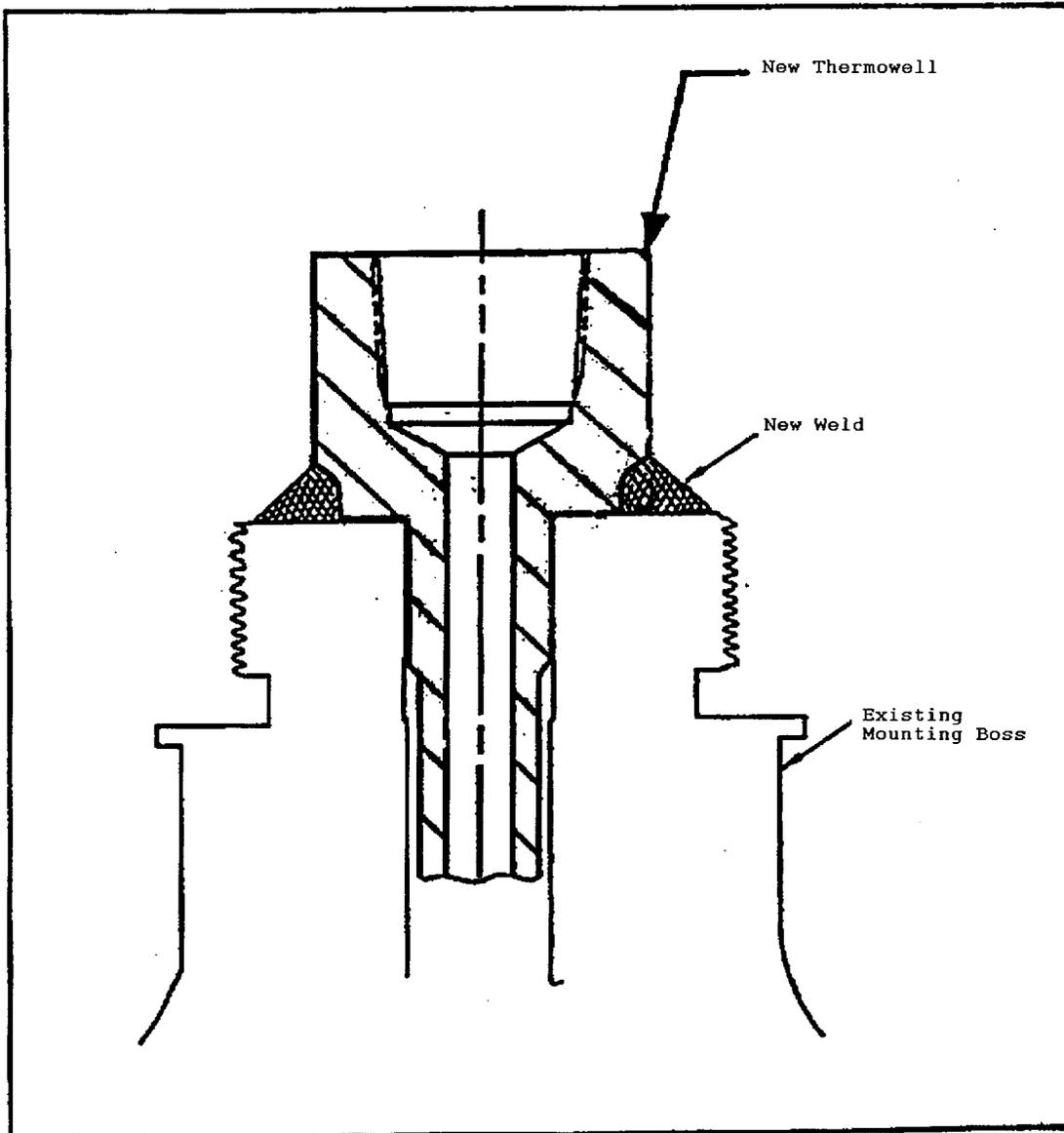
Duration of the Proposed Alternative

The proposed alternative applies only to the repairs to Oconee Units 1 and 3 RCS RTD thermowells.

Originated By: John B. Beckman 8/6/2001
John B. Beckman, P.E. Date

Reviewed By: P. M. Street 8/6/01
P. M. Street Date

ATTACHMENT



Weldable Thermowell Installation