

July 2, 2008

Mr. Richard L. Anderson  
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SUBJECT: DUANE ARNOLD ENERGY CENTER – SAFETY EVALUATION FOR REQUEST  
FOR RELIEF FROM SEAL WELD PROCEDURE QUALIFICATION, REQUEST  
NUMBER NDE-R012 (TAC NO. MD6293)

Dear Mr. Anderson:

In a letter to the Nuclear Regulatory Commission dated July 31, 2007, as supplemented by a letter dated February 19, 2008, FPL Energy Duane Arnold, LLC requested relief from certain American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code requirements at Duane Arnold Energy Center (DAEC). As an alternative to the ASME Code requirements, FPL Energy requested relief from IWA-4221 to allow welding procedure specifications (WPSs) for seal welding of the installed and spare Main Steam Relief Valves to be post-production qualified. The WPSs would meet all other provisions of ASME Code, Section IX. The relief was requested for the fourth 10-year interval of the Inservice Inspection Program for DAEC, which began on November 1, 2006.

Based on the information provided in the relief request and the responses to the NRC staff's request for additional information, the NRC staff concludes that compliance with the Code requirement would result in hardship without a compensating increase in the level of quality and safety, and the licensee's proposed alternative provides reasonable assurance of structural integrity. Therefore, the requested relief is authorized in accordance with 10 CFR 50.55a(a)(3)(ii) for the fourth 10-Year interval of the Inservice Inspection Program interval at DAEC.

If you have any questions regarding this matter, please contact Karl Feintuch at (301) 415-3079.

Sincerely,

*/ra/*

Lois James, Chief  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosure: Safety Evaluation

cc w/encl: See next page

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Last revised March 20, 2008

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION PROGRAM REQUEST FOR ALTERNATIVE FOR

FPL ENERGY DUANE ARNOLD, LLC

DUANE ARNOLD ENERGY CENTER

REQUEST FOR ALTERNATIVE NDE-R012

DOCKET NO. 50-331

1.0 INTRODUCTION

By letter dated July 31, 2007 (Reference 1), as supplemented by a letter dated February 19, 2008 (Reference 2), FPL Energy Duane Arnold, LLC (the licensee), requested relief from certain American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code requirements at Duane Arnold Energy Center (DAEC). As an alternative to the ASME Code requirements, the licensee requested relief from IWA-4221 to allow weld procedure specifications (WPSs) for seal welding of the installed and spare Main Steam Relief Valves (MSRVs) to be post-production qualified. The weld procedure qualifications would meet all other provisions of ASME Code, Section IX.

2.0 REGULATORY EVALUATION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The ISI Code of record for DAEC for the second 10-year ISI interval was the ASME Code, Section XI, 2001 Edition, including Addenda through 2003.

Pursuant to 10 CFR 50.55a(a)(3), alternatives to requirements may be authorized by the U. S. Nuclear Regulatory Commission (NRC) if the licensee demonstrates that: (i) the proposed alternatives provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee submitted the subject relief request, pursuant to 10 CFR 50.55a(a)(3)(ii), which proposed an alternative to the implementation of the ASME Code, Section XI, IWA-4221, "Construction Code and Owner's Requirements."

### 3.0 TECHNICAL EVALUATION

#### 3.1 Background

Installed and spare MSRVs were originally manufactured to the 1968 Edition, Winter 1968 Addenda of ASME Code, Section III and General Electric Design Specification 21 A9206, Rev. 6. All subsequent repair/replacement activities were intended to meet the original Construction Code and design specification. All repair/replacement activity seal welding was performed by the original manufacturer (Target Rock) using the same WPSs as used during original fabrication. Current WPSs for seal welding were qualified in accordance with Target Rock procedure TRP-1139 rather than ASME Code requirements.

#### 3.2 ASME Code Component(s) Affected

Code Class: 1

Component Numbers: PSV-4400, PSV-4401, PSV-4402, PSV-4405, PSV-4406, PSV-4407, and six uninstalled spare MSRVs.

#### 3.3 ASME Code Requirements for which Relief is Requested

Under the rules of ASME Code, Section XI, IWA-4221, "Construction Code and Owner's Requirements," the ASME Code states that: "(a) An item to be used for repair/replacement activities shall meet the Owner's Requirements."

The licensee requests relief from IWA-4221 to allow weld procedure specifications for seal welding of the installed and spare MSRVs to be post-production qualified in accordance with ASME Code, Section IX requirements.

