April 12, 2001

Mr. Craig G. Anderson
Vice President, Operations ANO
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 1 - AUTHORIZATION TO USE ALTERNATIVE MATERIALS AND ASSOCIATED CODE CASES 2142-1 AND 2143-1 FOR REPAIRS TO REACTOR VESSEL HEAD PENETRATIONS (TAC NO. MB1568)

Dear Mr. Anderson:

By letter dated March 27, 2001, Entergy Operations, Inc., (the licensee) requested approval of a proposed alternative to use Alloy 690 welding filler materials (Inconel 52/152) and associated American Society of Mechanical Engineers Code Cases 2142-1 and 2143-1 for Arkansas Nuclear One, Unit 1 (ANO-1). The request is associated with the use of Alloy 690 type filler material to repair a reactor vessel head penetration associated with a control rod drive mechanism. The licensee's letter dated March 27, 2001, and the authorization documented herein follows the staff's verbal authorization during a telephone call on March 26, 2001, for the licensee to use the Code Cases for a repair to a reactor vessel head penetration.

The staff concludes that the use of the proposed alternative for repair of the reactor pressure vessel head penetrations will provide an acceptable level of quality and safety. Pursuant to Title 10 of the *Code of Federal Regulations,* Section 50.55.a(a)(3)(i), the staff authorizes the use of the proposed alternative for repair of reactor vessel head penetrations during the third inservice inspection interval for ANO-1. Our Safety Evaluation is enclosed.

Sincerely,

Robert A. Gramm, Chief, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR AUTHORIZATION TO USE ALLOY 690 WELDING FILLER MATERIAL

PER CODE CASES 2142-1 AND 2143-1

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT 1

DOCKET NO. 50-313

1.0 INTRODUCTION

By letter dated March 27, 2001, Entergy Operations, Inc., (the licensee) requested approval under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(3)(i) to use Alloy 690 welding filler materials and associated American Society Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Case 2142-1, "F-Number Grouping for Ni-Cr-Fe, Classification UNS N06052 Filler Metal, Section XI," and Code Case 2143-1, "F-Number Grouping for Ni-Cr-Fe, Classification UNS W86152 Welding Electrode, Section XI," for the repair of a control rod drive mechanism (CRDM) nozzle on the reactor vessel head of Arkansas Nuclear One (ANO), Unit 1 (ANO-1).

The current Code of Record for ANO-1 for inservice inspection (ISI) is the ASME Code, Section XI, 1992 Edition with portions of the 1993 Adenda as specified in the ISI program. The Code of Record allows use of Alloy 600 (Inconel 82/182) welding filler materials, but does not include Alloy 690 (Inconel 52/152) welding filler materials. Industry studies indicate that Alloy 690 (Inconel 52/152) welding filler materials are less susceptible to intergranular stress corrosion cracking (IGSCC) than the Inconel 82/182 materials.

The referenced Code cases introduce and classify new nickel base weld metals that closely match Alloy 690. Code Case 2141-1 establishes welding classifications and other requirements for a bare wire filler metal. Code Case 2143-1 establishes welding classifications and other requirements for a coated electrode. The licensee's relief request consists of applying the two Code Cases to the repair of a CRDM nozzle on the reactor vessel head for ANO-1. The licensee found boric acid crystals on the outside of the reactor vessel head at CRDM nozzle #56 during inspections conducted during a refueling outage that began in March 2001. The licensee subsequently examined the nozzle using liquid penetrant, eddy current, and ultrasonic methods. The related weld on the interior of the reactor vessel head (J-weld) was also examined by the liquid penetrant method. The examinations confirmed that the licensee needed to perform weld repairs of the CRDM J-weld and nozzle.

The licensee's request consists of two issues:

- The use of Alloy 690 (Inconel 52/152) welding filler materials in Code Class 1 weld repair in lieu of Alloy 600 (Inconel 82/182) welding filler materials; and

- The use of two ASME Code cases that group the new welding filler materials in the same welding categories as other commonly employed nickel base weld metals. This allows the use of appropriate existing welding procedures and performance qualifications with the new weld metals.

2.0 DISCUSSION

2.1 Alloy 690 welding filler materials (Inconel 52/152)

Alloy 600 type weld metals (Inconel 82/182) were widely used during the construction of nuclear power plants. Operating experience showed that Inconel 182 was susceptible to IGSCC, although primarily in boiling water reactor (BWR) environments. At ANO-1, the licensee has identified a small leak through a CRDM J-weld that needs to be repaired. To assure the integrity of the replaced weld, the licensee proposed the use of alternative Inconel 52/152 materials for the fabrication and replacement of the subject weld. Laboratory test data have shown that Inconel 52/152 materials are resistant to stress corrosion cracking in simulated pressurized water reactor (PWR) and BWR environments. The staff has approved the use of Inconel 52/152 in the replacement of steam generators for a number of PWRs (including ANO, Unit 2) and has recently approved its use for repair of thermocouple and CRDM nozzle welds on reactor vessel heads at Oconee Nuclear Station. The staff finds that the licensee-proposed use of Inconel 52/152 filler materials in the CRDM nozzle weld is acceptable since it will provide an acceptable level of quality and safety.

2.2 Code Cases 2142-1 and 2143-1

The purposes of a weld metal Code case are to establish uniform chemical and material properties and to classify the weld metal with respect to its welding characteristics. This welding characteristics classification is known as an "F-No." Weld metals with like characteristics are grouped together for welding and welder qualification purposes in order to eliminate unnecessary duplication.

Code Case 2142-1 lists American Welding Society (AWS) specification AWS A5.14 and Unified Numbering System (UNS) designation UNS N06052 conforming to Inco 52 (Inconel 52). It classifies this weld metal as F-No. 43 for both procedure and performance qualification purposes. Code Case 2143-1 lists appropriate AWS and UNS specifications for a coated electrode matching Inco 152 (Inconel 152) and it classifies this material as F-No. 43 for welding purposes. By this set of specifications and F-No. assignments, these materials are completely described for welding purposes as similar in their welding characteristics to many other Code nickel-based weld metals. Thus, these two weld metals (Inconel 52/152) are exempt from the requirements for specific procedure and performance qualifications for non-Code materials.

The staff finds that these two Code cases appropriately specify and classify the necessary weld metal parameters and are acceptable for use. The staff has approved the use of these two Code cases in the replacement of steam generators for a number of PWRs (including ANO, Unit 2) and has recently approved its use for repair of thermocouple and CRDM nozzle welds on reactor vessel heads at Oconee Nuclear Station, Unit 1.

3.0 CONCLUSION

Based on the above evaluation, the staff concludes that the proposed alternative to use Alloy 690 welding filler materials (Inconel 52/152) and associated Code Cases 2142-1 and 2143-1 for the repair of the CRDM nozzle weld at ANO-1 will provide an acceptable level of quality and safety. Pursuant to 10 CFR 50.55.a(a)(3)(i), the staff authorizes the use of the proposed alternative to repair reactor vessel head penetrations during the third inservice inspection interval for ANO-1.

Principal Contributors: W. Reckley
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Date: April 12, 2001

cc:

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