#### 3.4 Reason for Request

The original WPSs used for the seal welding of the subject components were qualified in accordance with Target Rock procedure TRP-1139 rather than ASME Code requirements. Target Rock procedure TRP-1139 included requirements for multiple surface non-destructive examinations (NDE) and macro examinations of sectioned specimens. TRP-1139 classified both the seat-to-body and the bellows-to-spacer plate seal welds as "Special Welds." TRP-1139 required qualification welds for "Special Welds" to receive a liquid penetrant (LP) examination as part of acceptance. The procedure qualification records (PQRs) (Target Rock referred to these as "Metallurgical Test Reports") show that an LP examination of the root and final passes for the bellows-to-spacer plate qualification seal weld and an LP examination of each pass for the seat-to-body qualification seal weld were performed. The acceptance criteria listed in TRP-1139 for the LP examinations states, "Liquid penetrant inspection shall not disclose any linear indications or cracks, and no rounded indications exceeding 1/32 inch diameter. A maximum of five indications (1/32 inch diameter) shall be permitted per linear inch of weld." TRP-1139 also states that qualification welds for "Special Welds" shall be metallographically examined with sufficient microspecimens (four maximum) to fully evaluate fusion to base metal, penetration, weld bead contour, soundness, grain size, heat affected zone in base metal, etc." TRP-1139 acceptance criteria for macro examination of qualification welds states, "Metallographic examination shall show sufficient (but not excessive) penetration, a good sound fusion zone, a

weld bead contour which follows the joint geometry, freedom from porosity exceeding .010 inch diameter and no cracks." The workmanship samples used for procedure qualification listed on the Metallurgical Test Reports were polished, etched, and examined under magnification.

The three affected production seal welds on each MSRV are the bellows-to-spacer plate seal weld, the pilot seat-to-body seal weld, and the second stage seat-to-body seal weld.

The 1968 Edition, Winter 1968 Addenda of ASME Code, Section III did not include fabrication requirements for valves or provide any requirements for seal welding. General Electric Design Specification 21 A9206, Rev. 6 required WPSs to be qualified in accordance with ASME Code, Section IX.

The 1968 Edition of ASME Code, Section IX should have been used to qualify the WPSs for seal welding, since the 1968 Edition of ASME Code, Section IX, paragraph Q-10 (b), requires all welding to be qualified using reduced section tension specimens and guided bend specimens. Pursuant to 10 CFR 50.55a, "Codes and Standards," Paragraph (a)(3)(ii), the DAEC requests authorization to post-production qualify the manufacturer's WPSs for seal welding in accordance with ASME Code, Section IX requirements. To qualify the WPSs for seal welding prior to production welding in accordance with ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety, as further described below:

First, in order to meet the ASME Code requirements to qualify the WPSs for seal welding prior to production welding and subsequent ASME Code stamping, all seal welds would have to be removed and re-welded using the same WPS that is now pre-qualified.

Second, removal of existing seal welds would require that the MSRVs be completely disassembled, the seat rings replaced, and the reassembled valves tested. This unnecessary welding evolution could potentially degrade the carbon steel casting. Therefore, replacement of existing seal welds is considered a hardship, or unusual difficulty, without a compensating increase in the level of quality and safety.

### 3.5 Proposed Alternative and Basis for Use

Target Rock has completed three PQRs using the same seal welding parameters as in the original WPSs for seal welding. Weld coupons were tested in accordance with the 2004 Edition through 2006 Addenda of ASME Code, Section IX. All tensile and bend tests were found acceptable per ASME Code, Section IX requirements. All three WPSs for seal welding have been revised to reference the new PQRs that were qualified via tensile and bend testing. These post-production PQRs verify that the seal welds made with the original WPSs for seal welding meet all tensile and bend test requirements and justify continued use. The revised WPSs for seal welding that now reference the new PQRs will be used during future repair/replacement activities, if performed by Target Rock.

In addition, Target Rock performed the following NDE on the affected production welds after the current repair/replacement activities were performed. Both the seat-to-body and bellows-to-spacer plate production seal welds were subject to a LP examination of their root and final passes. The acceptance criteria are provided in NWS Technologies LP procedure, NWS-NDE-P-01, Rev. 2, which meets ASME Code, Section III, Subsection NB (Class 1) requirements.

NWS-NDE-P-01, Rev. 2 is written to comply with ASME Code, Section III, Subsection NB, 1992 Edition through 1993 addenda. The ASME Code, Section III, Subsection NB LP acceptance criteria are unchanged up to the current 2007 Edition. The current code of record for the DAEC is the 2001 Edition through 2003 Addenda of the ASME Code, Section XI for repair/replacement activities. Section XI allows the Owner to follow the original Construction Code requirements, or the requirements of a newer edition/addenda of the Construction Code. Therefore, the use of NWS-NDE-P-01, Rev. 2, meets the requirements of ASME Code, Section XI, 2001 Edition through 2003 Addenda. The method and number of tests (LP examination of root and final passes) exceed ASME Code, Section III, Subsection NB requirements. ASME Code, Section III, Subsection NB requires either an LP or a magnetic particle examination to be performed on the final weld surface.

### 3.6 Staff Evaluation

ASME Code, Section III requires that all welding be performed using WPSs procedures qualified according to ASME Code, Section IX. ASME Code, Section III, NB-4323 states, "No welding shall be undertaken until after the welding procedures which are to be used have been qualified." Seal welding on the subject Target Rock MSRVs was performed using WPSs qualified according to Target Rock procedure TRP-1139 rather than ASME requirements. The licensee has requested relief from IWA-4221 to allow WPSs for seal welding of the installed and spare MSRVs to be post-production qualified in accordance with ASME Code, Section IX requirements.

The purpose of WPSs and PQRs is to ensure that the production weldment will have the required properties for its intended application. The applicable properties include adequate results from tension and bend tests. Target Rock procedure TRP-1139 used to develop the WPSs for seal welding of the subject components did not include these types of tests.

The tests used to qualify the WPSs for seal welding of the subject components included LP and metallographic testing of the welds. The qualification welds passed these tests. Target Rock performed the following NDE on the affected production welds during and after the current repair/replacement activities were performed. Both the seat-to-body and bellows-to-spacer plate production seal welds were subject to a LP examination of their root and final passes. These met the required ASME Code, Section III examination requirements. These types of tests are designed to ensure the soundness of the weld, but do not determine that the weldment is capable of having the required mechanical properties. These can only be determined by the ASME Code, Section IX required tests (tension and bend tests of the representative qualification welds, in this case).

The licensee has completed three PQRs in accordance with ASME Code, Section IX using the same parameters as in the original WPSs for seal welding. The qualification weld coupons were subjected to tension and bend tests in accordance with the 2004 Edition through 2006 Addenda of ASME Code, Section IX. All of these tests were acceptable per ASME Code, Section IX requirements. These post-production qualifying PQRs verify that the seal welds made with the original WPSs for seal welding meet all tensile and bend test requirements of ASME Code, Section IX. The post-production qualified ASME Code, Section IX PQRs, to the original requirements of TRP-1139, and the examinations performed on the production welds provide evidence that the subject welds are acceptable and can continue in service.

If the welds were not accepted, then qualification of the WPSs for seal welding prior to production welding and subsequent ASME Code stamping would require all seal welds to be removed and re-welded using the same parameters as in the original WPSs. Also, removal of existing seal welds would require that the MSRVs be completely disassembled, the seat rings replaced, and the reassembled valves tested. This additional welding could potentially degrade the carbon steel casting. Therefore, replacement of existing seal welds is a hardship, or unusual difficulty, without a compensating increase in the level of quality and safety.

#### 4.0 CONCLUSION

Based on the discussion above, the staff concludes that the proposed Request for Alternative to allow WPSs for seal welding of the installed and spare MSRVs to be post-production qualified in accordance with ASME Code, Section IX requirements is acceptable and compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC staff authorizes the proposed alternatives related to the seal welding of the installed and spare MSRVs.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

#### 5.0 REFERENCES

1. Letter No. NG-07-0588 dated July 31, 2007, from Gary Van Middlesworth, FPL Energy Duane Arnold, LLC, to USNRC with regard to Relief Request for Seal Weld Procedure Qualification, Duane Arnold Energy Center, Docket No. 50-331, License No. DPR-49 (ML072220137)
2. Letter No. NG-08-0093 dated February 19, 2008, from Richard L. Anderson, FPL Energy Duane Arnold, LLC, to USNRC with regard to Response to Request for Additional Information related to the Relief Request for Seal Weld Procedure Qualification, Duane Arnold Energy Center, Docket No. 50-331, License No. DPR-49 (ML080590357)

Principal Contributor: Edward Andruszkiewicz

Date: July 2, 2003